Te Whatu Ora
Health New Zealand

RMO Clinical Handbook

9th Edition

Version 1.x (11th x.2023)

Contents

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Acknowledgement

The authors of the RMO Handbook and Te Toka Tumai Auckland acknowledge Te Rūnanga o Ngāti Whātua as mana whenua. The land that Auckland City Hospital sits on was gifted by Ngāti Whātua tupuna and rangatira, Āpiha Te Kawau. Te Toka Tumai Auckland has a respectful and valued partnership with Ngāti Whātua that continues to evolve. Within this relationship, the authors and Te Toka Tumai acknowledge the importance of Mātauranga Māori (Māori knowledge systems) and the contribution of a unique world view, providing a long-term vision for the health and wellbeing of our population.

The authors, Te Toka Tumai Auckland and Te Whatu Ora also emphasise the importance of Te Tiriti O Waitangi at the heart of our mahi within the health system, and our commitment to achieve health equity in Aotearoa. Te Kaunihera Rata O Aotearoa (Medical Council of New Zealand) requires all doctors to meet cultural safety standards. MCNZ state that cultural safety benefits all patients and communities, and has a central role in health equity.

General Information

Introduction

This is the 9th edition of Te Toka Tumai Auckland RMO Clinical Handbook. Having made its first appearance in 2001, the Handbook has gone through a few changes in formatting over the years including the introduction of an App format in 2020.

The Handbook has become a core resource for doctors and nurses over the years. Although the target readership is the First Year House Officer who is seeking readily accessible, locally appropriate information to allow him/her to efficiently provide good care to patients, this Handbook is used much more widely by other clinical staff. We hope that this new edition will continue to be a readable, reliable, simple reference for all.

I am indebted to all the contributors to the Handbook over the years, in particular to Dr Richard Frith and Dr David Spriggs, the original Handbook editors. Without the precedents set by them, our task would have been immeasurably more difficult. I would also like to extend a huge thank you to the Clinical Education and Training Unit (CETU) and Pat Starkey and Yvonne Chan who have committed many hours to this project.

We wish to thank the members of our RMO committee who provided valuable feedback and guidance. We also wish to acknowledge all the work of the many senior medical staff and RMOs of Te Toka Tumai Auckland who reviewed and updated the chapters as well as our Pharmacist colleagues who have gone through the whole handbook to ensure medication and dose accuracy and consistency in nomenclature.

Please keep in mind that the Handbook is not a textbook nor is it a compendium of policies and guidelines. Inevitably there will be clinical questions that will not be covered in this Handbook. All readers need to be aware that information can become outdated. We also reinforce the importance of good clinical judgement when following any advice in the Handbook. If in doubt, further advice must be sought from senior clinical staff.

We are always happy to hear feedback about the Handbook and are open to any suggestions for improvement.

Bodhi Wimalasena, Editor

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Disclaimer Notice

This handbook:

- was not created as medical advice for members of the public. It is intended as guidance for Resident Medical Officers (RMOs) undertaking training in NZ public hospitals.
- contains recommendations concerning investigation and management of medical problems in adults and should not be used when treating children.
- should not be relied upon as medical advice and is not a substitute for conversations between a patient and a physician – specific details about a patient's health are vital when considering treatment.
- will be updated electronically. It is important to use the most up-to-date version available.
- has no contact phone number or email address listed due to privacy reasons. Please refer to the 'Referral and Contact list' on Te Toka Tumai's staff intranet, or please contact CETU for a 'Frequently used phone contacts' card.

Disclaimer:

This handbook was designed as a general guide to appropriate practice and was not intended to avoid the necessity for the individual examination and assessment of appropriate courses of treatment on a case-by-case basis. RMOs should therefore consider the information provided carefully, but not stick slavishly to these recommendations or to drug doses if they consider that they are incorrect or inappropriate.

Although reasonable care has been taken in preparing this handbook, any guidance of this sort has the potential to contain errors in both fact and opinion. In particular, there is the possibility that specific data (particularly drug doses and recommendations about drug administration) could be inaccurate. What is more, recommendations about specific investigation pathways could contain errors, or may be superseded in time by newer, more appropriate guidelines or pathways. RMOs should consult other sources of information, especially if there is some doubt, including product information sheet, the reference viewer and hospital formulary for prescribing information and the laboratory ranges for investigation results.

Trade names used in this Handbook are for identification and exemplar purposes only. They do not imply endorsement of any particular drug or vaccine.

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Credits

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Previous editions: First edition 2001, Second edition 2003, Third edition 2005, Fourth edition 2008, Fifth edition 2011, Sixth edition 2014, Seventh edition 2017, Eighth edition 2019

The RMO Clinical Handbook is freely available to Te Toka Tumai Auckland staff and is electronically available on the Te Toka Tumai Auckland intranet

This is a living document and we encourage all feedback.

Please send your suggestions or corrections to: CETUAdmin@adhb.govt.nz

Hauora Māori

RMOs are strongly encouraged to read, use and to be familiar with many helpful resources which are on offer, both for educational purposes and for patient care. RMOs new to Aotearoa New Zealand are encouraged to explore and undertake the modules available on Ko Awatea Learn (use work email address as login, and usual password, search Ko Awatea Learn under “cultural safety”)

Ko Awatea LEARN: Te Toka Tumai Dashboard.

Further reading and position statements

Te Toka Tumai - Treaty of Waitangi Resources (hanz.health.nz)

Ministry of Health - https://www.health.govt.nz/system/files/documents/pages/whakamaua-tiriti-o-waitangi-framework-a3-aug20.pdf

Medical Council of New Zealand - Cultural safety | Medical Council (mcnz.org.nz)

Essential resources for patient care

Āke Āke app –

Android
https://play.google.com/store/apps/details?id=com.kiwamedia.android.qbook.WTA0001&fbclid=IwAR3U5oFjeoNrfEZm8seLpOLb3No4LlPlPVWRO2h3HaMULN2UDcSeQKaghMw

iOS
https://apps.apple.com/app/id1435134156

He Kamaka Waiora – https://adhb.hanz.health.nz/Pages/He-Kamaka-Waiora.aspx#

The He Kāmaka Waiora team works with Māori patients and their whānau who need to access the hospital services. This includes co-ordinating whānau accommodation, providing social and cultural and advocacy services. The team also work with Te Toka Tumai Auckland and Waitematā clinicians and staff to help Māori patients and their whānau during their hospital stay and after discharge.

Under the guidance of the Chief Advisor Tikanga, He Kāmaka Waiora also provides cultural advice and services on all matters Māori to the staff of Te Toka Tumai Auckland and Waitematā.

He Kāmaka Waiora can help you if you need:

- Cultural advice and services (Pōwhiri and mihi whakatau)
- Finding accommodation for the whānau of patients
- Organising Māori language translations and te reo Māori language classes

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First Year Survival Guide

Welcome to the start of your medical career! Life as a first year House Officer is very different from that of a medical student. While it can be overwhelming at times, remember there is always someone to talk to and no matter how isolated you feel, we've all been there before and are only too happy to help. Here are a few "rules" that those who have gone before you have put together to help make your first year, and particularly those nerve-wracking first few weeks, a safe and enjoyable experience. Good luck and have fun!

Fear is normal

Everyone's scared on their first day. Luckily you're employed at one of the most supportive District Health Boards in the country with a 24hr crash team and numerous Registrars onsite all the time. There is always someone happy to listen, whether that be your friends outside of work, family, PGY1 peers, your Education Supervisor, Consultant, GP, or someone else.

If in doubt, ASK

Everyone knows you're new and so expects you to ask questions. A lot. No matter how scary or disinterested your Registrar or Consultant may seem, if you don't understand something – ASK. There are other more experienced House Officers who are happy to help and the Senior Nurses know how the system works. Listen to them.

Get organised

Good time management is an essential part of succeeding in your first year. Creating order in your workplace and home environments, and predicting and planning for issues before they arise will lead to a much smoother experience.

Write things down

Don't rely on your memory – it fails the best of us. Make lists and tick things off; you're much less likely to miss something that way.

Be proactive

You are an important member of the team and you need to know what's happening. Don't hang back on ward rounds and if you don't know the plan when the team is moving on – ASK.

Don't sit on it

If you've got a problem, be it a personality clash with your Registrar, something at home, the workload or something completely different, talk about it early. There is always someone happy to listen.

Don't do it if you're not comfortable doing it

Remember, you're a medical professional and you have a responsibility to know your limits and stick to them. This includes consenting for an unfamiliar operation, or being asked to perform a procedure you've never done before.

If you're sick, stay home

Just because you're a doctor, it doesn't mean you don't get sick. If you're sick, stay at home. You'll recover faster and you won't spread your illness to your colleagues and patients.

Go home

At the end of the day, go home. There is an on-call roster to cover after-hours and no one will thank you for running yourself into the ground.

Be collegial

Notwithstanding the comment, "Go home", above, don't dump on your colleagues.

We're all in this together and it is amazing how much happier you'll all be if you look

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out for each other and share the burden. This also applies to your relationships with other health professionals.

Eat, drink and go to the toilet

Take time out to attend to your basic needs! It's amazing how much more productive the rest of your shift will be and, with rare exceptions, most things can wait for half an hour.

You don't know it all

Nobody expects you to know everything. As above, if you don't know, then ask and best not to go comparing yourself to your Registrar or Consultant – they've been doing it for a lot longer than you have!

Savour the successes

Take pride and pleasure when things go well. Doctors spend too long beating up on themselves.

Talk about it

If you don't tell someone when you're in trouble, then no one can help you. There are always people you can talk to and tackling issues early affords much better outcomes for everyone.

Adapted from "Survival Tips for JMOs", Council for Early Postgraduate Training in South Australia (CEPTSA).

HEALTH POINT PATHWAYS

For further information on ADHB services and protocols, consult

https://www.healthpoint.co.nz/

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Working as part of a team

As a House Officer, you will be a member of a number of teams. While your primary responsibility is to provide the best possible patient care, you also need to ensure you act with fairness and collegiality towards your team colleagues. The following are some general principles of behaviour that will enhance your value as a team member.

Standards of behaviour

In a busy hospital environment, with the inevitable stresses of acute care, compounded by tiredness, uncertainty and anxiety, there is the potential for communication difficulties or conflict between team members and patients. We have, however, a zero tolerance for unprofessional, disruptive behaviour by RMOs.

Communication with nurses, colleagues and patients must remain civil at all times. If there are particular difficulties communicating with others in the hospital, discuss this with your Registrar or SMO.

Time management

It is important that you are punctual for ward rounds, team meetings, 'rapid rounds' etc.

If you are going to be late for a ward round, clinic, handover or other meeting, call your Registrar or Consultant.

Try to finish all of your work before leaving. If you can't, and it needs to be done, make sure you hand over to the responsible RMO.

Ward rounds

Record all management plans.

Communicate any changes to nurses looking after the patient.

Careful follow-up of previous decisions / documentation.

Patient discharges

Discharge planning should start at the time of filling out the A to D planner.

Try to predict the discharge date – this is good for ward planning and for the relatives.

Complete the electronic discharge summary for each patient. Check at the start of the run if there are any particular rules regarding discharge from the service (notes should remain in ED / wards).

Handover

Handover to the next RMO is an essential part of good patient care. It is also good to complete any tasks that need to be done to facilitate discharge or transfer of patients at nights or weekends.

Complete weekend plans for every patient.

Prepare discharge summaries for patients who are to be discharged at the weekend.

Hand over jobs to be done / unseen patients / medical contacts / problem patients /patients you are worried about to the next RMO.

Daily handover to on-call team for patients requiring attention during the evening.

Friday afternoon handover to weekend teams for patients requiring attention over the weekend.

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Try to finish all of your work before leaving.

Request bloods / other investigations if they need to be done over the weekend.

Sign off unaccepted lab results.

RMOs' relationship with on-call SMOs

When you are on call, discuss with your Registrar or SMO the threshold for calling (this differs between specialties and services).

Don't create any surprises for the SMO – call if a patient unexpectedly deteriorates or dies.

The ultimate responsibility for patient care lies with the SMO – keep your SMO informed if there are ongoing problems.

Request for specialist opinion

Remember that a consultation with another service is a specialist-to-specialist discussion which you are facilitating. If you are the first contact with a referred patient, you must discuss the problem with the SMO. Record the SMO's name in the notes.

If you write the consult note, include any comments by the SMO and indicate that he or she has seen the patient, or discussed the case. Ask a specific question.

You may need to contact the referrer to determine the urgency of the problem. This is not always apparent from the referral letter.

RMOs accepting GP calls

If you take calls from GPs on behalf of your in-patient service, and the patient needs to be admitted or assessed, you must accept the patient rather than expect the GP to try and find a more appropriate person.

Transfer to a more appropriate service can occur after review by negotiation with fellow RMOs.

Sickness

If you are unable to come to work during the week, contact the RMO Support Unit and your Registrar or SMO; on weekends, call the Duty Manager and your Registrar or SMO. As much notice as possible should be given.

Dress

Your clothes must be professionally appropriate at all times.

Teaching

Teaching is part of the job and can be very rewarding. You will be expected to teach and role-model for medical students and other staff. Students often learn much more from the House Officer than from the SMO.

If you do not know what to do, ASK. Your colleagues, seniors, nurses, ward clerks, etc. are there to help.

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Chaperones

Respectful two-way communication and the judicious use of chaperones are your best protection.

When to use them

- Patients have the right to have a mutually acceptable third party present during any examination if they wish.
- Doctors have the right to insist that a third party be present, especially during internal/intimate examinations. Doctors may refuse to conduct a routine internal/intimate examination if the patient refuses consent for a third party to be in the room.
- Deciding when to use a chaperone is a matter of judgement, for which there are no fixed rules.
- Do not assume that you do not need a chaperone if you are the same sex as the patient.
- There are no upper or lower age limits.
- Take cultural and religious considerations into account where necessary.
- Be especially sensitive to the feelings of vulnerable patients.
- Don't make assumptions about the preferences of different groups of patients.

Trust your instincts. If you feel uncomfortable, or if your patient seems unduly reluctant to be examined, arrange for a chaperone or suggest that they see another doctor.

Choosing an appropriate chaperone

- The most appropriate person is a member of the clinical team. The patient must be introduced to them and told what their position is within the team.
- Potential embarrassment and inadvertent breaches of confidentiality make friends and relatives poor choices as chaperones.

How to use a chaperone

- Never force a chaperone on an unwilling patient. A patient who is not embarrassed being examined may be uncomfortable in the presence of an observer.
- If the offer of a chaperone is declined, document this in the patient's notes. If you don't want to proceed with the examination in the absence of a chaperone, tell the patient so and ask them either to reconsider or to accept a referral to another doctor.
- Remember to preserve confidentiality in the presence of a chaperone.
- Record the name and designation of the chaperone in the patient's notes.

Respecting the patient's dignity

- Provide the patients with a private space in which to undress and dress themselves.
- Provide the patient with a gown, if necessary.
- Make sure that the door to any public-access area is closed.
- Use drapes to avoid exposing more of the patient's body than is necessary.
- Only offer to help the patient remove or replace clothing if they ask for, or appear to need, assistance.

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Consent for Procedures

INFORMED CONSENT

Informed Consent is not a process of filling out forms, but rather the exchange of information so that a person can make an informed decision.

- Patients have a fundamental legal and ethical right to determine what happens to their own bodies
- The seeking and giving of consent is a process and not a one-off event
- A patient with capacity is entitled to withdraw consent at any time, including during the performance of a procedure
- When you are not sure, ask

QUANTITY OF INFORMATION

Clinicians need to be aware that the question of what information is required for informed consent to a procedure must be assessed from the point of view of the reasonable patient in the particular patient's circumstances.

Every patient has the right to receive honest and accurate answers to questions relating to services.

RIGHT TO REFUSE

It should be made clear to the patient that he/she has the right to refuse or withdraw from treatment without fear of recrimination or penalty.

HOW INFORMATION SHOULD BE GIVEN

Sufficient time should be allowed for the patient to read written information, and discuss this and any verbal information with whomever she/he wishes.

WHO SHOULD GIVE THE INFORMATION

The primary responsibility for ensuring appropriate information is shared lies with the person who is performing the procedure.

In some situations, it is impractical for all information to come from the health professional conducting the procedure. In such cases an appropriate health professional familiar with the treatment or procedure and with adequate knowledge of the risks and benefits of the treatment or procedure should impart the information.

In situations where a team is involved in management or treatment the process of imparting information may be shared between various members of the team.

When obtaining consent is delegated, the patient should be told the reason why the person carrying out the treatment or procedure could not personally obtain consent.

WHEN IS WRITTEN CONSENT REQUIRED?

- The patient will be under anaesthetic or sedation; or
- There is significant risk of adverse effects on the patient; or
- When either party requests it; or
- The patient is to participate in any research
- Body parts or tissue are to be removed (information must include information on removal, retention, return, or disposal)

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DIMINISHED CAPACITY AND COMPETENCE TO CONSENT

Everyone must be presumed competent to give informed consent, unless there are reasonable grounds for believing that the person is not competent. A patient with diminished competence retains the right to give informed consent appropriate to that patient's level of competence.

A person may be competent in some aspects and incompetent in others (e.g. managing finance versus understanding the effect of illness upon them).

There are reasonably well established guidelines as to what criteria to use in the assessment, but clinical opinion and practice may vary. The law is vague, using such terms as 'mental capacity' and 'sound mind', but not specifying exactly what is meant by competence or its absence. Courts usually defer to clinical judgement.

Where you have concerns regarding diminished capacity, e.g. in patients with dementia, delirium or intellectual disability, discuss the situation with your Registrar or Consultant.

Please refer to the full Te Toka Tumai Policy on Informed Consent, and Tikanga best practice:

Te Toka Tumai Informed Consent Policy (intranet)

Tikanga Best Practice (intranet)

See also: Medical Council of New Zealand's policy on informed consent (external site).

FREQUENTLY ASKED QUESTIONS

Can Postgraduate Year 1 (PGY1) House Officers do consents for procedures?

Yes. However, doctors should not take informed consent where they do not feel competent to do so.

Do I need to discuss all possible complications of an operation with the patient?

A doctor has a duty to warn a patient of a material risk inherent in the proposed treatment. 'Material risk' should be taken as a risk that seems important to a patient not only to the doctor. A Medical Practitioner must ensure that a patient has been fully advised of the risks inherent in that treatment or procedure, as well as ensuring that a patient has given appropriate consent to the carrying out of treatment or procedure.

Simply obtaining a patient's written consent does not mean that the legal duty towards a patient to explain all material risks has been fulfilled.

What procedures can House Officers consent for?

A doctor's ability to obtain informed consent from a patient is not limited by seniority but by experience.

Consent for Gastroscopy

Obtaining informed consents for simple procedures (such as gastroscopy) will be delegated to the primary referring team due to the high volume of these procedures being performed daily in tertiary institutions like ADHB. The ultimate legal responsibility lies with the person who is responsible for the procedure.

See Gastroenterology and intranet site for more information.

Consent for Bronchoscopy

Bronchoscopy consent will be done by the Respiratory Service. Respiratory House Officers will get information on the consent process during orientation.

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For your own professional development, you are encouraged to contact individual services for further information if you are not familiar with the risks and benefits of these common procedures.

What about blood products?

Blood products require separate consent. Information for patients and doctors can be accessed through the Te Toka Tumai Informed Consent policy (intranet).

See also Blood Products and Transfusion chapter.

What about body parts?

When applicable, you have to ask the patient if he/she would like their body part/tissue returned to them post operation. If patient indicates yes, you have to assist the patient with completing the 'Body parts/tissue release' form (CR2547).

See also: Te Toka Tumai Body Parts and Tissue – Storage, Cremation and Return Policy (intranet).

I was asked to obtain informed consent for a procedure that I don't know enough about to explain the risk and benefit/feel comfortable of consenting. What should I do?

You should not obtain the informed consent and explain to your senior the situation. For House Officers, discuss the issue with your Registrar or Consultant first. If you don't feel comfortable doing so, contact your Education Supervisor - they are here to help. For Registrars, discuss the issue with your Consultant; seek advice from your supervisor or Clinical Director if appropriate.

What should I do if I'm not comfortable with how I think a particular consent was obtained by a colleague?

You should discuss the situation with your Consultant and escalate it to the Clinical Director, if appropriate.

I did the consent and the patient happily signed it. The operation resulted in a common complication. The patient claims I didn't mention all the possible complications, including this particular one to him. What should I do?

- Discuss the situation with your senior
- Give the patient a copy of Te Toka Tumai's 'Your Rights' leaflet
- Refer the patient to Te Toka Tumai's Consumer Liaison team
- Consult your medical indemnity organisation if there are any concerns

Details of the complaints should not be recorded in the medical notes. An entry documenting the incident is sufficient.

Record the details of the complaint elsewhere and make a copy.

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LabPLUS

LabPLUS is located in Building 31 on the ACH site.

The services provided include:

Chemical Pathology Haematology

Microbiology

Molecular and Cytogenetics

Anatomical Pathology

Virology and Immunology

Point of Care Testing support

Phlebotomy

LabPlus Call Centre from 0700-1900h Monday to Friday

0800-1200h Saturday

Outside of these hours the automated answering service connects callers to the laboratory of their choice.

Enquiries concerning tests available, turnaround times, sample requirements, services available and other advice should be directed through LabLink in the first instance.

Call Centre staff will refer the caller to an appropriate clinically trained staff member for more detailed enquiries.

Patient identification and laboratory requests

Requests must include patient's name (i.e. surname and initials) and NHI (Blood Bank will require the full first name(s) and surname of the patient).

The specimen and request form must contain a minimum of 2 unique identifiers e.g. patient's name (surname and first name) and NHI.

The requirements for patient identification on laboratory requests are set out in the policy Specimen Collection and Labelling Policy which is available on the intranet. All clinical staff are advised to familiarise themselves with this policy.

The test guide and further information

The LabPLUS Test Guide is available on the Te Toka Tumai intranet and provides comprehensive information about all tests offered including indications for and interpretation of the tests.

The LabPLUS website provides more details about the service.

Phlebotomy

LabPLUS staff provide a comprehensive phlebotomy service to ACH, Starship and GCC. For up-to-date details contact LabLink or consult the LabPLUS website.

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Limiting and Withdrawing Treatment – Establishing Shared Goals of Care (SGOC)

All patients should have a Goals of Care form completed within 24 hours of admission. The default for everyone with an uncompleted form is Goal A: the goal of treatment is *curative and restorative.* This means that CPR and intensive therapies, including intensive care admission, are considered appropriate for the patient.

Rationale

When treatments which are unlikely to benefit the person and/or are not in keeping with their goals or values are instituted, significant suffering can occur. This harm occurs not only to the patient themselves, but also to their family and whānau and to staff, through moral distress.

Any patient in hospital could deteriorate rapidly. The GOC process and documentation helps avoid a situation where a team that does not know the patient must make emergency decisions in a crisis.

Capacity

If the patient has capacity, they (+/-others) should participate in decision-making about goals of care, unless they nominate someone else. If capacity is in doubt, follow the algorithm on page 2 of the GOC form.

Process

Establishing goals of care should be a shared process between the clinical team and the patient and family or whānau. These discussions should be facilitated by a registrar or SMO. Other health professionals may be involved in establishing and documenting the patient's preferences for receiving information; current level of understanding; knowledge gaps; and goals and values in relation to their care and treatment. This information can be documented on page 3 of the GOC form.

Framework for a GOC conversation (see diagram)

There are three steps:

1. **Preparation** in which the clinical team has a preliminary discussion amongst themselves about which treatments are likely, on balance, to cause more good than harm, and which are likely to be harmful. In some cases this will be obvious but in many cases there may be a fine line between the two.

2. **Conversation** with the patient (and/or whānau) involves finding out who should be present for the discussion and what their understanding is of the current situation. It may be necessary to give a new piece of information and then give the person some time to adjust to this news before exploring goals. A way to explore goals might be *"In light of what we have just been talking about, what is most important for you right now?"*

   Having the conversation in steps (as in the framework below) helps engender trust because you have taken the time to find out, listen and empathise.

3. **Recommendation**
   A recommendation should link beneficial treatments with patient goals and should be framed around what you are doing, rather than not doing e.g. "Can I make a recommendation? Given what you have said about your mum, I suggest we keep the antibiotics and fluids going for another 24 hours to see if she might pull through this, and meanwhile we ensure we help keep her breathing comfortable with these medications".

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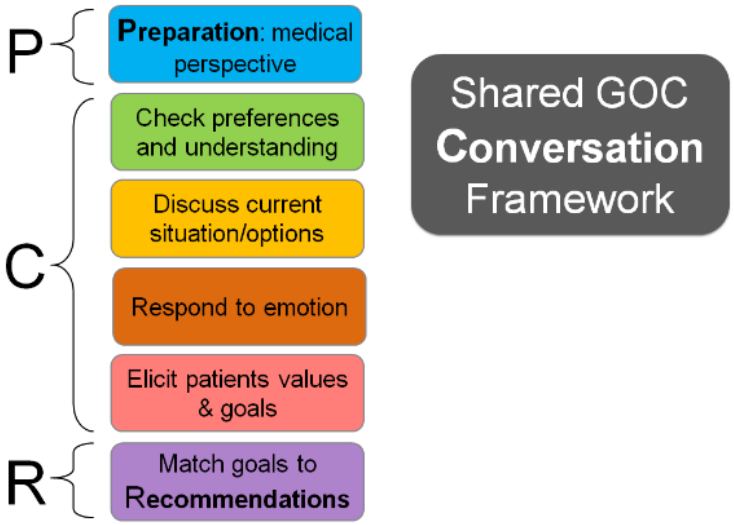
Tips

- A common error is to start with the treatment decisions rather than with checking understanding and exploring goals in light of that understanding.
- Avoid asking family or whānau to make medical decisions, for example about antibiotics or fluids. Instead make a recommendation based on the goals.
  e.g. if the goal is D – for comfort whilst dying – and the family want IV fluids to continue, you might say: *"I suggest that to keep her comfortable we turn these fluids right down so that excess fluid does not build up on her lungs and make her breathing more difficult".*
- There is NEVER nothing more that can be done.
- Avoid using the word futility with patients and whānau – they hear *"not worth it".*

Hospital Palliative Care team

Call the team if you are having difficulty establishing goals of care – especially in situations of significant uncertainty or complexity. The team can be helpful where there is a significant mismatch between the expectations of the patient and or family and whānau and the medical team which cannot be resolved.



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Nurse Facilitated Discharge

- Nurse Facilitated Discharge (NFD) is a successful process used to facilitate timely discharge.
- The process allows patients to be discharged by a Senior Nurse (Charge Nurse or Nurse Specialist) if they meet specific diagnostic/assessment criteria set by the medical team, ensuring patients expected to be discharged are assessed early in the shift rather than waiting for the next ward round.
- The NFD process improves acute patient flow, particularly during weekends.

NFD Process

1. Identify potential patients for NFD (at Daily Rapid Rounds)
2. Ensure criteria for discharge have been discussed with Registrar or Consultant then complete NFD form (CR4743)
3. Complete Electronic Discharge Summary (EDS) Write: **"This discharge summary is subject to nurse facilitated discharge which may result in an updated discharge summary**" in clinical management section of EDS (EDS does not need to be pre-printed)
4. Sign prescription
5. Leave NFD form and prescription in clinical notes
6. Inform Charge Nurse or Coordinator

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Correspondence with GP

Electronic Discharge Summary

The Electronic Discharge Summary (EDS) has 3 main functions:

- Information for the patient on what has happened, what they need to do and what the future plans are
- Information for Primary Care on diagnosis, medications, discharge planning and abnormal results
- Provides a record of the admission for secondary care

What is needed in a good EDS?

- Plain language that can be understood by patients and their family/whanau (no acronyms)
- Diagnosis for this admission
- Other relevant medical problems/diagnoses (not a list of every condition/operation)
- Discharge medications with any changes from admission highlighted
- Follow-up plans – by whom and when
- Key advice to patients
- Discharge plan
- Specific GP/ Primary Care follow-up tasks
- Significant investigations only. NO DUMPING (Lab results are available to GPs on Testsafe)
- Major Interventions
- Referrals to other services
- Significant ward reviews by other services
- Senior clinician responsible for this patient at this admission (including contact details)
- Destination on discharge– e.g. home / rest home / family / other service
- Specific data – e.g. ACC details, Special Authority Pharmac numbers

Outpatient Clinic Letter

What is needed in a good Outpatient Clinic Letter:

- Diagnosis and Problem List
- Medications
- Management Plan
- GP tasks
- Timely receipt (sign off)

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Processes around Patient Death

See Palliative Care chapter, care in the last days of life section for information around Recognising Dying and Symptom management

HANDING OVER TO YOUR MEDICAL COLLEAGUES: "SIGHTING" A PATIENT

- If you have a patient who is expected to pass away, it is not necessary to ask the evening house officer to "sight" the patient as the patient's regular team should be available (during the week) within 24 hours to complete the death certification paperwork.
- **Prior to a weekend**, it is important to hand over to your colleagues that you have a patient who is expected to pass away. This will enable the on-call colleague to familiarise themselves with the patient so they will be able to complete all of the paperwork. Your handover should include: the pertinent medical issues, the cause of death (as discussed with your SMO), and the location of the patient.
- As the on-call house officer, you should physically see the patient and ensure you have sufficient knowledge of the relevant medical conditions. A good way to do this is to introduce yourself to whanau as the on call doctor, explain that you will be available if any issues with symptoms arise, and review the notes.

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AFTER THE PATIENT DIES

If you need advice in completing the paperwork please contact the Clinical Nurse Manager for assistance.

Death Documentation: Guide for ADHB House Officers

Pronounce the patient dead

Examine the patient:

- Check the patient's ID label, and check the identity of the patient with their nurse or family member.
- Feel for a central pulse for 10 seconds
- Auscultate the heart for 10 seconds
- Observe the chest and auscultate for respirations for 60 seconds
- Check that pupils are dilated and unreactive to light
- Check for a pacemaker
- If there is any uncertainty on examination, consider attaching a cardiac monitor
- The MoH guidelines[1] state that the clinical examination should be performed twice, with a minimum of ten minutes between assessments

Then write your findings in the patient's clinical notes. Document the time and date of death as stated to you by nursing staff or relatives who noted it.

Inform whānau/family (if they haven't already been informed)

Ask whether there are any cultural or religious requirements.[2]

- Where the deceased is Māori, notify He Kāmaka Waiora/Māori Health Service if within hours. If whānau are not present, Kaiatawhai (a Māori health service representative) may need to remain with the tūpāpaku (body of the deceased) until whānau arrive.
- Ideally the tūpāpaku should be kept on the ward in a single room until a whānau member is there to accompany them to the morgue. Please inform Whānau if the tūpāpaku is to be moved off the ward.
- Where the deceased is Pacific Islander, offer the support of Pacific Island whānau/family support services.

Complete the Hospital Record of Death form (CR2204)

This is a physical form that should be available in the 'deceased documentation' folder on each ward.

If not, you can find it by searching the clinical forms library on Hippo: https://adhb.atlasmd.com/login/MainBody

Is discussion with the Coroner necessary?[1]

Yes or unsure

In-hours: discuss with the team registrar or consultant

After-hours: the on-call registrar for the service should discuss with the on-call consultant for the service

HOs are not to discuss cases with the Coroner themselves

No

Did you see the patient and were you aware of their medical condition before death?

Yes

No

Will the body be available in the hospital premises for any of the doctors who attended the patient alive to view the body within 24 hours of death?

No

Was the death expected, i.e. the cause of death has been documented in the notes or is evident on reading the clinical notes?

Yes – go to page 2

No

Yes

The doctors who attended the patient alive must complete the certificates. Please ensure they are informed of the death as soon as they return to duty.

Go to **https://deathdocs.services.govt.nz/welcome** log in using your RealMe login.

Both the Medical Certificate of Causes of Death (HP4720) and Cremation Certificate should always be completed online. Hard (paper) copy documentation should only be utilised in the case of IT systems going down or for when practitioners cannot access the online documents.

Complete the Medical Certificate of Causes of Death HP4720 Form[3]

This is otherwise known as the 'death certificate'.

To watch a short online tutorial about filling in this form go to:
https://www.youtube.com/watch?v=Pk8aCZmd_J4

The doctor filling in this form must have examined the body themselves. This may mean you need to go to the mortuary to examine the body if you are completing paperwork the following day.

Complete the Cremation Certificate of Medical Practitioner

Complete this even if the patient's family are planning a burial. Plans can change and it is useful to have this done just in case.

The same doctor must complete the Medical Certificate of Causes of Death and the Cremation Certificate.

If you did not know the patient before death, you **must** confirm their identity after death with their nurse or a family member.

Once completed:

1.Print both the Medical Certificate of Causes of Death (HP4720) and Cremation Certificate and place in the clinical record.

2. The Record of Death, Hospital Death Notice, Medical Certificate of Causes of Death and Cremation Certificate all then need to accompany the tūpāpaku to the mortuary (and will be re-filed in the clinical record from there).

Write a discharge summary

This should be succinct but informative as it will help inform the GP of what has occurred.

If within normal business hours you can also phone the GP to notify them of their patient's death. It is also good practice to inform any specialists involved in the patient's care of their death.

Contact the Clinical Nurse Manager (CNM)

Once you have completed all of the documentation, or earlier if you need assistance with the documentation.

Disclaimer: This flowchart has been created in accordance with MOH guidelines and Auckland Hospital policy. It is intended for use at Auckland Hospital – otherwise please refer to local hospital guidelines.

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1. MOH guidelines on verifying death (including guidance on which deaths are reportable to the coroner): https://www.health.govt.nz/publication/guidelines-verifying-death
   Nb: any patient under the MHA (Mental Health Act) order at time of death is reportable to the coroner – this can be easily overlooked.
2. Refer to the Tikanga Best Practice guideline on the intranet https://adhb.hanz.health.nz/Our%20Organisation/Tikanga%20Best%20Practice.pdf#search=tikanga
3. For help filling in the 'Medical Certificate Cause of Death form' i.e. deciding what to put in each section for 'Cause of death', visit: https://www.health.govt.nz/our-work/regulation-health-and-disability-system/burial-and-cremation-act-1964/completing-death-documents/medical-certificate-cause-death/completing-medical-certificate-cause-death-form

For any other questions regarding death documentation you can contact the **Medical Referee - Dr Garry Clearwater**.

When a body is to be repatriated to another country

A "Deceased Person Infectious Status" (CC02) form is required to meet New Zealand and overseas customs requirements. This form will be supplied on request by the Clinical Nurse Manager.

The Medical Referee

There is a doctor appointed by each crematorium authority and whose appointment is approved by the Director General of Health. Their primary role is to check the Death and Cremation Certificates for compliance with the appropriate acts and regulations and, if everything is in order, sign an authorisation certificate "Permission to cremate". They do not have access to a patient's medical records but are authorised to make appropriate enquires. They may require a formal declaration of identity of the deceased and may refuse to authorise a cremation if there is any doubt over the accuracy of the documentation. The current medical referee is Dr Garry Clearwater.

REFERRAL TO THE CORONER

All discussions with the coroner must be made by a Consultant or Registrar.

The Coroners Act 2006

A useful document for the public entitled "When Someone Dies Suddenly" is available to download at: https://coronialservices.justice.govt.nz/assets/Documents/Publications/MOJ0047-SEP22-FINAL-V2-WEB.pdf

Referral to the coroner is required for:

- Deaths which are without known cause, suicide or unnatural or violent.
- Deaths for which no Medical Certificate of Cause of Death is given.
- Deaths during, or that appear to have been as a result of, a medical, surgical dental or similar operation or procedure or treatment and was "medically unexpected".
- Deaths that occurred while a person was affected by an anaesthetic, or appear to have been the result of the administration of an anaesthetic or a medicine and was "medically unexpected".
- Deaths that occurred while the woman concerned was giving birth, or that appear to have been a result of that woman being pregnant or giving birth.
- Deaths in official custody or care, including any person who died while subject to the following Acts:
  - The Alcoholism and Drug Addiction Act 1966
  - Children, Young Persons, and their Families Act 1989
  - Corrections Act 2004, the Crimes Act 1961
  - Intellectual Disability (Compulsory Care and Rehabilitation) Act 2003
  - Mental Health (Compulsory Assessment and Treatment) Act 1992

See for more detail: www.legislation.govt.nz/act/public/2006/0038/latest/DLM377532.html

Referral to the coroner may not be required

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- Just because death occurs within any particular time period (e.g. 24h or 48h) after a procedure, although the proximity of a procedure should be a factor in assessing the likelihood of a causative relationship OR
- If a reasonable clinical assessment by a Registrar or specialist well acquainted with the case finds no causative relationship between any procedure and death OR
- If the patient is 70 years or older, and death was due to accidental injury arising "principally by virtue of infirmities that were attributes of the person's age" and the accident and death were not otherwise suspicious, violent, unnatural or caused by another person and there is no mandatory requirement for a coronial inquest i.e. the suicide or death of person in custody or care. Additional information is required on the Death Certificate if no referral to the coroner is made in this situation.

If the need for a coroner referral is unclear, the Registrar or Consultant must call the on-call coroner.

Procedure for coroner referral

- The Record of Death (CR2204) form must be completed for all deaths to be referred to the coroner and faxed to the National Initial Investigation Office (NIIO) prior to any discussion with the coroner (they will not discuss the case unless they have a copy at hand). Completion of the Record of Death is a requirement of the chief coroner in all health care facilities across New Zealand for all deaths. Any response in the shaded boxes means that the form must be faxed or emailed to NIIO which is the Coronial Service Unit's centralised office. The NIIO will coordinate all aspects relating to new reports of coronial deaths, up to and including organising the release of the body. Inform the Clinical Nurse Manager when a Record of Death has been sent to the NIIO.

- **All discussions with the coroner must be made only by a Consultant or Registrar**. They should inform the Clinical Nurse Manager if the coroner has either accepted or declined jurisdiction of the death.

- Ensure that the next-of-kin are advised that police will be attending the death and they need to remain for formal identification of the deceased. If the next-of-kin are not present when the police attend they may be required to return to Auckland City Hospital mortuary to complete the identification process. The coroner will only accept identification of the deceased by persons other than the next-of-kin in exceptional circumstances.

- **It is very important that the next-of-kin are updated if a death is either declined or accepted by the coroner.**

BODY BEQUESTS TO THE FACULTY OF HEALTH SCIENCES AT AUCKLAND UNIVERSITY

- Bodies can be bequeathed via the University Human Body Bequest Programme, and accepted under terms of the Human Tissue Act. They are used for anatomical examination and/or research during the training of medical students, physiotherapists, nursing students and surgeons.

- Conditions which render a donation unacceptable are need for a coroner's post mortem, recent surgery, infectious diseases (hepatitis, HIV, TB etc.), body weight under 45kg or over 90kg, open wounds/sores, and undiagnosed (rapid onset) dementia or when the faculty's current needs are already met. Final acceptance is at the discretion of the university so it is important that the patient or next-of-kin have made alternative arrangements.

- After death, the Clinical Nurse Manager needs to be informed so that the University Bequest Coordinator can be contacted on the next working day. The deceased shall be stored in the hospital mortuary in the interim. If the bequest is accepted, next-of-kin will need to complete a consent form, after which the University arranges transport and embalming of the body. The remains are normally

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cremated one to three years later and the ashes are either scattered or returned to the next-of-kin if requested at the time of acceptance.

- Enquiries can only be made Monday to Friday 0800-1700 – there is no after-hours service.
- Contact details, forms and information is on the University Human Body Bequest Programme web page at https://www.fmhs.auckland.ac.nz/en/sms/about/our-departments/anatomy-with-medical-imaging/bequests/procedures.html

ORGAN DONATION IN NEW ZEALAND (ODNZ)

Every year families offer or agree to the donation of organs and tissues after the death of a family member. If you ever receive an enquiry about tissue or organ donation, please phone Organ Donation New Zealand (ODNZ) and discuss with the Donor Coordinator, which is a 24-hour service for all donor enquiries.

Circumstances where donation can occur

Tissue donation

Patients who die in hospital e.g. wards, Emergency Department or also at home/hospice/nursing home in the Auckland region can potentially donate: eyes, heart valves, skin.

Organ donation

Organ donors must be in an ICU on mechanical ventilatory support.

If a family volunteers or wants to discuss organ or tissue donation, please find contact information from the following sources:

- Website: www.donor.co.nz
- Intranet: Organ and Tissue Donation

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Pain Services

ACUTE PAIN SERVICES INTRANET SITE

THE AUCKLANT REGIONAL PAIN SERVICE (TARPS) INTRANET SITE

In-patient acute pain management is coordinated by the Acute Pain Service (APS) as part of the Department of Anaesthesia and Pain Medicine.

Outpatient pain management is run by The Auckland Regional Pain Service (TARPS) for Auckland Hospital. TARPS also deal with ACC referrals and interventional procedures.

The chronic pain services are purely outpatient-based.

For pain management in palliative care patients, go to Palliative Care chapter.

WHO TO CALL AND REFERRAL PROCESSES

- **Inpatient referrals for acute pain management** should be made to the **Pain Registrar**. Leave a written referral form in the patient's notes. Before referring, please ensure standard analgesic techniques have been tried, as outlined below.

- **Chronic pain referrals (ACC cases from all DHBs and non-ACC cases from Auckland Hospital only)** will be seen at The Auckland Regional Pain Service (TARPS) at Greenlane Clinical Centre.

An e-referral needs to be made.

Referral information required

- Name and age
- Brief medical history, including surgery if any
- Past pain history
- Current analgesic regimen and response
- Medical/surgical plan e.g. further operation, investigations, or conservative treatment

ACUTE PAIN ASSESSMENT

- Other than in certain emergencies, management of acute pain should be preceded by a thorough assessment of the patient and their pain. Acute pain is a symptom rather than a disease, and assessment should aim to identify the potential causes of the pain where possible. Timely treatment of the underlying cause is an important contributor to overall pain management. Other contributors to a patient's distress should be noted where present (e.g. intoxication, withdrawal, urine retention, anxiety).

- In addition to a thorough history (past medical history and presenting problem), examination and prudent use of investigations, a pain assessment should include a specific assessment of the patient's degree of function and their level of sedation.

- In addition to providing relief for humanitarian purposes, a major focus of acute pain management is improving function. By this, we mean their ability to breathe deeply, cough and engage with rehabilitation relevant to their condition. A patient who is not functionally limited by their pain is less likely to benefit from strong analgesics.

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- Sedation is a common side-effect of many analgesics and can also result from many pathological causes. If a patient has increasing sedation, it is important to reduce the dose of contributing medications as well as search for other potential causes.
- It is important to clarify allergies and intolerances to analgesics (acknowledging that some of these may only be relative contraindications) as well as current side-effect profile and ability to take medication orally.

STANDARD ACUTE PAIN MANAGEMENT

For all patients who are in pain, the following stepwise approach to pain management should be followed. Include as many medications within each step (unless contraindicated) before moving to a higher step.

Further information is available in subsequent sections.

Step 1	• Paracetamol **1 g** po/pr q4-6h regularly (maximum dose 4 g/24 hr) • Tramadol **50-**100 mg po q4h regularly (maximum dose 400 mg/24 hr or 300 mg/24 hr in older adults) (Ensure first dose is always 50 mg) • Anti-inflammatory – e.g. Celecoxib 100-**200** mg BD
Step 2	If pain score >3-4/10 and able to take oral analgesia • Morphine 10-20 mg q30min prn (use lower doses in older adults) • Include a maximum dose that can safely be given in 24 hours
Step 3	If pain score >3/10 and unable to take oral analgesia • Either morphine or fentanyl given as per IV protocol
Reduce dose if **low body weight (<50 kg), hepatic** or **renal dysfunction** or **increasing age**. Please refer to Acute Pain Service if on-going issues with pain management	

SPECIFIC MEDICATIONS

For detailed prescribing information please see the NZ Formulary (NZF)

Non-opioid analgesics

Paracetamol and non-steroidal anti-inflammatory drugs (NSAIDs) are used for the treatment of mild-moderate pain and help reduce opioid requirements in more severe pain. Paracetamol is also useful to reduce fever.

PARACETAMOL	
Dosage	1 g po/pr q4h; up to 4 g daily; chart regularly, not prn (and ensure is administered regularly) • Intravenous paracetamol should only be prescribed when the oral route is unavailable • We recommend restricting total daily paracetamol dose to 3 g in patients who:

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	○ Weigh less than 50kg ○ Have active or stable liver disease, alcoholism, glucose-6-phosphate dehydrogenase deficiency ○ Are malnourished
Precautions	• Hepatotoxicity and nephropathy in overdose • Beware of inadvertent concomitant prescribing of combined paracetamol/weak opioid analgesics • Caution: Imatinib and other related medications may increase paracetamol levels

ANTI-INFLAMMATORY AGENTS (NSAIDS) = non-specific NSAIDs (nsNSAIDs) and COX2 inhibitors The most commonly used agent is the COX2 inhibitor celecoxib. nsNSAIDS are alternatives and include naproxen, diclofenac, tenoxicam and ibuprofen. At equianalgesic dose they are equally effective. These agents often provide better analgesia than when using paracetamol alone.	
Indications	• Pain • Inflammatory states
Precautions	**ALL AGENTS** • Current or history of peptic ulcer/gastritis/oesophagitis or NSAID related indigestion • Renal dysfunction (hypotension and volume depletion may precipitate renal failure) • Increased risk of renal dysfunction from combination of NSAID + ACE inhibitor + diuretic or other nephrotoxic agents like contrast agents and chemotherapeutic agents • Older adults (relative, depending on their medical history, especially renal/GI risk) • There is concern regarding cardiovascular effects, particularly increased incidence of MI and CVA, with use in patients with cardiovascular disease and some evidence of a small effect in otherwise fit patients – prescribe for short term use only • Contraindicated within 2 weeks of CABG • Bone healing – there is no evidence for a detrimental effect with short term, post-operative use (<7 days) • History of heavy alcohol use; cirrhosis • Increased risk of bleeding with nsNSAIDs, worsened with coagulation defects (pre-existing, iatrogenic) (**NOT Celecoxib**) • Asthma
Practical guidelines	• There is no evidence that one NSAID is better than another for analgesia if given at correct doses

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	• Celecoxib is used primarily as it has less gastric side effects and can therefore be used more universally • Concurrent use of omeprazole may improve tolerance further • If one anti-inflammatory fails, do not try another • If any doubt about a patient's tolerance to NSAIDs, ask whether they have had them previously. Most patients with asthma are NSAID-tolerant and this should be confirmed • Precipitation of renal failure, although rare, should always be considered • Prescribe short courses e.g. 3 days. This will prompt a review of suitability for longer term use

SPECIFIC ANTI-INFLAMMATORIES	
CELECOXIB	Oral preparation, immediate release, COX 2 specific inhibitor **Dosage** • 200 mg BD, reducing to 100 mg when able
NAPROXEN	Oral preparation, immediate release, non-specific NSAID **Dosage** • 250 mg TDS up to 500 mg BD
DICLOFENAC	Can be given orally or rectally and comes in immediate and modified release preparations, non-specific NSAID **Dosage** • Modified release – 75 mg SR po BD **OR** 100 mg SR po daily (100 mg strength not funded) • Immediate release – 50 mg po TDS • Suppository – 50 mg BD or TDS
TENOXICAM	Parenteral or oral NSAID with a long duration of action (usually given daily), non-specific NSAID **Dosage** • 40 mg loading dose then 20 mg daily (parenteral or oral)
IBUPROFEN	**Dosage** • Oral, immediate release 400 mg po TDS up to QID • Oral, modified release 1.6 g daily as single dose, up to 2.4 g daily in 2 divided doses.

TRAMADOL
Tramadol is an analgesic for use in moderate to severe pain. Part of its action is via the opioid receptor, but the remainder is via inhibition of re-uptake of noradrenaline and serotonin in descending inhibitory

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pain pathways. It can therefore be useful in combination with other opioids and can be useful for neuropathic pain.	
Precautions	• Typical opioid side effects can occur but in normal clinical doses respiratory depression is rare • History of epilepsy (convulsions reported as a result of toxic metabolite) – do not use • Head injury (risk of convulsions) • Renal and hepatic failure (reduce dose) • Serotonin syndrome can occur if combined with SSRIs (high dose) or other drugs that increase serotonin levels e.g. MAOIs, amphetamines, ecstasy, cocaine, lithium. Low dose SSRIs can still be used as long as staff are aware of this potential problem • Nausea and vomiting occur at similar rates to other opioids (see practical guidelines below) • Caution is required in the presence of hyponatraemia • Risk of elevated INR if on warfarin

Formulations	• Immediate release 50 mg oral capsule (can be opened and contents dispersed if necessary)
	• Modified release (SR) tablets:
	  ○ 50 mg (not funded),
	  ○ 100 mg, 150 mg, 200 mg (funded)
	• Oral liquid: Take care when prescribing, dispensing, and administering tramadol oral solution to ensure the correct dose is given to the patient. Two strengths of liquid are available:
	  ○ 10 mg/mL preferred strength (funded - compounded by Pharmacies)
	  ○ 100 mg/mL (not funded)
	• Intravenous 50 mg/mL (give as slow injection, see below)

Dosage	• 50-100 mg q4h, usually should be given regularly up to a maximum dose of 400 mg/day • Variable dosage using SR preparation twice daily (ensure that the total dose is limited to 400 mg in 24 hours) • Intravenously as per administration guidelines https://www.noids.nz/wp-content/uploads/2020/11/Tramadol-S.pdf
Dosage in renal/liver failure	• Renal impairment (CrCl <30 mL/min) and severe liver disease→ 50-100 mg q12h • Modified release products should be avoided or used with extreme care
Practical guidelines	• Only give 50 mg orally on first dose to prevent nausea • If giving intravenously, give slowly to prevent nausea • It is not contraindicated if patient is also on an SSRI (e.g. fluoxetine, paroxetine, citalopram) as serotonin syndrome is rare and dose dependent – use with caution

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CODEINE Codeine is classified as a weak opioid. However, it is only a very weak mu-receptor agonist, and its analgesic action depends on the metabolism of about 10% of the dose to morphine, via the CYP2D6 cytochrome P450 isoenzyme. The principal metabolite of codeine is codeine-6-glucuronide, which has a similar low potency to the parent medicine and is renally excreted.	
Precautions	• Ultrafast metabolisers will produce more morphine • Poor metabolisers will get very little analgesia • Very constipating • **DO NOT USE FOR ACUTE PAIN** as unreliable effect

OPIOID ANALGESICS Opioids are used for the treatment of moderate-severe pain. They are powerful analgesics and have variable durations of action. There are multiple routes of administration including oral, rectal, intravenous, intramuscular, subcutaneous, epidural, intrathecal and intranasal.	

Precautions	• Side effects
	  ○ Respiratory depression
	  ○ Euphoria
	  ○ Sedation
	  ○ Confusion, hallucinations
	  ○ Nausea and vomiting
	  ○ Constipation
	  ○ Urinary retention
	  ○ Pruritus
	• Older adults – analgesic and side-effect susceptibility increases markedly with age
	• Be aware of effects in renal impairment (see table below)
	  ○ Increased effect of morphine – reduce dose or use alternative (oxycodone or fentanyl)
	  ○ Toxicity with pethidine (avoid)
	• Hepatic disease – increased sensitivity, therefore, reduce dose (see table below)

Practical guidelines	• Wherever possible, give opioids orally • If given intravenously, always prescribe "as per IV protocol" • All strong opioids have the same analgesic efficacy and the same addictive potential (see under individual drug below for prescribing differences) • Everyone who is taking an opioid long term (which includes medical and illicit use) will develop a physical withdrawal syndrome ("cold turkey") if deprived of that opioid

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	• If a patient is already on an opioid on admission, always prescribe it to prevent withdrawal. If unable to take the preparation, or if any doubt, call the Acute Pain Service early for advice • Any patient with a clinical need for opioids should not be deprived based on your moral judgement (i.e. IV drug users still get pain and should be treated) • An individual's response to opioids differs depending on their previous exposure to opioids. Opioid-tolerant patients tend to need much higher doses to achieve the same degree of analgesia as opioid-naïve patients. It is best to seek advice from the Acute Pain Service in these cases • Only immediate release opioids should be used for acute pain management

Which opioid?	
Step 1	**Decide on the route of administration** • Can the patient take tablets orally (or liquid via a feeding tube)? If not, use IV • Do they need rapid (within minutes) analgesia? If yes, use IV Oral opioids – morphine (preferred 1st line), oxycodone Intravenous opioids – morphine, fentanyl
Step 2	**Determine suitability** • If renal dysfunction, use oxycodone immediate release (OxyNorm®) if oral route appropriate or use fentanyl if only intravenous route available

Step 3	**Determine the correct preparation**
	• Oral immediate release opioids – morphine (elixir or Sevredol® tablets), oxycodone (Oxynorm®) – for acute pain
	• Oral sustained-release preparation – morphine (m-Eslon SR® capsules), Oxycodone CR
	  ○ only with Specialist advice
	  ○ not for acute pain management
	• Intravenous opioids – morphine, fentanyl, tramadol, oxycodone*
	  ○ IV protocol
	  ○ PCA
	* See advice/cautions under individual drugs

REMEMBER: MORPHINE SHOULD BE USED AS FIRST LINE UNLESS CONTRAINDICATED

Dosage	
MORPHINE	Immediate release oral morphine (morphine elixir or Sevredol®) • 10-20 mg q30min prn

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	• 5-10 mg q30min prn for smaller adults • 2.5-5 mg q30min prn for the older adults Individualise dose in opioid-experienced patients (likely to need more than above standard dosing).
OXYCODONE	ONLY TO BE USED IF PATIENT IS INTOLERANT TO MORPHINE Is safer than morphine in renal failure, but still needs **significant dose reduction** **No other advantage to oxycodone over morphine** Immediate release oral oxycodone (OxyNorm® in capsule or liquid form) • 5-10 mg q60min prn • 1- 3 mg q60min prn for older adults/opioid sensitive
PETHIDINE	• We do not recommend its use due to accumulation of toxic metabolite (norpethidine) with doses >600 mg a day • Is available for patients that have an allergy to alternative opioids • Oral pethidine is poorly absorbed and not recommended for acute pain management
METHADONE	Methadone should not be initiated without consultation with the Acute Pain Service or Palliative Care team. However, all patients who are admitted on a regular dose of methadone should have this prescribed. If the patient is on Opioid Substitution Treatment (the "Methadone programme") telephone the patient's case manager at the Auckland Opioid Treatment Service (AOTS) to confirm the dose before prescribing (see Recreational Drug Problems chapter) and refer to the Auckland Hospital policy. Clinical pharmacists may also be asked to help confirm correct dosage. Should the patient need additional analgesia, consult the Acute Pain Service.

OPIOIDS AND PATIENTS WITH HEPATIC IMPAIRMENT

In patients with hepatic impairment, most analgesia has reduced clearance and increased oral bioavailability. Doses may need to be adjusted, particularly when multiple doses are used. Additionally, patients with cirrhotic liver disease may have renal impairment despite a normal serum creatinine. See below for patients with renal impairment.

Oral opioid	Hepatic considerations	Dosage recommendations
Morphine	Hepatic impairment does not appear to have a significant effect on morphine due to a large hepatic reserve for glucuronidation, but increased bioavailability due to reduced first pass effect	• Caution with repeated doses • Prescribe smaller doses and consider a longer dosing interval • Seek advice in severe hepatic impairment or choose alternative opioid
Oxycodone	Reduced clearance in mild-to-moderate hepatic impairment	• Prescribe smaller doses (e.g. 30-50% of the usual dose) and at a longer dosing interval • Seek advice in severe hepatic impairment
Pethidine	Reduced clearance in hepatic dysfunction	• Prescribe smaller doses and at a longer dosing interval in hepatic impairment

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		• Prolonged use of pethidine should be avoided in all patients, regardless of hepatic function
Tramadol	Reduced clearance in severe hepatic impairment	• Prescribe smaller doses at a longer dosing interval • Seek advice in severe hepatic impairment or if unsure

OPIOIDS AND PATIENTS WITH RENAL IMPAIRMENT

Renally excreted drugs and/or their metabolites will accumulate as renal function deteriorates. Doses will need to be adjusted.

Oral opioid	Renal considerations	Dosage recommendations
Morphine	May have prolonged duration of effect and accumulation in patients with renal impairment	• Avoid in severe renal impairment • Prescribe smaller doses at a longer dosing interval in mild-to-moderate renal impairment
Oxycodone	Reduced clearance in mild-to-moderate renal impairment	• Prescribe smaller doses (e.g. 30-50% of the usual dose)
Pethidine	Avoid in severe renal impairment due to risk of accumulation of norpethidine (neurotoxic metabolite)	• Avoid in patients with renal impairment • Prolonged use of pethidine should be avoided in all patients, regardless of renal function
Tramadol	Reduced clearance in severe renal impairment	• Avoid in severe renal impairment • Prescribe smaller doses at a longer dosing interval • Seek help from the pain service or clinical pharmacist if unsure

SUSTAINED/CONTROLLED-RELEASE OPIOIDS

- These should not be prescribed unless the daily requirement for short-acting opioid has already been clearly established and short-term use of long-acting opioid is considered necessary.
- They are not able to be titrated with haste, so are not used as primary agents in acute pain. Side effects will linger for much longer than if immediate release opioids were used.
- Use with caution as it is more difficult to stop them once they are started.
- Do not discharge patients on newly prescribed sustained-release opioids without consulting the Acute Pain Service.
- If prescribed, always discuss the weaning plan with the patient, patient's family if appropriate and their GP.
- If prescribed, sustained release morphine should be used instead of other opioids unless there is a clear contraindication.

INTRAVENOUS OPIOIDS

MORPHINE, FENTANYL, AND OXYCODONE

These are always prescribed "as per IV Adult protocol". This allows safe titration of the opioid.

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- The IV protocol allows the nurse to give a patient with a >3 pain score 1-2 mg morphine (or 10-20 microgram fentanyl) every 3mins until pain control is achieved, unless side effects such as sedation occur. The nurse needs to stay with the patient for the 3mins to assess the effect.

- The IV Adult protocol can be used for all patients requiring fasting or where the oral route (including feeding tubes) is unavailable.

- It can also be used whilst a patient is on an epidural infusion not providing adequate analgesia. In this circumstance, the Pain Registrar should be called immediately and the IV protocol used as a stop-gap until they arrive to see the patient. Constant bedside clinical monitoring is vital.

Opioids may also be given:

- Via a PCA – these are prescribed only by the Acute Pain Service or Anaesthesia

- Via a syringe driver – these are mainly used by Palliative Care

Patient Controlled Analgesia (PCA)

- PCAs are set up by Anaesthesia, Pain Service, or the Department of Critical Care Medicine.

- They are useful when multiple doses of opioid need to be given intravenously for a prolonged period e.g. post-operatively.

- They are not needed if the patient can take the opioid orally.

- A set dose of opioid is given when the patient presses the button on the machine.

- A lockout period is set (usually 5 minutes) during which any subsequent presses of the button will not result in drug delivery. This helps prevent overdose.

- Only the patient should press the button. This is for safety reasons. For example if someone presses the button when the patient is asleep this could lead to unconsciousness and death.

- Complications and cautions for using a PCA are the same as when giving opioids by any other route.

- If you stop a patient's PCA, please ensure they have an oral opioid prescribed instead.

Discharging a patient on opioids

In the absence of specific advice to the contrary, patients who have had acute pain should have discharge opioids prescribed according to the following rules:

- No more than 3 days' supply should be given

- No more than four times a day frequency when prescribed to be used "as required".

- Prescribe a range based on what doses the patient has used in the 12 hours prior to discharge. The range should start at half this dose, for example:
    - If the patient has used morphine immediate release (Sevredol®) 20 mg then prescribe Sevredol® 10-20 mg QID prn for a maximum of 3 days.
    - If they have been using Sevredol® 10mg then prescribe Sevredol 5-10 mg QID prn for a maximum of 3 days.

- If the patient has not needed an opioid in the 12 hours prior to discharge, it is unlikely that they will routinely need any on discharge.

- Only prescribe tramadol if it has already been taken and has been tolerated by the patient.

- Remember to prescribe simpler analgesia if this has been taken in hospital e.g. paracetamol and anti-inflammatory.

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- If long-acting opioids have been started during the admission, there MUST be a plan for on-going prescribing/weaning in discussion with the Acute Pain Service and the GP.

The opioid prescribing decision tool below should be used to help with analgesia prescribing on discharge for acute pain.

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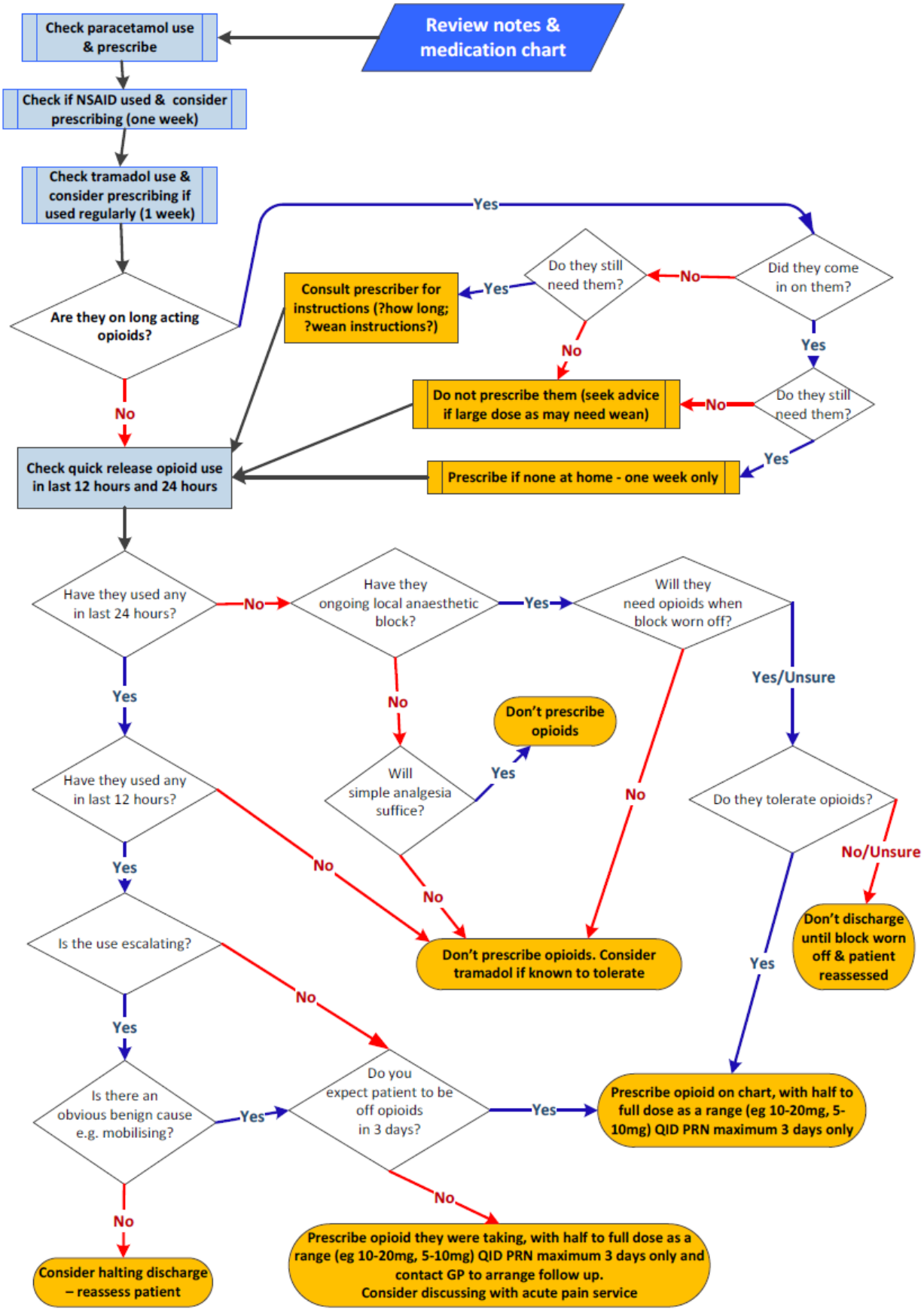
OPIOID PRESCRIBING DECISION TOOL



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MANAGEMENT OF OPIOID-INDUCED SIDE EFFECTS

The older patient is more sensitive to the analgesic effects and side effects of opioids.

Remember to reduce the dose.

RESPIRATORY DEPRESSION

- Dose dependent
- Less likely in opioid-experienced patients (higher doses needed)
- Enhanced by other sedative agents
- Should be monitored for sedation and respiratory rate. Sedation is a more reliable way of detecting opioid-induced respiratory depression, although monitoring respiratory rate is still important

REVERSING OPIOID-INDUCED RESPIRATORY DEPRESSION

If sedated but respiratory rate >8

- Administer oxygen
- Ask nurse to stay with the patient and rouse patient when necessary
- Contact the Acute Pain Service

If respiratory rate <8

- Give 4 L/min oxygen via mask
- Rouse patient, if necessary, by using painful stimuli

If patient rousable

- Maintain wakefulness, encourage deep breathing, and inform the Acute Pain Service
- Be cautious with giving naloxone as you may precipitate complete analgesia reversal or opioid withdrawal in those who are on long-term opioids

If the patient is unrousable

- Administer 40 - 100 micrograms naloxone IV and repeat every 2-3min until the patient is rousable
- Repeated doses may be needed owing to its short half-life
- Consider starting naloxone 20 micrograms/mL infusion and administer at a rate of 400 micrograms/hour. Infusions may be useful especially if the patient has received long-acting opioids.
- When the patient is rousable, maintain wakefulness and encourage deep breathing
- Call the Acute Pain Service immediately
- Depending on the clinical situation a "Code Red" may be necessary

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NAUSEA AND VOMITING

Always prescribe anti-emetics when prescribing opioids.

Changing to an alternative opioid can sometimes relieve nausea.

Combinations of anti-emetics may be more effective than one given alone. For example, the combination of ondansetron and haloperidol has an additive effect.

A simple treatment cascade is:

- Domperidone 10 mg po q8h prn, if NBM use metoclopramide 10 mg IV q8h − beware of extrapyramidal side effects
- Ondansetron 4-8 mg po/IV q8h prn
- Cyclizine 12.5-25 mg po/slow IV q8h prn
- Droperidol 0.625 mg IV q8h prn
- Hyoscine hydrobromide (scopolamine) patch 1.5 mg q3days if resistant to above

CONSTIPATION

Constipation is a common symptom, especially if opioids are used long term. Changing to an alternative opioid can sometimes relieve constipation.

- Consider a stimulant laxative e.g. docusate and senna (Laxsol®), particularly in long-term opioid use
    - A combination of laxatives that work in different ways may be more effective than one medication given alone. E.g. combining a stimulant laxative (Laxsol®) and an osmotic laxative (lactulose)
- For patients at high risk of constipation, e.g. older people, always prescribe laxatives when prescribing opioids

HALLUCINATIONS

All opioids can cause confusion and hallucinations. These side effects are usually dose dependent so reduction of dose may help. Changing to an alternative opioid may reduce the incidence. Tramadol is especially prone to causing hallucinations in older patients.

ITCHING

Itching may occur from histamine release, particularly with morphine but can occur with any opioid and when used via intrathecal or epidural routes.

- Non-sedating antihistamines such as loratadine may help. Sedating antihistamines may also be used, although care should be taken because of potential sedation. Changing to an alternative opioid may relieve itch.
- Naloxone (low dose) and droperidol are effective for the treatment of itch. Extreme care should be taken before using naloxone as it has the potential to completely reverse the analgesic effect of the opioids. If in doubt consult the Acute Pain Service.

OPIOID WITHDRAWAL

Withdrawal from opioids can occur when a patient has been on regular opioids for a period of time and the opioid is abruptly stopped. This could occur as soon as after one week of opioid therapy but more commonly occurs with longer usage.

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- Typical signs are the "cold turkey" signs i.e. abdominal and body pain, anxiety, chills, diarrhoea, nausea and vomiting and weakness.
- The earliest sign, particularly when there is a significant drop in dose rather than complete cessation, is usually anxiety and fidgety behaviour.
- Symptoms can be treated easily by reinstituting the opioid.
- Withdrawal can be prevented by slow weaning of long-term opioids. This should be done with advice from the Acute Pain Service for inpatients or in conjunction with the Community Alcohol & Drug Services (CADS) for outpatients.
- Adjuvants such as clonidine patch can help with the slow weaning of opioids. Seek advice from the Acute Pain Service.

For additional information on pain relief and anti-emetics, refer to the Palliative Care site.

ADJUVANT ANALGESICS

- Use of these medications will be under the direction of the Acute Pain or Palliative Care services
- If you have any concerns, please call the appropriate team for advice

KETAMINE

Low dose ketamine infusions are used:

- As an anti-tolerance (mostly to opioids), anti-hyperalgesic, or anti-allodynic agent and NOT as a primary analgesic
- It is usually given as an intravenous infusion using a 1 mg/mL solution at rates of 1-5 mg/hr

The main side effects are:

- Sedation
- Hallucinations
- Hypertension
- Tachycardia

AMITRIPTYLINE

- Tricyclic antidepressant that is also effective for neuropathic pain
- Effective in about 30% of cases
- May take days to weeks for full effect
- Usual starting dose is 10-25 mg po nocte (5-10 mg in older, frail adults)

The main side effects are:

- Sedation (hence nocte dosing and usefulness if poor sleep)
- Dry mouth
- Constipation

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- Dysrhythmias
- Urinary retention (if prostatism)
- Glaucoma (rare)

GABAPENTIN/PREGABALIN

Uses:

- Neuropathic pain − effective in ~15% of cases of confirmed neuropathic pain
- May take days to weeks for full effect
- Should not be used routinely peri-operatively and only if there is strong suspicion of neuropathic pain (on discussion with the acute pain service)

Usual dosage:

- Pregabalin – 75 mg po BD (25 mg BD in older adults) [This is the preferred gabapentinoid as reliable absorption]
- Gabapentin 300 mg po TDS (100 mg TDS in older adults)
- All gabapentinoids are entirely renally excreted and their dose should be adjusted for changes in renal function, including acute kidney injury where they may accumulate and cause side-effects such as sedation.

The main side effects are:

- Dizziness or feeling "spaced out"
- Sedation
- GI symptoms – nausea, constipation, or diarrhoea
- Headache
- Weight gain
- Fluid retention

ENTONOX® (N_2O)

Entonox® is a mixture of 50% nitrous oxide / 50% oxygen. It is delivered via a cylinder with a specialised on-demand valve.

It has been extensively used as a labour analgesic. It is sometimes used on the ward for mobilisation of trauma patients and during dressing changes.

Mode of administration

- Explain the procedure to the patient. Reassure them and explain that they should concentrate on breathing normally
- Offer the demand valve to the patient
- Mouthpiece should be held by the patient between the teeth, advise to breathe through their mouth only

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- Inhalation should commence for a few breaths before the procedure starts
- If the patient hyperventilates, they should be encouraged to exhale slowly, then breathe normally
- After the completion of the procedure, administer oxygen via mask for at least 30 minutes

Precautions

- Closely monitor the patient's sedation and respiratory rate during administration
- N_2O can diffuse and expand air filled cavities in the body. Therefore, its use is contraindicated in the presence of conditions such as pneumothorax, pneumocephalus, bowel obstruction, middle ear surgery, gas embolism, etc.
- Bone marrow and neurological complications have also been reported in critically ill patients who have been repeatedly exposed to N_2O
- B12 levels should be checked if patients are undergoing repeated exposures to N_2O (over a period of weeks or more)

EPIDURAL / INTRATHECAL / REGIONAL CATHETER INFUSIONS

These infusions are always managed by the Acute Pain Service and any related problems should be directed to the service.

Some practical points regarding epidurals

- The standard epidural infusion contains dilute local anaesthetic and fentanyl. This can cause hypotension – usually at the start of infusion, or after an increase in infusion rate or a bolus.

If you are called to see a hypotensive patient with an epidural on the ward, don't attribute the hypotension to the epidural without assessing the patient. It is always important to exclude other more common causes of hypotension, particularly hypovolaemia, sepsis, and cardiac problems.

- There is a small but significant risk of infection (epidural abscess) so it is important that the epidural entry site remains covered with a sterile dressing and the catheter and giving set should not be disconnected.

Risk signs are pain, redness, pus at the catheter skin exit site. Unexplained back pain, fever and changes in neurology may indicate an abscess. This is an emergency, and the Acute Pain Service should be contacted IMMEDIATELY.

- Epidural infusions provide excellent pain relief for most patients. When they are stopped, the block and analgesia may wear off very quickly. It is important to provide alternative analgesia, either orally or intravenously.

Epidural infusions should only be stopped by the Acute Pain Service. However, if a catheter gets pulled out accidentally or there is pump failure, you should call the Acute Pain Service immediately and prescribe either an oral or intravenous opioid as appropriate.

- Epidural haematoma is a small but significant risk. It is increased if there is coagulopathy or inappropriate anticoagulation. An important presenting sign is an unexplained increasing motor block.

Take care with anticoagulation and anti-platelet agents in patients with epidurals and do not prescribe warfarin or anti-platelet agents other than aspirin whilst an epidural catheter is in situ. Only members of the Acute Pain Service should manipulate epidural catheters.

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Guideline for removal of catheter when on anticoagulants

PAIN RELIEF IN PREGNANCY

- Pain in a pregnant woman may be related to the underlying pregnancy or may be due to an unrelated condition.
- The use of analgesics must be balanced against the possibility of harming the developing foetus.
- In general, try to avoid all medications during the 1st trimester unless absolutely necessary.

Analgesics that can be used safely in pregnancy:

- **Paracetamol** - can be used to manage mild to moderate pain in pregnancy.
- **NSAIDs.**
  - Discuss with the Acute Pain Service before prescribing NSAIDs in pregnancy
  - NSAIDs may be associated with spontaneous abortion when used in the **1st trimester** and the mother may wish to avoid them during this time
  - They should be avoided in the **3rd trimester** due to possible premature closure of the ductus arteriosus
- **Amitriptyline** - can be used to manage pain with a neuropathic component
- **Clonidine** - can be used to manage pain with a neuropathic component. Most commonly given via a transdermal patch
- **Opioids** - considered safe to use for short periods to manage moderate to severe pain in pregnancy
  - **Morphine, Fentanyl and Oxycodone** can be used orally or parenterally to control severe pain
  - **Methadone** may be used for longer term pain management under advice from the Acute Pain Service
  - **Codeine** and **Tramadol** are generally avoided but may be used for short periods in certain patients

Analgesics which are avoided in pregnancy:

- **Gabapentin and Pregabalin**
- **Ketamine**

These agents may have a detrimental effect on foetal neurodevelopment and are generally not used in pregnancy unless the benefit outweighs the perceived risk.

Please contact one of the Women's Health Pain Nurses for up-to-date advice on analgesia in pregnancy.

(See Pain Services intranet page for contact details).

PAIN RELIEF IN BREAST FEEDING

Please contact one of the Women's Health Pain Nurses for up-to-date advice on analgesia in breastfeeding. (See Pain Services intranet page for contact details).

The Breastfeeding tab on Reference Viewer provides detailed information on medicines and lactation.

General principles

- Paracetamol and NSAIDs are safe at normal doses
- Codeine must not be used for any breast-feeding patient
- Tramadol appears to be safe

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- Morphine and fentanyl appear in small quantities in breast milk so are unlikely to be a problem – use minimal amount necessary and avoid breastfeeding when drug concentration peaks in mother
- Oxycodone is safe for up to 72 hrs in reasonable doses (<90 mg/day orally)
- Seek advice for other analgesics

RIB FRACTURE PAIN MANAGEMENT

Algorithm for management of pain in patients with rib fracture:

https://adhb.hanz.health.nz/site/Anaesthesia/_layouts/15/WopiFrame.aspx?sourcedoc=/site/Anaesthesia/Docs%20%20Acute%20Pain/Pain%20management%20in%20patients%20with%20rib%20fractures.pdf&action=default

ANALGESIA FOR WARD PROCEDURES

- The most important factor for procedural pain relief is to explain fully to the patient what to expect.
- Liberal use of local anaesthetic lidocaine is important, and you must give it time to work.
- Allow patients to load themselves with their PCA opioid if connected or give intravenous opioid by IV protocol and allow time for it to work.
- Consider using Entonox® if not contraindicated (see above section). Always make sure patients know how to use it and that they are allowed to use it adequately before starting the procedure.

Sedation on the ward for procedures is not advised without appropriate training, full monitoring, and resuscitation capabilities.

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Common Ward Calls

Dear House Officer

Understand that it is all going to look very scary the first few times you come across any of the conditions below. However, like anything in medicine, managing these situations becomes easier with practice. So use this guide to help yourself out when your brain freezes and you've got nurses seeking your help. Remember, this is not a complete guide; simply some suggestions to keep your patient alive. The Med Reg is always available no matter where you are and you should not be afraid to call them. You will NEVER get in trouble for calling for help. Good luck!

TIPS FOR BEING ON CALL

- Patient, name, NHI, room
- Prioritise your calls – Is this actually acute? Can it wait until morning?
- Always ask nurse to check whether there is already a documented plan by team as to management if the presenting complaint should arise (sometimes with complicated patients or when situations can be pre-empted there is already a potential plan in place).
    - Get general history and ask for vitals - Are there any 'red flag' symptoms? Is this the first time this has happened? Is there a simple explanation for this i.e. do I need to go to the ward?
    - Give an ETA if you can – so the nurses know how long they will have to wait (otherwise, you run risk of being paged multiple times for the same reason).
- Advise nurses of simple things that can be done before you get up to the ward.
    - e.g. repeat obs, ECG, analgesia, anti-emetics, IV fluids (e.g. bolus – you may choose to do a verbal order). Request nurses to have notes and meds chart ready for you to review when you arrive.
- Assess each problem fully yourself. Requests like "Can you come prescribe some anti-emetic because the patient's vomiting" may actually be due to an underlying acute abdomen.
- Caution when giving meds to patients with chronic illnesses e.g. renal/liver/heart failure; Parkinson's disease.
- Caution when prescribing medications for the geriatric population – e.g. avoid NSAIDs, codeine, tramadol. Also, avoid regular metoclopramide as can cause extra-pyramidal side effects, especially in the elderly.
- ALWAYS check allergy section prior to prescribing meds. If a new allergic reaction is noted then clearly document on med chart and in notes so that team pharmacist can be aware in the morning.
- When asked to chart fluids: (1) Ask whether patient actually needs fluids overnight? (2) Check recent electrolytes + creatinine in case you need to add in more K^+ (3) Never prescribe sodium chloride 0.9% for a dehydrated patient with advanced liver disease (increases ascites), prescribe albumin in this case.
- Have a low threshold to call a Registrar. Don't do anything you feel uncertain about.
- 3 IV attempts are enough: call someone else! (Note the CNAs can do this if needed).
- Manually check vital signs yourself (especially if abnormal). The trend is important.

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Call	Causes (major threats to life)	Worrying factors	Immediate management
IV catheters			• An IV catheter should only be inserted when there is a specific indication. It should not be inserted 'just in case' it is needed at a later time • IV catheters should be monitored routinely as part of ward rounds and routine clinical examinations • IV catheters should be removed as soon as there is no clinical need, if the catheter has 'tissued', or if there is any concern about infection • Further information about iv catheters is in the Intravenous Catheters – Peripheral clinical guideline on Hippo • Please also refer to the course on Venepuncture, Cannulation and Phlebotomy Programme on Ko Awatea Learn.

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Call	Causes (major threats to life)	Worrying factors	Immediate management
Confusion	ACS Delirium vs. dementia Drugs Fluid imbalance Hypoxia Metabolic causes Pre-existing Stroke Trauma **Delirium tremens** **Intracranial mass** **Meningitis** **Sepsis/infection** **Toxins/heavy metals**	Drowsy Fever Focal neurology History of alcoholism Hypoxia Time of onset	History and examination • Septic screen + delirium screen if appropriate Orientation questions • Day, date, month, season, year • Building, floor, room • Name months backwards or count back from 20 • Prime Minister • DOB, full name, address Consider ETOH withdrawal scale • Remember, withdrawal is much more dangerous than benzos! If agitated, see “psych/aggression’ below Ask yourself whether an urgent CT is indicated (considering history and exam) Document GCS, orientation, and use of aids: hearing aids, glasses, and clock

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Call	Causes (major threats to life)	Worrying factors	Immediate management
Constipation	Drugs – regular opioids (but no regular laxatives charted) Lifestyle Post op ileus Elderly Dehydration Immobility **Obstruction**	Nausea/vomiting New abdominal distension Not passing flatus	Exclude: • Pregnancy • Cancer • Hypothyroidism • Hypercalcaemia Consider PR exam **Are they on clozapine?** • **If so, this is an emergency** • **AXR** • **Call Psych Registrar** If clinical suspicion of bowel obstruction, then request AXR, otherwise AXR not usually needed. 1. Stimulant (Laxsol® 2 tabs bd) 2. Softener: Lactulose is good for acute setting – 20 mL bd 3. Consider Lax-Sachet or Micolette® or Fleet® enema 4. Bulking agent (Konsyl D®) (note these are largely preventative, not overly effective once constipated) Avoid oral Fleet if there is obstruction and probable faecal loading as there is a risk of perforation. Avoid stimulant laxatives (Laxsol®) in patients who are post-bowel surgery. Record stool chart.

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Call	Causes (major threats to life)	Worrying factors	Immediate management
Chest Pain	Infection Musculoskeletal pain Reflux **Aortic dissection** **MI** **PE** **Pneumothorax** **Tamponade**	ECG changes Hypotension Nausea Reduced GCS SOB Sudden onset sweating Tachycardia/bradycardia	ECG Consider troponins Full blood count, electrolytes Consider aspirin 300 mg STAT Consider glyceryl trinitrate (GTN) trial – 1 spray Manual BP both arms if aortic dissection likely Check calves – look for pitting oedema, erythema, and measure calf circumference bilaterally Calculate Well's score • Consider D dimer (discuss with cardio or gen med first). • Please noted that if patient is post-op, D-dimer will be elevated and unlikely to be helpful. CXR

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Call	Causes (major threats to life)	Worrying factors	Immediate management
Decreased urine output	Blocked catheter Drugs Hypovolemia/dehydration Retention Sepsis **Hyperkalemia** **Renal failure** • Pre-renal • Renal • Post renal	<0.5 mL/kg/hr Hyperkalaemia Hypotension Increased creatinine	Note: UO approximately 0.3 mL/kg/h often acceptable if patient is D1 post-op. But ensure that this is not due to hypovolaemia. Examine abdomen – is there a palpable bladder? Bladder scan • IDC (or in/out catheter) if >500 mL on scan • Constipation can often be a common cause of urinary retention Check previous electrolytes + creatinine • If abnormal, discuss with Reg • Hyperkalaemia: ECG, and consider cardiac monitoring Clinically dehydrated or low bladder volume • Plasmalyte® challenge • NB renal failure/heart failure: discuss with Reg first (consider 250 mL) If blocked catheter – flush (nurses do) NB – nurses can put in IDCs. Ring and ask for this. • Female nurses do female catheters and male nurses can do male catheters. • Any issues with IDC call CNA then Urology

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Call	Causes (major threats to life)	Worrying factors	Immediate management
Diarrhoea **(ACUTE: <2 WEEKS)**	HIV Infection Drugs (especially antibiotics) Laxatives • Overflow diarrhoea	Hypovolemic Watery only Blood?	Bloods: creatinine and electrolytes. If suspect overflow (watery): • Do AXR • Don't give loperamide etc. If suspect infection: isolation • Ask for stool specimen to be sent off. Request C.diff screen if patient has recently been on antibiotics Rehydration • Oral fluids • IVF • Electral® sachets Record stool chart Remember faecal losses of electrolytes may be as high as 100 mmol/L Na+ and 5-15 mmol/L K+ per litre of stool. Antibiotics are not necessary for the majority of infective diarrhoeas.

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Call	Causes (major threats to life)	Worrying factors	Immediate management
Falls / Collapse	Delirium/dementia Drugs Environmental Hypotensive Medications Postural hypotension Vasovagal/syncope **Arrhythmia** **Hypoglycaemia** **Hypoxia** **MI** **PE** **Seizure** **Stroke**	Bleeding Chest pain Decreased GCS Focal neurology Hypotension Incontinence Palpitations/tachycardia	Address both the cause and consequences of fall/ collapse. History is key. Neuro, cardiovascular and respiratory exams, look for other injuries. Bloods – FBC, electrolytes + creatinine, +/- CRP, +/- coags, +/- trops ECG Telemetry for 24 hours if ?arrhythmia-related If suspected head injury or unwitnessed fall: • Consider frequency of neuro obs; can be as often as q15min • HR, BP, RR, O_2 sats, GCS • CT head Coags if: • Age >65 • Suspected head injury • Anticoagulation • Fall from height >1m If suspected fracture request x-rays. Keep patient NBM, check x-ray when done and discuss with ortho.

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Call	Causes (major threats to life)	Worrying factors	Immediate management
Fever	Aspiration Atelectasis (D1-2 post-op) Infection • IDC • Chest • Wound • Drain • IV access site • Post surgical **Sepsis** **Shock**	Chest pain Confusion Hypotension Persistent tachypnoea Significant decrease in sats Tachycardia/Bradycardia Rigors Immuno-compromised	Full septic screen • MSU/CSU • CXR • Peripheral or catheter blood culture (before Abx administration, if possible) • FBC • Electrolytes • Sputum • Wound swabs If hypoxic then do ABG Management • IVF resus • Registrar • Antibiotics • Cooling cares (fan, cold flannel) Check paracetamol is charted regularly.

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Call	Causes (major threats to life)	Worrying factors	Immediate management
Hypertension	Anxiety/pain Cardiac causes Drugs Pre-existing **Aortic dissection** **Eclampsia** **Hypertensive encephalopathy** **MI** **Pulmonary oedema** **Raised ICP** **Stroke** **Autonomic dysreflexia**	Bradycardia Change in mental state Chest pain DBP >120 mmHg SBP >200 mmHg Headache/vomiting Visual changes Pregnancy	Old or new? GCS Treat if: symptomatic or SBP >180. • Review: usual anti-hypertensives • Consider: different anti-hypertensive (felodipine ER 2.5 mg STAT or perindopril 4 mg STAT), or larger dose of current anti-hypertensive • Ring Gen Med if unsure • If there is evidence of persistent HTN and patient asymptomatic, document in the notes and request team to address this in the morning

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Call	Causes (major threats to life)	Worrying factors	Immediate management
Hypotension	Cardiac causes Drugs Postural Sepsis Dehydration **Arrhythmia** **MI** **Shock** **Bleeding**	Back pain Chest pain Decreased sats Dizziness Febrile Low urine output/AKI Obvious bleeding Reduced GCS Stridor Tachycardia/bradycardia	Old or new? GCS Examination • Manual BP • Is the HR greater than the systolic BP? • Examine and assess patient's fluid status Review fluid balance chart Review medication. • Consider withholding • anti-hypertensives (ring Reg) • Consider IVF (caution heart failure or renal failure) • Consider fluid challenge of 500 mL

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Call	Causes (major threats to life)	Worrying factors	Immediate management
Hyperglycaemia	Infection/acute illness Non-compliance Post-op Steroids Stress **DKA** **HHS** **MI** **Sepsis**	Acidosis Chest pain Ketones in urine Reduced GCS Vomiting	Consider Novorapid® if BSL >15 (see Diabetes chapter for dosing guidance) Recheck BSL in 30 mins. Note: a normal BSL isn't vital, <15 may be adequate. Review usual BSLs – don't lower by too much. After managing an episode of hyperglycaemia (if patient clinically stable), write in notes requesting team to address this issue in the morning. Consider Diabetes Nurse Specialist referral.

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Call	Causes (major threats to life)	Worrying factors	Immediate management
Hypoglycaemia	Alcohol Increased exercise Insulin Missed meals Oral hypoglycaemics **Acute liver failure** **Sepsis**	Patients not known to have diabetes Recurrent episodes Reduced GCS	Check GCS. Nurses should already have followed insulin chart/hypo instructions and given something. Clearly document for hypoglycaemics to be withheld. Give 10% glucose IV and get patient to eat a snack or Hypo-Fit® (orange) oral gel 18 g (see Diabetes chapter)

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Call	Causes (major threats to life)	Worrying factors	Immediate management
Pain	Inadequate analgesia New pathology Surgical complications **MI** **PE**	Hypertension Not going away with simple analgesia Persistent tachycardia Thunderclap headache Worsening pain	SOCRATES Consider referral or discussion with Registrar • Paracetamol, 1 g PO qid (regular) • Tramadol 50-100 mg PO tds (regular) • Celecoxib 200 mg PO bd (regular) • Morphine 10-20 mg PO q1h (PRN) • Morphine “as per IV protocol” • Renal failure: fentanyl “as per IV protocol” **Note: avoid NSAIDs, codeine, tramadol in the elderly** If needing more than this, discuss with Reg or Pain Team Call a code if worried about opiate OD, especially respiratory depression.

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Call	Causes (major threats to life)	Worrying factors	Immediate management
Psych / Aggression	Delirium		Do they have a management plan? Non-pharmacological measures Consider code orange • Security, duty manager and psych liaison come to this Ring a Psych Reg for dosing advice if they need haloperidol, etc. • Lorazepam 0.5-1 mg • Haloperidol 0.5 mg (contraindicated in Parkinsonism) • Caution, underdosing is safer than overdosing • **Be safe: do not see patients alone**

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Call	Causes (major threats to life)	Worrying factors	Immediate management
Rash	Allergic reaction (drug eruption) Eczema Heat rash Infectious – scabies, etc. Grover's Disease Shingles **Erythroedema** **SJS**	Blistering Involvement of oral mucosa Large area Peeling of skin/desquamating	Are they systemically unwell? • If so, have a low threshold to call Derm STOP administration of drug causing allergy Ring derm if: • Desquamating • And/or oral mucosa involved Consider anti-histamine for itch: • Loratidine 10mg or cetirizine 10mg • Consider an emollient for dry skin • Aqueous cream can worsen rashes, fatty cream may be better Dermnet is a great and regularly updated resource. CLEARLY DOCUMENT new allergic reaction on med chart and in notes so that team pharmacist can be aware in the morning.

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Call	Causes (major threats to life)	Worrying factors	Immediate management
Seizure	**Status epilepticus**	>10 min	Code Red IV medication is preferred as IM absorption is erratic Lorazepam (1st choice) - 4 mg IV push over 2 min Midazolam - 10 mg IV or IM If you have not dealt with this before, call the Med Reg.

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Call	Causes (major threats to life)	Worrying factors	Immediate management
Short of breath	Bronchospasm Infection **Anaphylaxis** **Arrhythmia** **Aspiration** **Cardiac tamponade** **MI** **PE** **Pulmonary oedema** **Tension pneumothorax** **Upper airway obstruction**	Confusion Chest pain Fatigue Febrile Hypotension Reduced sats Tachycardia/bradycardia RR >30 breaths/min	If anaphylactic, follow anaphylaxis guidelines O2 to keep sats above 94% (If COPD aim for 88-92%). If hypoxic – do ABG CXR ECG Consider septic screen Frusemide for pulmonary oedema • e.g. 40-80 mg IV STAT dose • (depends if they are frusemide naïve or not) • Record respiratory rate

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Call	Causes (major threats to life)	Worrying factors	Immediate management
Swollen legs	DVT Oedema – heart failure Dependent Cellulitis	Confusion Chest pain Fatigue Febrile Hypotension Reduced sats Tachycardia/Bradycardia Tachypnoea	History • Screen for PE symptoms • Risk factors for DVT – do a Well's Score • Check if patient has been on thromboprophylaxis Examination • Soft calves? • Signs of heart failure or varicose veins • Erythema Talk to a Reg before doing a D-dimer

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Call	Causes (major threats to life)	Worrying factors	Immediate management
Tachycardia	Cardiac arrhythmias Drugs Hypovolaemia/dehydration Inadequate pain relief Renal failure Sepsis **Heart failure** **Hypoxia** **MI** **Shock**	Chest pain Decreased sats Distended neck veins Febrile Hypotension Increased RR Sweating Tachycardia >130 bpm	Are they hypotensive? – get a manual BP Is the HR > the systolic BP? ECG – to check rhythm; consider flexi monitoring Review fluid balance chart Discuss with General Medicine or Cardiology

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Call	Causes (major threats to life)	Worrying factors	Immediate management
UGI bleed	Mallory Weiss Ulceration **Carcinoma** **Varices**	Age (>60 yrs) Clots Co-existing illnesses (cardiac, renal, liver, metastatic cancer) Confusion Hb <90 g/L Known varices/evidence of cirrhosis Shock Melaena or fresh blood Anticoagulated	ABCs/haemodynamic stability • Fluid resus +/- code if needed PR exam – to look for melaena Check Hb, coags, LFTs, G+H Stop anticoagulation Rockall score Call Gastro early • ?timing of scope • Omeprazole • Record stool chart

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Call	Causes (major threats to life)	Worrying factors	Immediate management
Vomiting	Drugs (including anaesthetic induction agents) Infection Upper GI bleed **Blood loss** **Bowel obstruction** **Diabetic ketoacidosis** **Meningitis** **MI** **Raised ICP**	Abdominal injury Head injury Hypotension Reduced GCS Requiring 3 or more anti-emetics Blood in vomit Feaculent vomit	Metoclopramide (not if Parkinson's) 5-10 mg PO/IV tds/prn Cyclizine 50 mg po/IV tds/prn Ondansetron 4-8 mg po/IV tds/prn Domperidone 10 mg po tds/prn If bowel obstruction suspected: • AXR • IV fluids for replacement • NBM • Consider NGT

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Emergency Codes and Procedures

Te Toka Tumai Auckland Emergency Codes and Procedures

- The hospital emergency system is initiated by calling **777.**
- Callers should state the nature of the emergency and the **exact location** of the emergency.
- Recipients on the emergency paging list carry an emergency pager (note: this is quite separate to iBleep).

The common important clinical emergency codes at Auckland City Hospital (ACH) are as follows:

https://adhb.hanz.health.nz/Toolkit/Clinical%20Codes%20accessible%20via%20777.pdf

Adult Code Blue Grafton site	Cardiac or respiratory arrest	*Medical Registrar, Cardiology Registrar (level 3/4), DCCM Registrar, CVICU Registrar (level 3/4), PAR Nurse Specialist, CNM, Orderly*
Adult Code Red Grafton site	Medical Emergency	*Medical Registrar, Cardiology Registrar (level 3/4), DCCM Registrar, CVICU Registrar (level 3/4), PAR Nurse Specialist, CNM, Orderly*
Adult Anaesthetic or Airway Emergency Grafton site	Difficult airway, malignant hyperthermia, massive transfusion, anaesthetic crisis	*Anaesthetics Registrars Levels 4, 8 & 9, DCCM Registrar, PAR Nurse Specialist (Wards only)*
Adult Emergency Chest Reopening in CVICU	Chest reopening required in an emergency	*CTSU SMO & Registrar, CTSU Theatre Nurse, Level 4 Anaesthetic Registrar & Anaesthetic Technician, CVICU SMO, CNM (inform only), Orderly*
Obstetric Emergency Code Grafton site Contact Centre assists decision on which team(s) to send, based on algorithm	Obstetric Emergency *(Also Call Adult Code Blue for cardiac arrest)*	*Delivery Unit (DU) Registrar & House Officer, Women's Assessment Unit (WAU) Registrar, Clinical Midwife Advisor (after hours) or CNM (in hours), Clinical Charge Midwife, Level 9 Anaesthetist, Level 9 Theatre Co-ordinator (notified as required), PAR Nurse Specialist, CNM (after hours) or MUM (in hours) (inform only)*
Neonatal Code Blue Grafton site	Neonatal Emergency/ Cardiac arrest	*NICU Registrar(s), NICU Nurse Specialist - Advanced Neonatal Practitioner(s), SCBU Registrar & House Officer, Clinical Midwifery Advisor, CNM (inform only)*
Trauma Call – Adult ED Grafton Site	Trauma patient Adult ED	*Surgical Registrar, DCCM Registrar, AED CCN, AED Consultant & Registrar, Trauma CD & Registrar, Trauma Fellow & Coordinator*
Code Crimson Trauma Call – Adult ED Grafton Site	Severe trauma patient Adult ED	*As for Trauma call + Surgical SMO, Anaesthesia, Level 8 Theatre Coordinator (inform), Blood Bank (inform), Radiology Registrar (inform)*
Medical Emergency – Adult ED Grafton Site	Medical patient Adult ED	*Medical Registrar, DCCM Registrar, AED CN, AED Registrar, Consultant*
Surgical Emergency – Adult ED Grafton Site	Surgical patient Adult ED	*Surgical Registrar, DCCM Registrar, AED CN, AED Registrar, Consultant*

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Further explanation of common codes

Code Blue (a cardiopulmonary arrest)

- Press the red emergency button if available at the bed space and a high pitch emergency pulse tone will be transmitted
- Call **777** and ask for a code blue to be called to your location.
- This code is activated when a patient or visitor becomes unresponsive and stops breathing or is breathing abnormally. It is also occasionally used when staff believe that someone is about to have a cardiac arrest (conscious VT, collapse of uncertain cause).

Code Red (also referred to as a Rapid Response team (RRT)

- Press the red emergency button and a high pitch emergency pulse tone will be transmitted
- Call **777** and ask for a code red to be activated to your location.
- This code is activated when ward staff are either imminently worried about a patient or visitor and require an urgent medical response, or have been mandated to call as per the escalation pathway in the NZEWS vital signs chart (EWS 10 or any vital sign in blue zone).

Code Orange (disruptive/agitated/aggressive patient or visitor)

- Press either the red emergency button or yellow assist button as appropriate
- Call **777** and ask for a code orange to be called to your location.
- This code is normally managed by the Clinical Nurse managers and security. The home team medical staff should be involved to exclude and/or manage an underlying medical problem requiring attention (delirium etc.).

Urgent assist to bedside. Press yellow triangle 'assist' button on wall-mounted nurse call system. An intermittent 2 Tone (high then low tone) pulse will be transmitted.

This assist bell signals any situation at the bedside that requires urgent assistance e.g. patient fall.

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Emergency Code Teams

- There are two distinct code teams in the adult hospital which correspond to the two intensive care units: the CVICU (Cardiac ICU) code team and the DCCM (General and Neurology ICU) code teams.
- These distinct teams are each responsible for codes that occur in their respective ICU "catchment" area.

Code Team	Team members	Attends code in the following areas
CVICU	CVICU Registrar Cardiology Registrar PaR Nurse (2) Orderly CNM (only for blue) An Anaesthetic Registrar also attends code blues	All codes on level 3 and 4 including public areas 42
DCCM	DCCM ICU Registrar Medical Registrar PaR Nurse (2) Orderly CNM (only for blue)	All other areas, including: • Support building • Other buildings on Grafton campus • 'Adult' patients in the child and family (psychiatric) unit in Starship

When an emergency page goes out, members from both teams receive the page, but only the team responsible for the clinical area attends the code (unless it is a 'second team' call - see below).

If you are unsure how to get to a particular clinical area, ask an experienced staff member on your ward or call the clinical nurse manager to assist you. There is also a **link to the hospital MAP** here: https://adhb.hanz.health.nz/Pages/ACH-maps-floor-plans-meeting-rooms.aspx

Second team calls

If a second code is called in the same team catchment area, and the first code has not been cleared by the PaR nurse specialist, a "second team" page is put out. This will alert all emergency code team recipients and the code team from the other team catchment area will attend the code.

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Adult Codes in Paediatric Areas

Adult codes in paediatric areas such as Starship hospital and child family unit are sent to both the paediatric and adult code response teams. The pager notification will indicate the area and the age group of the affected patient.

All pager messages will indicate specific Ward, Room, Level, Building.

The paediatric code team pager message will read:

"SSH Paediatric Code Blue Ward xx Room x level x bldg 2 Starship hospital ADULT"

The adult code team pager message will read :

"ACH Campus Adult Code Blue Ward xx Room x level x bldg 2 Starship hospital ADULT"

Both adult and child response teams are expected to attend. The child team will play the role of initial responder and hand over to the adult team on their arrival.

Paediatric Codes in Adult Areas

Paediatric codes occurring in adult areas of the hospital are sent to both the adult and paediatric response teams.

The adult team pager message will read:

"ACH Campus Adult Code Blue Ward xx Room x level x bldg 32 main hospital CHILD"

The paediatric team pager message will read:

"SSH Paediatric Code Blue Ward xx Room x level x bldg 32 main hospital CHILD"

Both adult and child responder teams are expected to attend. The adult team will act as initial responders and will hand over to the child team on their arrival.

Code Red and Blue Management

For the latest New Zealand Resuscitation Council guidelines, click on the following link:

https://www.resus.org.nz/healthcare-resources/

For a useful guide to managing patient deterioration, ADHB supports the freely accessed PDF e-book endorsed by the Australasian College of Intensive Care Medicine 'Managing Patient Deterioration'. A link to this PDF can be found here: https://rrthandbook.org/

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Establishing early leadership

On code team arrival, hand over important information using the ISBAR tool:

I Introduction: state your name and that you are looking after the patient

S Situation: reason for call, EWS, etc.

B Background and relevant medical history (briefly)

A Assessment: symptoms, vital signs, what you think is going on

R Request / recommendation: what you want/need e.g. help with patient management

Establishing early leadership at codes helps facilitate good communication and helps the team to run smoothly.

Code Team Roles

The Patient at Risk team

- The Patient at Risk (PaR) nurse specialists are an experienced team of senior nurses who support the care of deteriorating ward patients and facilitate escalation of care (e.g. to ICU) when appropriate.
- They are a core component of the response arm of the mandatory escalation pathway attached to the NZEWS vital signs chart and they also attend all code reds and blues 24/7.
- They are supported by a PaR Charge Nurse and a PaR Senior Medical Officer.

The House Officer

- There is currently no on-call House Officer (HO) on the emergency code recipient list (carrying a dedicated code pager) and therefore they are not always present at codes.
- Home team HOs are often present on the ward and therefore have the vital role of primary responder to emergency codes. They should handover important clinical information on code team arrival (using ISBAR).
- The HO can assist the code team with ordering and chasing investigations, taking bloods and cannulation etc.

The Medical Registrar or Cardiology Registrar

- The Medical and Cardiology Registrars have the clinical experience to provide a thorough patient assessment, formulate a differential diagnosis and establish an appropriate management plan.
- If a patient stays on the ward after a code, these Registrars will usually take responsibility for follow-up and on-going ward-based management if the code occurs after hours; during normal working hours they would hand back responsibility to the home team.
- The patient's SMO should also be informed of the deterioration of their patient and be involved in decision-making as per the RMO to SMO escalation documents link.

The ICU Registrar

- The ICU Registrar will generally assume leadership at all emergency code responses.
- If airway management is required and the Anaesthetic Registrar is not available, the ICU Registrar may need to hand over leadership to the Medical/Cardiology Registrar or PaR nurse specialist.
- If it becomes clear that ICU involvement is not required or ICU is deemed not appropriate, the ICU Registrar will hand over on-going management to the Medical/Cardiology Registrar once a management plan has been agreed on.

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The Anaesthetic Registrar

- The level 4 Anaesthetic Registrar only responds to code blues on levels 3 and 4. This is where the majority of code blues occur (in the Cardiology, Vascular and Cardiothoracic wards). Their primary responsibility in this situation is airway management.

The Orderly

- The Orderly brings the resuscitation trolley to all code red and blues.
- They can also assist with patient mobilisation (i.e. from floor to bed) and help transfer patients within the hospital (i.e. to radiology and to ICU).
- They are also able to take venous and arterial blood gases to the ICU and will return to the ward with printed blood gas results.

Clinical Nurse Managers

- The Clinical Nurse Managers are a team of experienced senior nurse specialists who support the wards with staffing, patient flow and complex senior nursing tasks (vac dressings, peripheral lines, accessing port-a-caths etc.).
- Although they are not usually directly clinically involved in code reds and blues, they help to support the wards by caring for other patients on the ward and assisting families. They are also the primary responders to code oranges.

Equipment

There are three sources of equipment at emergency clinical codes:

The ICU Registrar

The ICU Registrars from both CVICU and DCCM will bring a small carry-bag containing emergency resuscitation equipment.

The Orderly

The Orderly will collect an emergency resuscitation trolley from the PaR Resus room on level 5 and bring this to the location of the emergency code. This contains emergency medications, intubation equipment, a defibrillator and an M540 (with CO2 cables).

The Ward Resuscitation Trolley

There is a standardised resuscitation trolley accessible to all clinical wards in the adult hospital. This trolley has a defibrillator with either a manual/AED or a basic AED depending on the trolley location. All trolleys contain basic resuscitation equipment including a bag mask device and portable oxygen. They do not contain intubation equipment; however, they do have supraglottic airways (I-GEL) and simple resuscitation medications such as adrenaline and amiodarone.

Behaviour at codes

The majority of code red escalations are mandated by the NZEWS embedded into the national vital signs chart. Ward nursing staff are required to call a code red when they are imminently concerned for a patient or when the NZEWS score is 10 or above. Please be helpful and courteous when you arrive on the ward in response to a call for help - ward staff are doing their best for the patient. Dismissive or hierarchical behaviour worsens patient outcomes and is an obstacle to calling for help in the future.

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What to do at the end of a code

- At the end of the code, consider whether the patient needs to be moved to an area on the ward with more monitoring capability, or whether they should be admitted to an ICU. If you think the patient requires an ICU admission (or you are uncertain) advocate for this with the PaR nurses, the ICU Registrar and the responsible SMO.
- If the patient is to remain on the ward, make sure that there is an appropriate and safe plan which incorporates with NZEWS, including a plan for follow-up that ward staff are happy with. This should include the home team (including the SMO) or the after-hours team reviewing the patient with a clear time frame.
- In the event that the patient dies at the end of a code, it is the responsibility of the home team (or relevant on-call team) to meet with family and either complete death certification or refer to the coroner. The SMO with responsibility for the patient should be contacted if the patient dies unexpectedly.
- It is useful to conduct a quick “defuse/debrief” after a death or other stressful situation and this can be conducted by anyone on the team who feels comfortable leading it. PaR are very experienced with this.

Documentation and data collection

The PaR team will complete a database for every patient that has a code called (and every subsequent review). This can now be seen in RCP. The PaR nurses will ask the Registrar who is initiating treatment to document the code and the plan in the notes. Included in the plan is a plan for follow-up and recommendations for the home team. Depending on the clinical context and your involvement, you may want to document a more comprehensive record into the patient notes.

Quality and safety concerns

If you have any quality and safety concerns after an emergency code (delayed escalation, problem with pagers, concern with clinical management, equipment failure etc.) then enter a Datix and advise the PaR nurse specialist.

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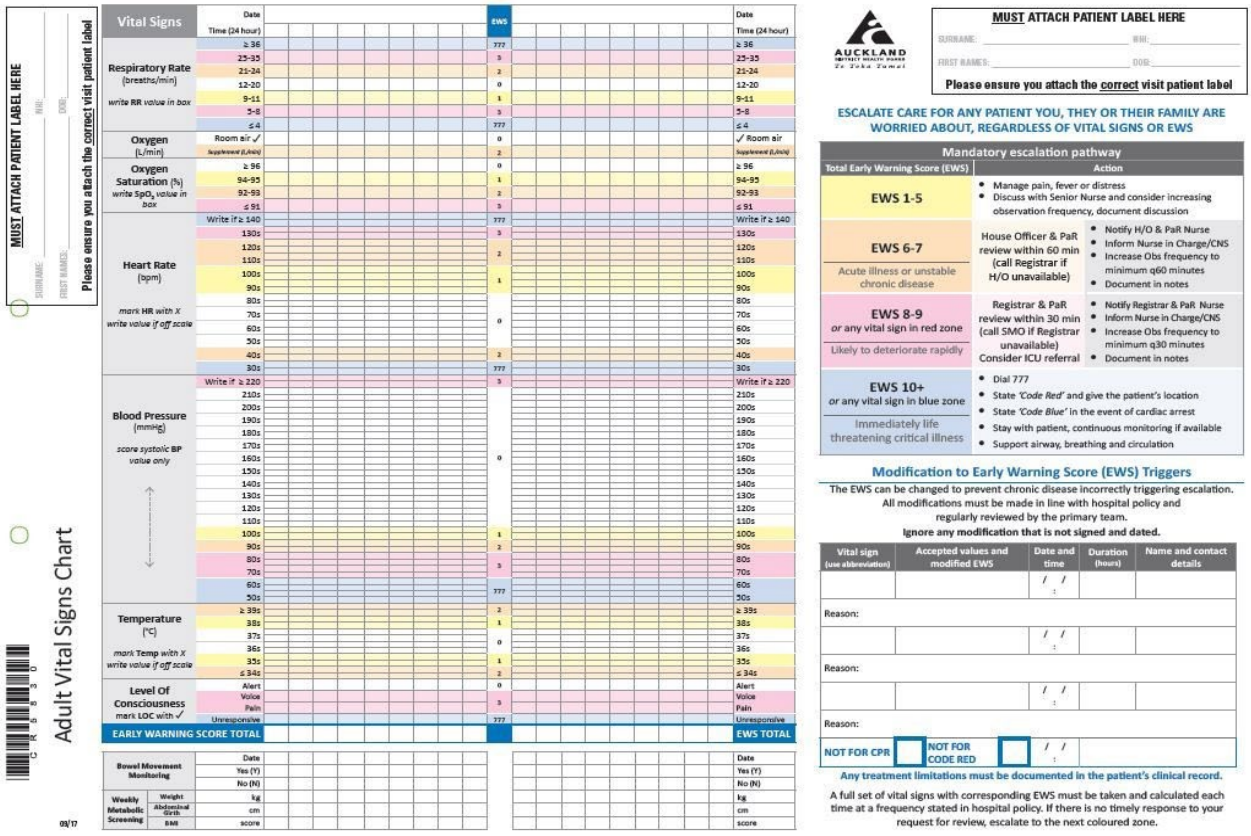
NZ Early warning score (NZEWS) and ADULT Patient Deterioration in AUCKLAND CITY HOSPITAL

Te Toka Tumai has a recognition and response system for acute physiologic deterioration of inpatients.

Within Te Toka Tumai, all staff are 'recognisers' and we have responders including the Patient at Risk (PaR) service and dedicated Rapid Response (Code) teams.

National Vital Signs chart and New Zealand Early Warning Score (NZEWS)

- All staff are encouraged to complete the following Ko Awatea learn package: https://koawatealearn.co.nz/course/index.php?categoryid=814
- The national vital signs chart supports our **recognition and response system** for acute physiologic deterioration of inpatients.
- The national vital signs chart has an Early Warning Score (EWS) embedded into it which is both sensitive and specific at detecting patient deterioration.
- **The EWS is not there to replace clinical judgement, but rather to support clinical decision-making and ensure deteriorating patients receive the care they need in a timely manner.**
- The EWS score is completed by nursing staff. Each vital sign is associated with a colour, and each colour is associated with a number (EWS) between 0 and 3.
- Once the vital signs have been completed, the numbers are added together to create a total EWS.
- If this total number is zero, no action is required. However if it is ≥1, nurses will refer to the escalation pathway which mandates a response ranging from a discussion with a senior nurse (EWS 1-5), a House officer and PaR nurse review (EWS 6-7), a Registrar and PaR review (EWS 8-9) or an **emergency code red** (EWS 10+).



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- **Any single vital sign** present in the red zone of the vital signs chart mandates the same response as a total EWS of 8-9 red (a Registrar review). Likewise, any single vital sign in the blue zone mandates the same response as EWS 10+ (call 777). These are known as single trigger escalations.
- The aim of the escalation pathway is to focus *early* senior nursing and medical attention to patients with physiological signs of deterioration, thereby preventing further deterioration and bad outcomes such as organ failure, an ICU admission or a cardiac arrest.

ADHB Escalation Pathway

ESCALATE CARE FOR ANY PATIENT YOU, THEY OR THEIR FAMILY ARE WORRIED ABOUT, REGARDLESS OF VITAL SIGNS OR EWS

Mandatory escalation pathway		
Total Early Warning Score (EWS)	**Action**	
EWS 1-5	• Manage pain, fever or distress • Discuss with Senior Nurse and consider increasing observation frequency, document discussion	
EWS 6-7 Acute illness or unstable chronic disease	House Officer & PaR review within 60 min (call Registrar if H/O unavailable)	• Notify H/O & PaR Nurse • Inform Nurse in Charge/CNS • Increase Obs frequency to minimum q60 minutes • Document in notes
EWS 8-9 *or* any vital sign in red zone Likely to deteriorate rapidly	Registrar & PaR review within 30 min (call SMO if Registrar unavailable) Consider ICU referral	• Notify Registrar & PaR Nurse • Inform Nurse in Charge/CNS • Increase Obs frequency to minimum q30 minutes • Document in notes
EWS 10+ *or* any vital sign in blue zone Immediately life threatening critical illness	• Dial 777 • State *'Code Red'* and give the patient's location • State *'Code Blue'* in the event of cardiac arrest • Stay with patient, continuous monitoring if available • Support airway, breathing and circulation	

- The escalation pathway is **mandatory** in order to overcome the barriers that exist in calling for help, such as clinical uncertainty, fear of interrupting someone and other perceived barriers to communication that can exist in the medical and hospital hierarchy.
- At the top of the escalation pathway, it is emphasised that staff should call for help with any patient they, the patient or patient's family are worried about, *regardless* of the vital signs or EWS.
- There is a graded response based on the seriousness of deterioration in a patient's vital signs
- When ward staff are unable to get the response mandated by the pathway they are empowered to escalate utilising the RMO to SMO Escalation plan specific to their area.
- The PaR nurse specialists are involved in all patients who have an EWS greater than 5. They provide senior nursing support to ward nurses caring for deteriorating patients and help to facilitate escalation and appropriate treatment.

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Modifications to EWS triggers

- Modifications may be appropriate in the presence of **some chronic diseases**, to avoid escalation in patients without a reversible disease process. In these situations, slightly abnormal vital signs are tolerable. **Avoid** modifying the EWS triggers in acute illness.
- Modifications can be written by a House Officer or Registrar but **must be discussed with a more senior doctor (Fellow or SMO)**. In the event that a HO or registrar completes the modification, the SMO or fellow name needs to be documented. Be very clear with the time frame that the modification is in place for – regular reviews of this is encouraged.

- **Be careful** modifying multiple parameters at the same time as this may delay appropriate escalation in care.
- **You must** clearly fill out all the boxes if you are modifying triggers and communicate the modifications to the nursing team.

Modification to Early Warning Score (EWS) Triggers

The EWS can be changed to prevent chronic disease incorrectly triggering escalation.
All modifications must be made in line with hospital policy and
regularly reviewed by the primary team.
Ignore any modification that is not signed and dated.

Vital sign (use abbreviation)	Accepted values and modified EWS	Date and time	Duration (hours)	Name and contact details
		/ / :		
Reason:				
		/ / :		
Reason:				
		/ / :		
Reason:				
NOT FOR CPR ☐	NOT FOR CODE RED ☐	/ / :		

Any treatment limitations must be documented in the patient's clinical record.

A full set of vital signs with corresponding EWS must be taken and calculated each time at a frequency stated in hospital policy. If there is no timely response to your request for review, escalate to the next coloured zone.

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EXAMPLES OF APPROPRIATE MODIFICATIONS

Patients who suffer from a chronic disease (COPD)

Vital sign	Accepted value and modified EWS	Date and time	Duration (hours)	Name and contact details
O_2 sats	88-95%= 0 86-87%= 2	3/10/2018 10:10	Until discharge	
Reason	Chronic COPD, normal sats 90%			
Oxygen	≤3 L/min = 0	3/10/18 10:10	Until discharge	
Reason	Chronic COPD, on home O_2 2 L/min			

Patients recovering from recent anaesthesia or sedation

Patients recovering from general anaesthesia or sedation may require short-term administration of supplemental oxygen until they are completely awake and have normal oxygen saturations on room air. In this situation it may be appropriate to apply a short term modification so that oxygen therapy does not contribute to an elevated EWS.

Vital Sign	Accepted value and modified EWS	Date and time	Duration (hours)	Name and contact details
Oxygen	≤2 L/min= 0	3/08/17 11:35	4 hours*	
Reason	Post-anaesthesia			

*If oxygen is unable to be weaned off after 4 hours, then oxygen should start to contribute to the EWS from that time onwards. Note that the presence of an opiate PCA does not mandate supplemental oxygen. Supplemental oxygen will need to be prescribed if required.

A useful video on Modifications can be found by clicking the following link:

https://www.hqsc.govt.nz/resources/resource-library/webinar-moving-the-goal-posts-modifying-the-new-zealand-early-warning-score/

Patients who continue to trigger an escalation despite a recent medical review

- A common reason to request modification of EWS triggers is to avoid repeated escalation when a patient continues to trigger a raised EWS, despite a recent medical review. **This is not a reason to modify the EWS triggers**. Make sure you have a values-based conversation with your rationale to the staff requesting the modification in this instance and explain why you aren't able to facilitate their request.
- To prevent repeated escalations, medical staff should clearly communicate and document their plan for follow-up and also when they would like to be called again prior to that planned follow-up. For example, the doctor might document a plan to review a patient in 2 hours, and ask nursing staff to escalate earlier if the EWS increases, or if they are worried. The escalation pathway is not designed to override an existing medical plan.

The Assessment to Discharge planner contains an example of a medical plan used to facilitate the transfer of patients from the ED to the ward.

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EARLY WARNING SCORE RECOGNITION AND PLAN (IF EWS IS RAISED)

Aim: to avoid repeated escalation (dictated by the mandatory escalation pathway) when a patient has recently been reviewed by admitting doctor and a treatment plan is in place. Please continue to notify the PaR nurse on arrival to ward.

The EWS is currently ☐ Date: _____ Time: _____

1. The next medical review will be in ☐ minutes / hours
2. By *(Name of Doctor)*: _____
3. Contact details: _____ (Please be aware of shift changeover)
4. Contact the Doctor and the PaR nurse earlier if:
   a. There is clinical concern (regardless of EWS)
   b. The EWS increases
   or c. _____

- If a patient is deemed safe to stay on the ward after a code red, the same principles around repeated calling apply.
- If a patient does not meet the requirements for an ICU admission, the home team Registrar should clearly communicate when staff should escalate to a second code red. Again, this might be when the EWS increases further or if they are worried.
- If treatment escalation to ICU has been deemed as 'not appropriate' then the home team Registrar and SMO should consider revisiting the goals of care with the patient and their family. They might consider switching goals of care to ward-based cares.

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Emergency Medicine

https://adhb.hanz.health.nz/adult-medical/AED-CDU/Pages/default.aspx (intranet)

Please check the ED intranet site for more extensive guidelines on common emergency department presentations and trauma guidelines both locally and regionally. The Trauma Service intranet site also has these guidelines.

Who to Call in AED

- There is a Consultant in the Emergency Department daily from 0800-0200h Sunday-Thursday and 24 hours Friday-Saturday. They should be the first port of call for enquiries or advice related to AED.
- The AED Charge nurse can also be contacted.

Emergency Medicine Pearls

- The Emergency Department may be one of the first clinical attachments in which a junior RMO may see and treat a patient entirely on their own.

- There are ample opportunities for you to expand your procedural skills, such as ultrasound guided IV access, suturing, joint manipulation and fracture reduction, and Epley manoeuvre. As these opportunities may be sporadic and not offered to junior staff due to acuity, it is useful if you show initiative and interest in learning these skills early so that you can be taught and supervised safely for your benefit.

- Certain presentations such as abdominal pain, chest pain, headache and syncope are common, but carry a high risk of a dangerous diagnosis, such as ischaemic gut, aortic dissection, and subarachnoid haemorrhage.

- Ensure that you have a broad differential diagnosis, while considering the worst-case scenario: what is the worst, most serious possible cause of this particular presentation? e.g. headache – could this be meningitis/SAH?

- Diagnoses that can easily be missed if not considered include:

    - Aortic dissections – ripping/tearing/severe pain, radiates to back, patient looks very unwell with hyper- or hypotension

    - Pulmonary embolism – pleuritic chest pain, SOB, hypoxia, unexplained tachycardia, risk factors – use Well's Score and PERC score

    - Severe sepsis and septic shock – be wary of tachycardic/hypotensive/tachypnoeic patients with a raised lactate in the context of fever/sepsis

    - SAH and subdural haematomas – sudden-onset severe headaches, head injury in elderly patients, altered level of consciousness or meningism

    - Ectopic pregnancy – abdominal pain +/- PV bleeding +/- tachycardia/hypotension in ANY woman of reproductive age, make sure to do a B-HCG early

    - Cauda equina syndrome – lower back pain with urinary retention/incontinence, saddle anaesthesia, lax anal tone, or bowel incontinence.

- **Junior RMOs are expected to discuss all patients they see with more senior ED doctors, both for their own and their patients' protection. There are no exceptions to this rule. You will be assigned a senior at the start of your shift to discuss all your cases prior to discharging anyone.**

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- When things go wrong, the clinical record is your strongest ally and best defence. Therefore, your records should be comprehensive: include details of your thought processes (e.g. differential diagnosis and justifications for actions taken), any clinical discussion you have had (both ED and non-ED) and their advice, and your clinical plan and advice to the patient. **If you are unsure, ASK.**
- Please debrief the whole team after resuscitations. Debriefs are used to create a shared understanding of what has happened in critical events, and the aim is to explore what happened, what went well and what we can do better for our patients. The hot debrief form is under AED CDU webpage, which provides a framework for debriefing, including the 'how to' information.

  https://adhb.hanz.health.nz/adult-medical/AED-CDU/Documents1/Hot%20Debrief%20Document.pdf

CDU and Adult ED: Guidance for all Specialty Doctors

The Adult Emergency Department (AED) and Clinical Decision Unit (CDU) aim to provide an effective, efficient and safe front door service to acute adult patients presenting to the hospital.

Long delays to ward admission from ED are associated with increased mortality for both the patient being admitted and new patients arriving at ED. Best practice is that acute referrals are seen within an hour of the referral. If your team is not resourced appropriately to achieve timely review of acute patients, you should escalate this to your Registrar or SMO on call.

Acute referrals are made because either the patient needs your help or the referring team need your help. The first specialty to be referred the patient should see the patient. It is not appropriate to decline or deflect referrals over the phone. After you've assessed the patient, if you think another specialty would be better suited to care for the patient, you should document your rationale for this decision in the clinical notes and refer the patient to that team. It is not appropriate to 'bounce' referrals back to Emergency Medicine.

Please refer to Working Collaboratively for better Patient Care document on Hippo to help you navigate patient level 2 patient care.
https://adhb.hanz.health.nz/Policy/Working%20Collaboratively%20for%20Better%20Patient%20Care.pdf

For a trauma emergency when massive transfusion is required call Code Crimson. For more information on Code Crimson visit: https://adhb.hanz.health.nz/Toolkit/Clinical%20Codes%20accessible%20via%20777.pdf

GP calls

- Pager and cell phone calls from GP and Primary care providers should be answered promptly.
- If you receive a referral from a GP:
  - Accept the referral or give appropriate advice if you do not feel the referral is appropriate.
  - If you feel it is not appropriate for your service, please give advice which speciality you feel is appropriate and liaise with that service.
  - Please do not ask the GP to make multiple phone calls.
  - Please do not advise the GP to send patients to the ED for EM to see unless it meets the criteria on Health Pathways.
  - If you feel EM is the right team, please contact the ED SMO and discuss.
  - Advise the GP to send an electronic acute referral. This must be addressed to your speciality if you have accepted the patient.
  - if the GP is to send a referral to you, ensure the Provider writes your speciality in the 'referred to' section, and your name in the 'discussed with' box.
- If the patient comes with a letter addressed to your specialty, even if the GP has not phoned beforehand, your service will be required to see them.
- Your patients will be triaged in ED and if they are triaged 1 or 2 they will remain in ED for your team to review. The AED medical staff provides an acute stabilisation and resuscitation service to unwell

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GP referred patients and will assist with certain procedures, but are not responsible for the general processing of GP referred patients.

- Triage 3, 4 and 5 stable GP referred patients will be transferred to CDU where capacity allows.

ED referrals – disposition

- If you are referred a patient by an ED doctor:
  - See all referrals as soon as able.
  - Patients in the resuscitation and monitored areas should generally be given priority.

- All referrals from EM to a specialty are one-way.
  - Patients cannot be referred back to EM as this is inefficient and leads to poor patient care. You can either:
    - Refer to the appropriate service or
    - Discharge the patient
    - Please do not decline or argue about referrals as this results in inefficient and poor patient care.
    - If you feel a referral is genuinely inappropriate, discuss your concerns with the supervising EM doctor.

- Patients may be referred via the 'Rapid Referral' pathway - details can be found here: https://adhb.hanz.health.nz/adult-medical/AED-CDU/Pages/Rapid-Referral.aspx

- Patients may be referred to Inpatient services by the Rapid Assessment and Treatment Clinician. These patients will not have had a full assessment and investigations may still be pending, please see the above link.

- When a patient is referred, the whiteboard indicates this by an orange colour.

- Patients that are deemed stable will be transferred to CDU for assessment. Unstable referrals will remain in ED and will need to be seen as soon as possible.

- Once you have assessed the patient:

  - If you feel they are better managed by another service, please refer them to an alternative in-patient service (note that patients cannot be handed back to ED).
  - If you feel the patient is for discharge, then complete the discharge documentation and follow-up.
  - If they are for admission, please ask the flow co-ordinator to book a bed.

Failed discharges

- If a patient presents to ED within 72 hours of discharge, clinic visit or outpatient procedure with a related problem, our triage nurse will request that you see the patient directly to ensure continuity of care. Occasionally, patients well known to an inpatient service may be referred by the ED staff for initial assessment. These patients will be transferred to CDU.

Admission and discharge

- Once the patient has been seen and the decision made to admit, they will be transferred to a ward bed as soon as available. Ensure that all paperwork (admission note, medication chart, goals of care) is completed by a member of your team.

- If a decision is made to discharge the patient, ensure you complete the discharge summary and prescription at the time to avoid delays and prevent frustrating follow up calls.

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- Elective or follow-up patients must not be brought back through the AED for in-patient specialty review or deferred admission. Please use the appropriate clinic or admission system (such as ORDA).

- AED does not provide short stay ward beds for in-patient specialties.

Resuscitation room

- All resuscitations will have a designated team leader, usually the duty ED Consultant or Fellow.

- The team leader will allocate roles initially and then utilise the specialist skills of the team and services they represent. Please let the team leader know if you are allocated a role in which you are not comfortable or familiar.

- Staff not part of the resus team will be asked to remain behind these lines unless requested to assist by the team leader.

- A short summary note pertinent to your specialty is useful where there are specific issues

General points about working on Level 2

- The ED Consultant and ED/CDU Charge Nurses are always available for clinical and administrative advice for patients in AED.

- Patient flow is critical to the functioning of both ED and CDU.

- All staff wear distinctive scrubs which helps with identification; ED SMO in-charge (light blue), ED SMO (black), ED/CDU Charge Nurse (red) and ED/CDU Flow Nurse (green).

- Please see your patients, make clinical and disposition decisions as soon as possible.

- Early decision making allows for good patient care and good patient flow.

- Patients that do not require a bed will be placed in the Ambulatory care area.

- To facilitate timely and efficient patient care, it is important that we all work together.

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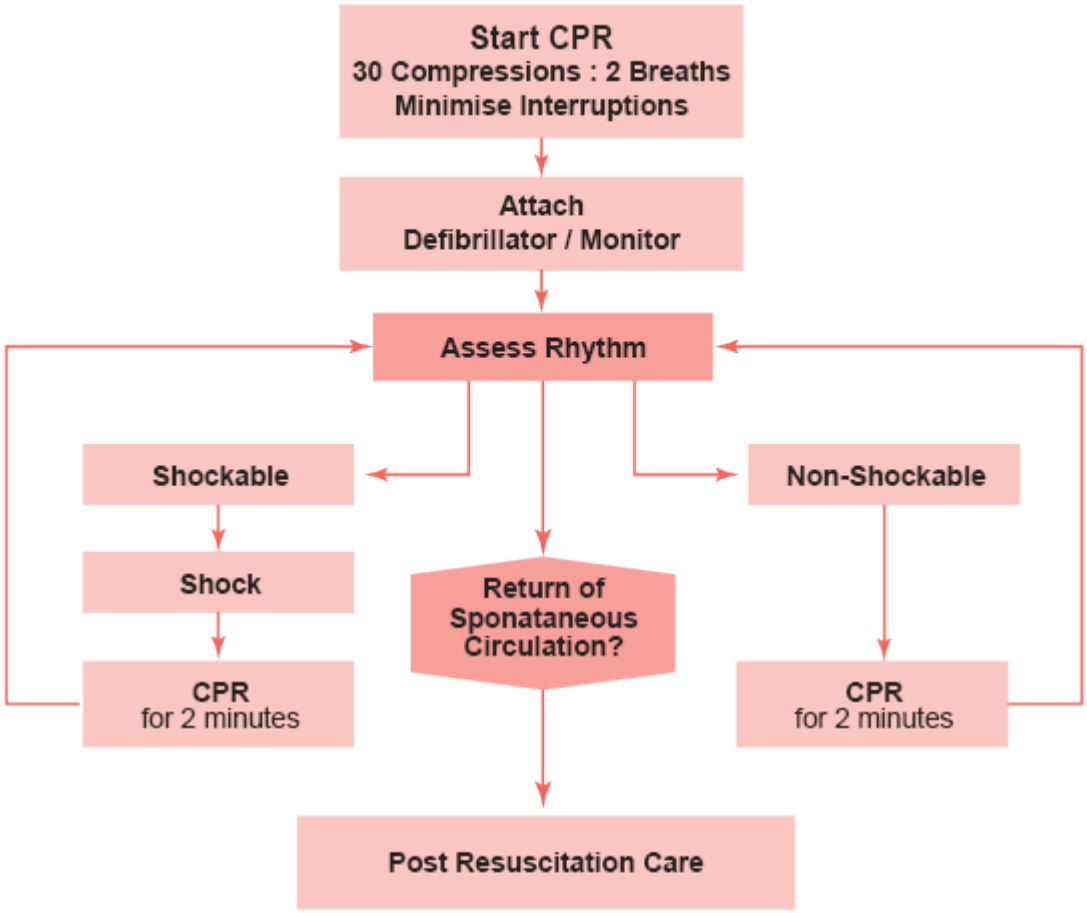
Guidelines for Adult Resuscitation

(Assuming patient is for full resuscitation)



During CPR

Airway adjuncts (LMA / ETT)
Oxygen
Waveform capnography
IV / IO access
Plan actions before interrupting compressions
(e.g. charge manual defibrillator)

Drugs

Shockable
* Adrenaline 1 mg after 2nd shock
(then every 2nd loop)
* Amiodarone 300mg after 3 shocks

Non-Shockable
* Adrenaline 1 mg immediately
(then every 2nd loop)

Consider and Correct

Hypoxia
Hypovolaemia
Hyper / hypokalaemia / metabolic disorders
Hypothermia / hyperthermia
Tension pneumothorax
Tamponade
Toxins
Thrombosis (pulmonary / coronary)

Post Resuscitation Care

Re-evaluate ABCDE
12 lead ECG
Treat precipitating causes
Aim for: SpO2 94-98%, normocapnia and normoglycaemia
Targeted temperature management

Post-resuscitation care

The aim of post-resuscitation care is to continue respiratory support, maintain cerebral perfusion, and to treat / prevent the cause.

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Aspect	Care steps
Airway	• Ensure ETT secured (noting the depth at the teeth/lips) • Place NG tube (if intubated) • Ensure CXR ordered to check ETT / NG placement (if applicable)
Breathing	• Aim SaO_2 94-98% • Aim $PaCO_2$ 35-40 mmHg (4.7-5.3 kPa) (ensure $ETCO_2$ is monitored) • Check ventilator settings (in general setting rate 12/min, PEEP 5 cm^3, TV 6-8 mL/kg, FiO_2 100 is appropriate for most) • Check ABG at regular intervals to guide ventilator settings
Circulation	• Place central and arterial line if needed • Maintenance IV fluids (or continue resuscitation if required) • Monitor BP: aim for patient's normal BP or SBP >100 • If needed, consider inotrope infusion via central line, titrated to BP Guideline dosages: • Noradrenaline 0.3-2 mg/h • Adrenaline 0.3-2 mg/h • Dobutamine 2.5-15 microgram/kg/min and refer to infusion table (e.g. for cardiogenic shock) • Dopamine as per infusion table in resus guidelines (e.g. congestive cardiac failure) • Metaraminol 0.5-1 mg boluses followed by 1-5 mg/h infusion • ECG monitoring plus serial ECGs if indicated

Disability / Environment	• Monitor BSL
	• If intubated:
	  ○ Ensure on-going sedation (propofol infusion at 50-200 mg/h depending on BP)
	  ○ Ensure on-going paralysis (rocuronium 50 mg – DOA is approximately 20-30 minutes)
	• Monitor temperature

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	• If post-out of hospital VF arrest aim T 32-34ºC; most important is prevention of hyperthermia • Place indwelling catheter and monitor urine output • Monitor electrolytes

Airway management in the ED

Decisions regarding the need for intubation will be made by the ED Consultant / Fellow / Senior Registrar. It is, however, important to be familiar with the principles of emergency airway management and the management of a difficult airway.

There is an airway trolley in each Resuscitation Bay – the layout is slightly different to trolleys in other parts of the hospital. Please become familiar with these. CMAC video laryngoscopes are in the Resuscitation storeroom and drugs are in the Resuscitation drug room. One or two nurses should be tasked with getting these to the bedside.

The Auckland Hospital ED Airway Checklist (Figure 1) has been created as a preparation aid for intubation in the Emergency Department. These lists are found on every resuscitation bed space writing platform and should be used for every intubation performed in the department. The drugs listed on the checklist are the most used, and hence recommended, induction and paralysis drugs in the department - but this is not meant to be a comprehensive list.

For doctors not comfortable in the management of airways, please refer to Figure 2 as a guideline.

It is very important to remember that if a patient requires advanced airway intervention and you do not have the experience to provide this, anticipate difficulty, or are having difficulty:

1. **Call 777** and state "**Adult Airway Emergency Resus**" or inform the Duty SMO.
2. **Maintain oxygenation by simple measures**: bag-valve-mask (BVM), oropharyngeal/nasopharyngeal airway, suction, jaw thrust, 2-person bagging.

Unless in an emergency, do not commence induction, paralysis or intubation until you have assembled all the resources and staff necessary.

CMAC video laryngoscopy is the preferred device for intubation. There is abundant evidence in the literature that first pass success improves significantly with the use of video laryngoscopy as the first device.

Please remember that it is highly recommended that **all actual or potential airway operators and airway assistants don full PPE regardless of the infective status of the patient**. This is to reduce the risk of transmission of airborne diseases to the operator or assistant.

Predictors of a difficult airway

History

- Previously difficult intubation
- Obstructive sleep apnoea
- Pathology associated with difficult airway (e.g. rheumatoid arthritis), upper airway lesion

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Examination findings associated with a difficult airway

- Mouth: prominent dentition (no dentition may impair BVM ventilation), large tongue size, poor mouth opening (<3 fingers width), small mandible (e.g. prominent overbite), trismus, blood/vomit in mouth, facial injury, poor visibility of uvula on mouth opening (e.g. Mallampati score) – **note that many of these signs cannot be easily assessed in the emergency situation**
- Neck: short, thick, immobile
- Body habitus: obesity
- Other: external compression of upper airway (e.g. goitre); beard (difficult BVM ventilation)

Assume all ED intubations are difficult and be prepared for failed intubation, hypoxia, and haemodynamic instability. Take the time to position and pre-oxygenate the patient. Have a Plan A, B and C, and remember there is help available so call early if you are unsure.

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Figure 1: ED Airway Checklist

ED Airway Checklist

Challenge (?) --------- Response ☑

PPE

PPE donned correctly by all staff ---------- ☐
Airway team: N95 mask & face shield -------- ☐

Start Pre-oxygenation Early

Optimise position ---------- ☐
BVM *(O_2 & PEEP & HME filter)* ---------- ☐
patient spontaneously breathing,
avoid actively squeezing bag ---------- ☐
Two-handed technique, tight seal ---------- ☐

Check TEAM

Team Leader ---------- ☐
1st Airway Operator ---------- ☐
Backup Airway Operator ---------- ☐
Airway Assistant ---------- ☐
External Laryngeal Manipulation ---------- ☐
C-spine Immobilisation? ---------- ☐
Drug Provider ---------- ☐

Check EQUIPMENT

Monitoring (SaO_2/ET CO_2) ---------- ☐
Oxygen ---------- ☐
Suction *(securely placed eg under pillow)* ---------- ☐
C-MAC/Laryngoscope ---------- ☐
ETT *(syringe & cuff checked)* ---------- ☐
Bougie *(Clinell wipe for removal)* ---------- ☐
iGEL ---------- ☐
D-Blade with stylet available ---------- ☐
Scalpel/bougie/6 ETT ---------- ☐
Ventilator ---------- ☐

Check PATIENT

Airway Assessment ---------- ☐
Vascular Access ---------- ☐

Check DRUGS

Induction Agent and Flush ---------- ☐
Paralysis Agent and Flush ---------- ☐
Post Intubation Medications ---------- ☐

Verbalise Airway PLAN:

Plan A, B, C, D ---------- ☐
Help Needed? ---------- ☐
Questions/suggestions ---------- ☐

REMEMBER!

- *Minimise aerosolising procedures where possible*
- *If oxygenating with Hudson mask or nasal cannulae, cover with surgical mask*
- *Video laryngoscopy first line, avoid direct laryngoscopy*
- *Do not ventilate until cuff inflated*

NEED HELP? (difficult airway team)

- Predicted difficult airway, or
- Failed intubation

→ Call 777 and state: "ADULT AIRWAY EMERGENCY RESUS, PPE REQUIRED"

RSI Drugs

Induction	Dose	"typical" dose for 70kg
Ketamine	1-2mg/kg	100-200mg
Propofol*	0.5-2.5mg/kg	50-200mg

*may need lower dose in unstable patients

Paralytic	Dose	"typical" dose for 70kg
Rocuronium	1-1.5mg/kg	100-150mg

Post Intubation

☐ Confirm tube placement ($ETCO_2$)
☐ Check ETT cuff pressure
☐ Secure ETT
☐ Analgesia (fentanyl bolus)
☐ Sedation (Propofol bolus/infusion)
☐ Paralysis (Rocuronium 50mg)
☐ Connect to ventilator
☐ NG/OG tube (defer if possible)
☐ CXR
☐ IDC
☐ Dispose safely of any disposable blades
☐ Clean fibreoptic C-MAC scope if used
☐ **Safe doffing of PPE observed by buddy**

Debrief

☐ Suggestions/Improvements
☐ Complete Airway Register

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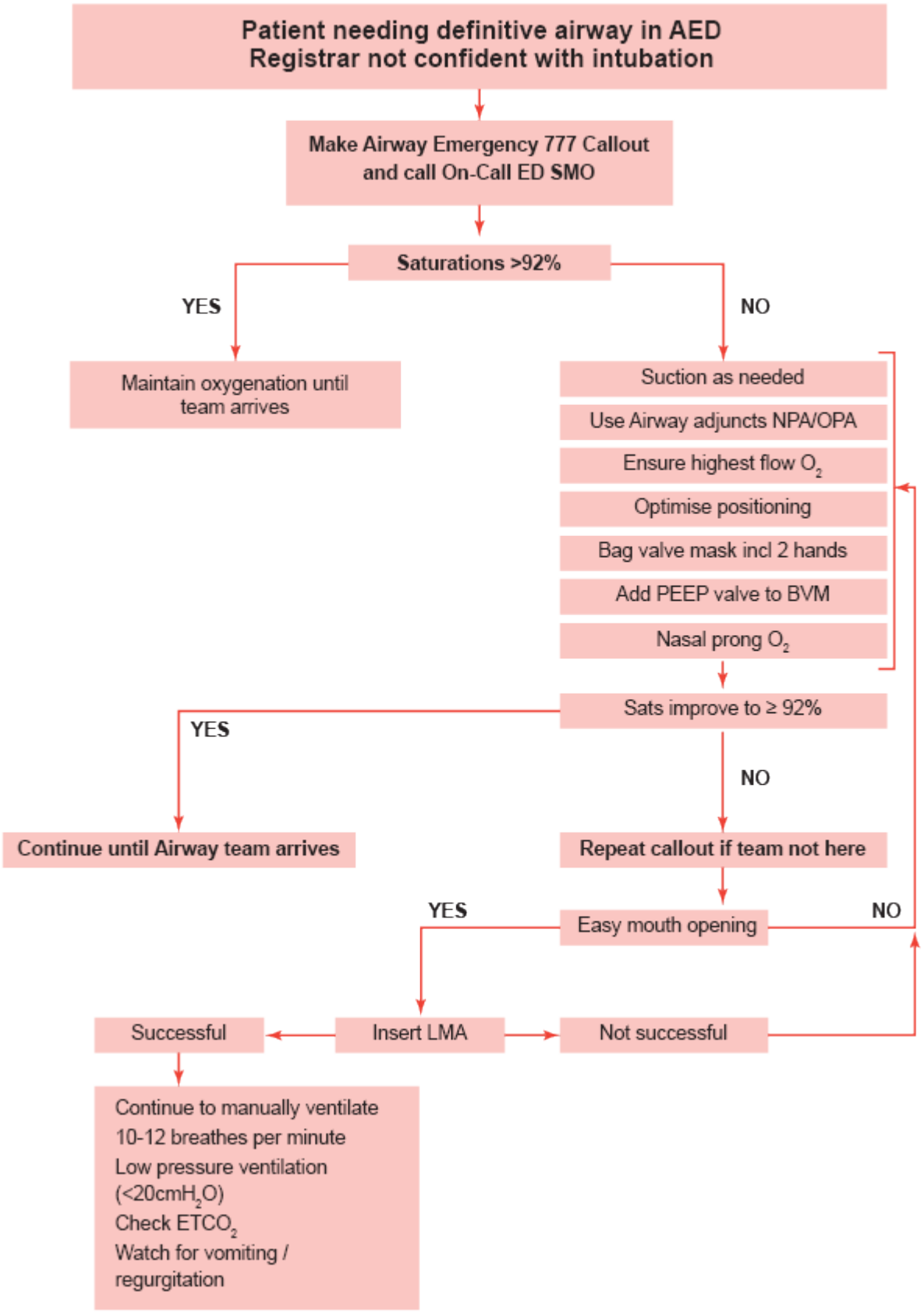
Figure 2:



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Chest Pain

Chest pain is a common presentation to the Emergency Department, accounting for approximately 8% of annual presentations to Adult ED. While over half of these patients will have a benign cause for their chest pain, careful history and examination, appropriate investigations together with correct application of evidence-based decision tools (e.g. EDACS-ADP, PERC), will assist in identifying those with life-threatening disease and those who need to be admitted into hospital.

Remember that chest pain is not always cardiac or even "chest" in origin. Consider the following list of causes for chest pain:

	Cardiovascular	**Pulmonary**	**Gastrointestinal**	**Other**
Potentially life-threatening	Acute coronary syndrome Aortic dissection Cardiac tamponade Myopericarditis Tachyarrhythmia	Pulmonary embolism Tension pneumothorax	Boerhaave syndrome (oesophageal rupture) Ascending cholangitis	Major trauma Acute chest syndrome in sickle cell crisis
Likely non-life-threatening	Simple pericarditis	Pneumonia Pleural effusion Pleurisy Spontaneous pneumothorax without tension	Biliary colic Pancreatitis Gastro-oesophageal reflux/peptic ulcer disease/oesophageal spasm	Minor trauma Referred pain Thoracic radiculopathy Shingles "Chest wall syndromes" e.g., musculoskeletal pain, costochondritis, Tietze syndrome Psychiatric e.g., anxiety

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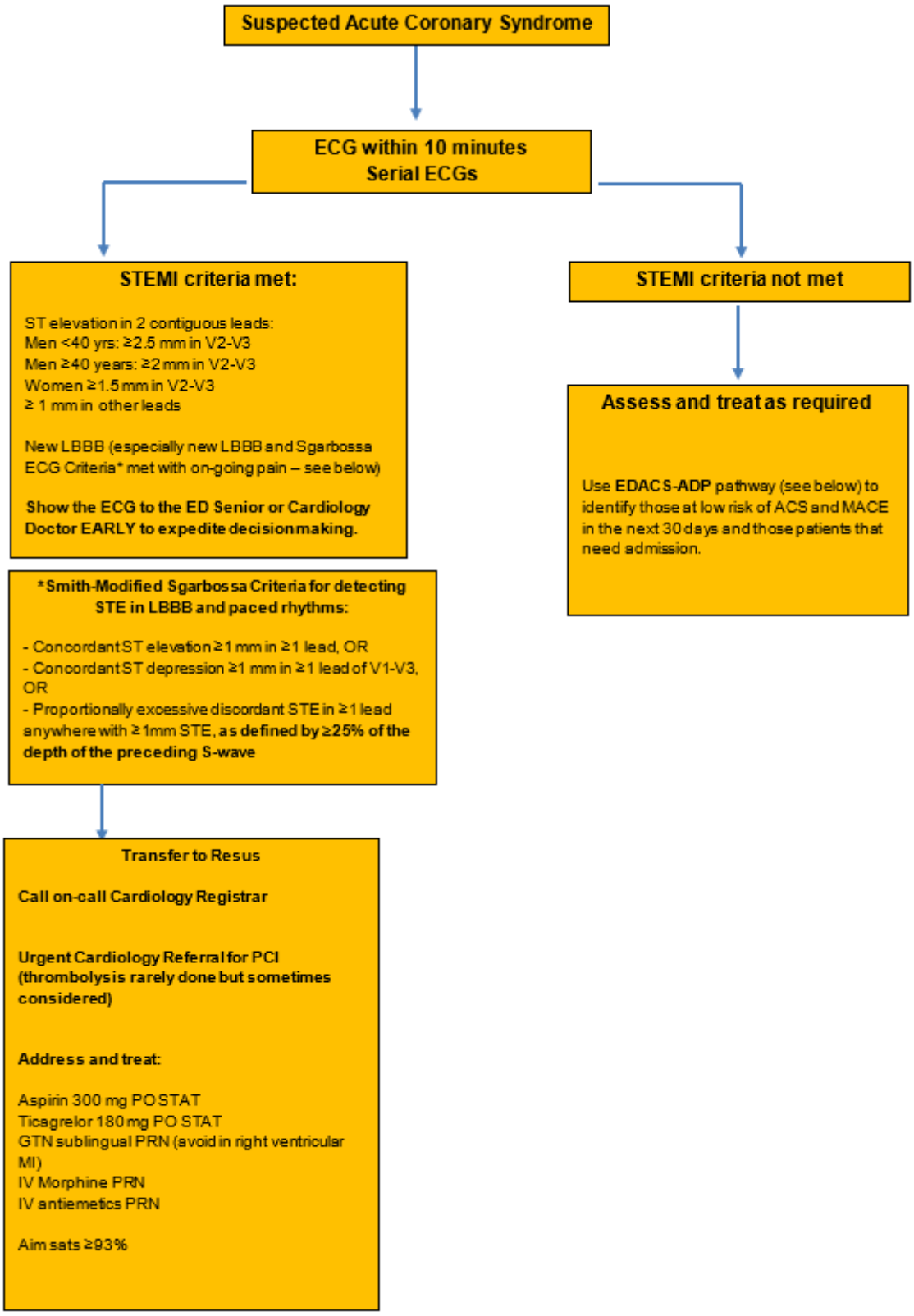
ACUTE CORONARY SYNDROME

The following flowchart shows a general approach to the patient who presents with suspected Acute Coronary Syndrome:



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RISK STRATIFICATION FOR ACS IN THE EMERGENCY DEPARTMENT (EDACS-ADP)

In patients who present with chest pain and immediate life threats have been excluded, they can be evaluated for the probability of Acute Coronary Syndrome (ACS) using the EDACS-ADP algorithm (**E**mergency **D**epartment **A**ssessment of **C**hest pain **S**core-**A**ccelerated **D**ecision **P**athway).

This pathway aims to differentiate patients at low risk (i.e. <1% risk) of a Major Cardiac Adverse Event (MACE) in the next 30 days, from those who are not low risk. It therefore identifies patients who may be suitable for discharge from ED with GP follow-up or delayed Cardiology follow-up.

The pathway (with an Excel based calculator) is on the AED/CDU Intranet site. Please try to use this calculator and print the resulting sheet applying a patient label, as this becomes part of the patient record.

For a patient to be considered low risk by this pathway, they must have **all of the following**:

- No red flags
- EDACS score of 15 or less
- Two negative ECGs and hsTnT tests two hours apart. If the first hsTnT is taken more than three hours after onset of pain and is undetectable (<3 ng/L) then one hsTnT test is adequate

Deviations from this pathway reduce the negative predictive value of the tool. There may be situations in which a deviation from the pathway may be appropriate – discuss all cases with the ED SMO in charge. Remember that patients who are not low risk should usually have a more delayed second hsTnT test (i.e. at 6 hours) and therefore require admission.

Most patients discharged after application of this pathway will be referred back to the GP for follow-up. If there are on-going concerns, then the patient can either be referred to General Medicine for admission, or discharged with a referral to outpatient Cardiology for on-going evaluation clearly stating the clinical concerns.

If a patient needs admission despite being low risk, then the referral should usually be made before the second hsTnT result is available.

While the pathway states that patients with raised hsTnT or abnormal ECGs should be referred to Cardiology, some patients may be more appropriately referred to General Medicine. If unsure, please discuss with the ED SMO.

The following pages show the EDACS-ADP calculator and pathway used in Adult ED.

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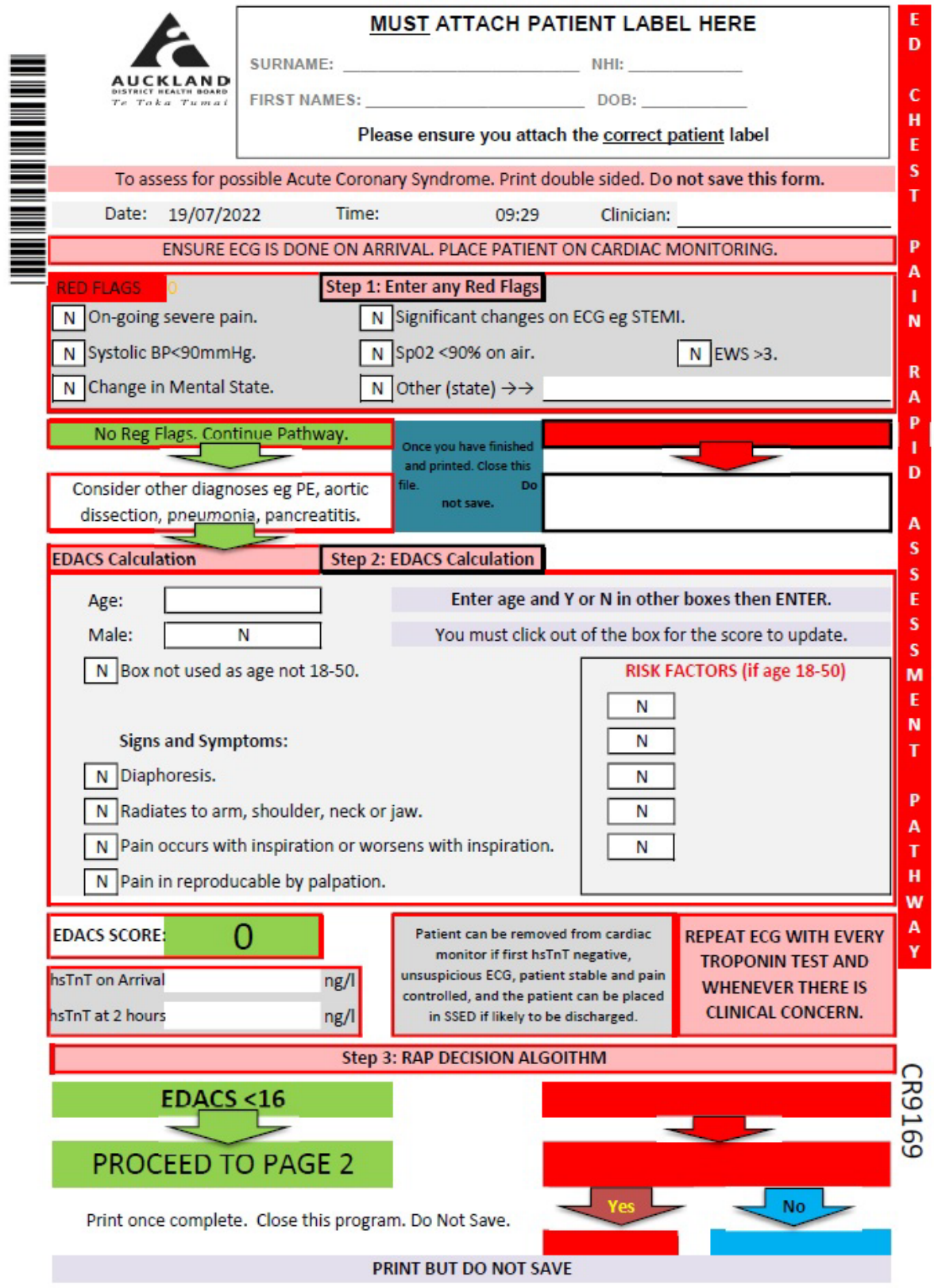

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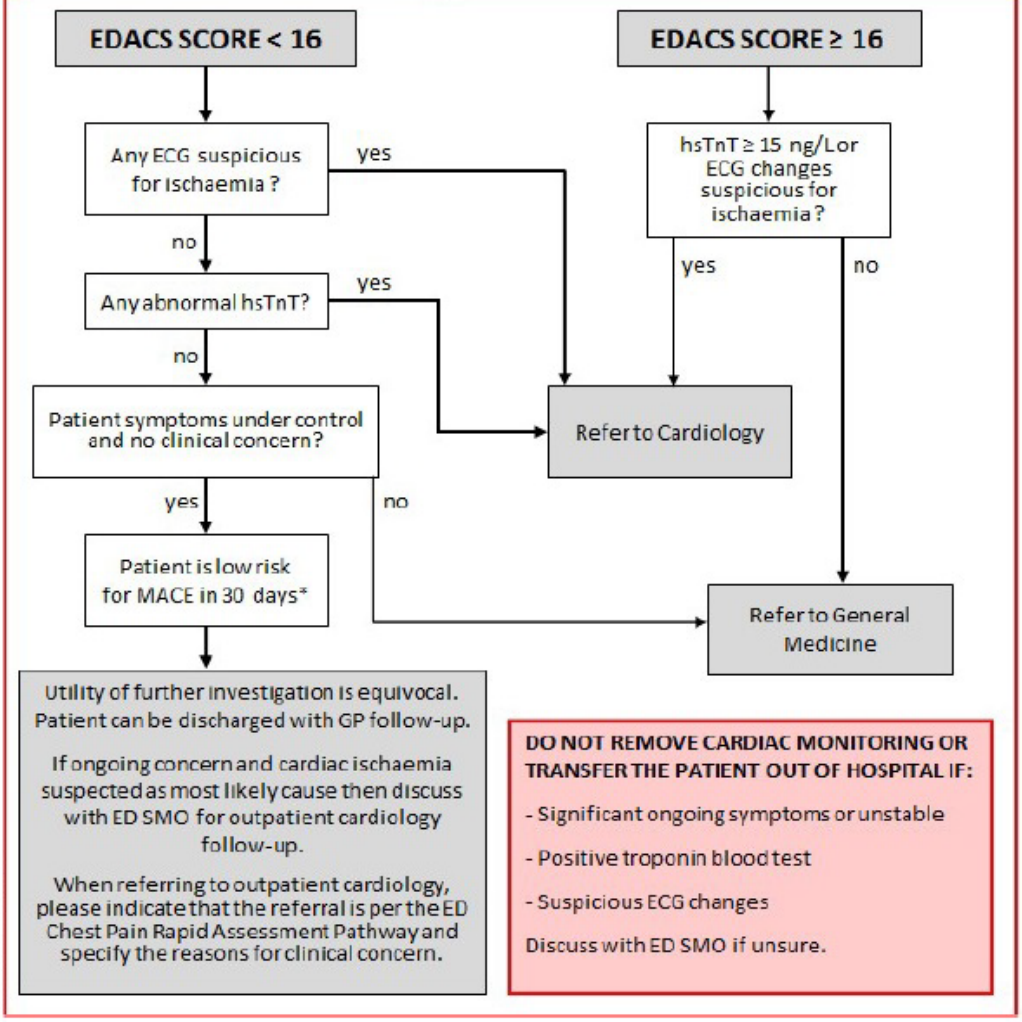
RAP DECISION ALGORITHM



*MACE = Major Adverse Cardiac Event (cardiac death, cardiac arrest, revascularisation, cardiac shock, arrhythmia, MI)

Notes:

1. 2-hour hsTnT may not exclude MACE if EDACS ≥ 16. A more delayed hsTnT should be done.

2. Patients who are being admitted should have their serial hsTnT ordered by the inpatient team.

3. If EDACS < 16, a single hsTnT < 3 (ie undetectable) taken three or more hours after onset of pain can exclude ACS.

4. Cardiology clinic follow-up times vary. Please make sure you clearly state your reasons for referral so it is prioritised appropriately. Consider referral for admission under Cardiology or General Medicine if you have significant clinical concerns.

Print and Close this form

DO NOT SAVE

ED CHEST PAIN RAPID ASSESSMENT PATHWAY

CR916

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AORTIC DISSECTION

Aortic dissection is a life-threatening condition that must always be considered in a patient presenting with chest pain: it is rare but must be ruled out. It should especially be considered in those with severe chest pain. The typical presentation is of sudden, severe, ripping/tearing pain in the middle of the chest often with radiation through to the back. It can also present with severe pain in chest/back/abdomen or neck with associated neurology, perfusion deficits or syncope. Unfortunately, presentations are not always typical therefore the diagnosis can be difficult to make.

Risk factors for aortic dissection include: Marfan or Ehlers-Danlos syndrome, bicuspid aortic valve, pregnancy, Maori or Pacific Island ethnicity, hypertension, a family history of dissection or a known thoracic aneurysm/dilated aortic root.

On examination, look for the following signs:

- Pulse deficits
- Systolic BP differences
- Any neurological deficits
- Hyper/hypotension
- Shock
- New diastolic murmur of aortic insufficiency (increases with expiration)

If **any** suspicion of aortic dissection, please discuss ASAP with the ED SMO in Charge, as the patient may require an emergency CT angiogram. Please note that a negative D-dimer is not a proven rule-out tool for aortic dissection.

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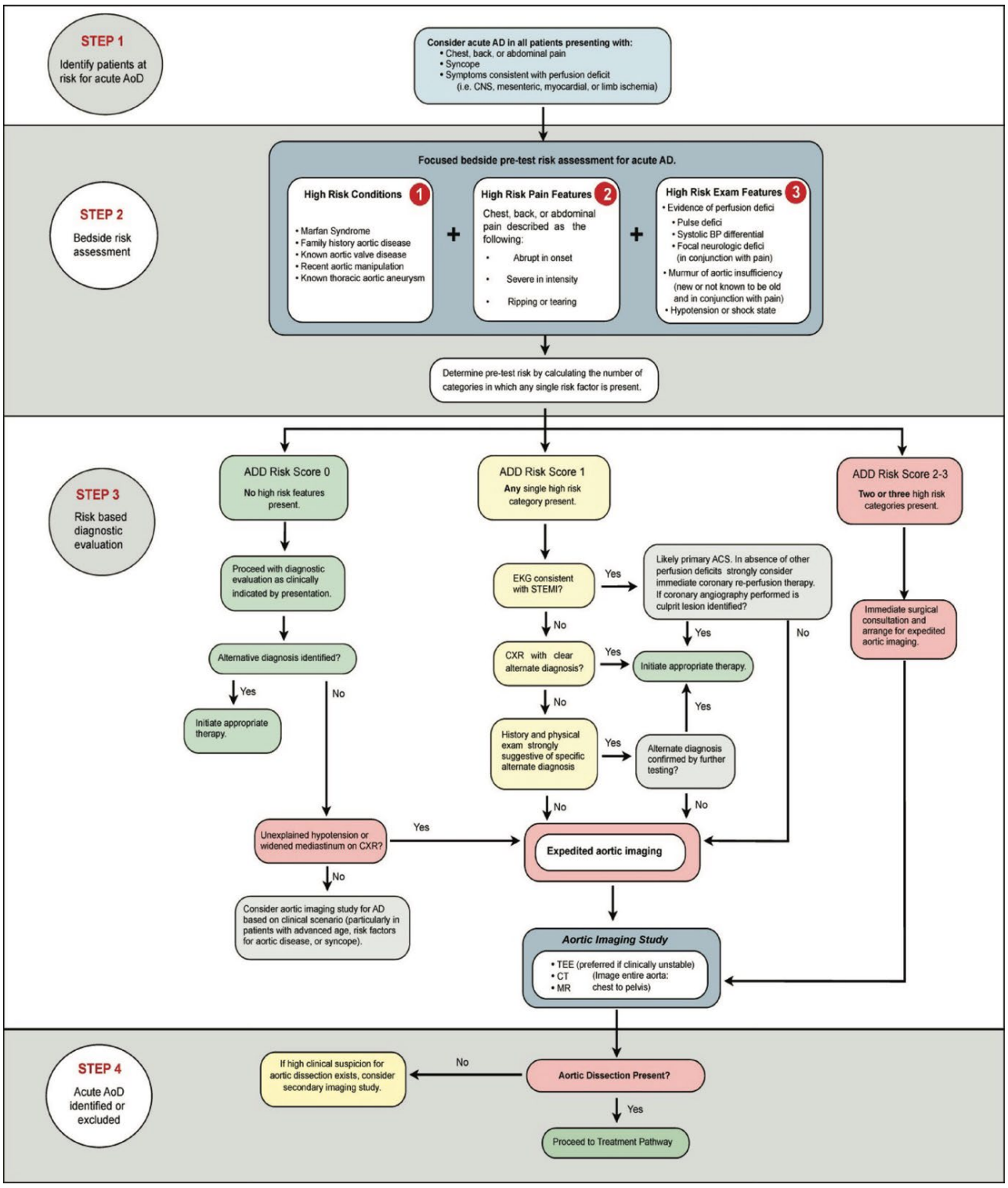

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PULMONARY EMBOLISM

Pulmonary embolism can present in a multitude of ways, but should always be considered in those with sudden onset chest pain and dyspnoea. Pain is usually pleuritic in nature. PE can also present as collapse and hypotension with no other clear cause. Haemoptysis and leg pain may be other presenting features.

Clinical signs

- Look for signs of shock – hypotension/pale/decreased perfusion
- Tachycardia, elevated JVP, loud P2
- Tachypnoea, central/peripheral cyanosis
- Signs of DVT

Risk factors

Major (relative risk 5-20) – SLOMMP

- Surgery – major abdominal/pelvic, hip/knee replacements, post ICU
- Lower limb problems – fracture, varicose veins
- Obstetrics – late pregnancy, Caesarean section, puerperium
- Malignancy – abdominal/pelvic, advanced/metastatic
- Mobility – hospitalization, institutional care
- Previous VTE

Minor (relative risk 2-4) – COM

- Cardiovascular – congenital heart disease, CHF, HTN, superficial venous thrombosis, central venous line
- Oestrogens – OCP, HRT
- Miscellaneous – COPD, neurological disability, occult malignancy, thrombotic disorder, long distance travel, obesity, other (IBD, nephrotic syndrome, dialysis, myeloproliferative disorders, paroxysmal nocturnal haemoglobinuria, Bechet's disease)

Thrombophilias

- Factor V Leiden mutation
- Prothrombin gene mutation
- Hyperhomocysteinaemia
- Antiphospholipid antibody syndrome
- Deficiency of antithrombin III, protein C or protein S
- High concentrations of factor VIII or XI
- Increased lipoprotein (a)

PULMONARY EMBOLISM RULE-OUT CRITERIA (PERC RULE)

An evidence-based rule that when applied correctly excludes Pulmonary Embolism with <2% miss rate.

Remember the patient needs to be deemed by clinical gestalt to be low risk *prior to applying the rule*. This means that a certain level of experience is required prior to safely applying the rule. Please consult with a senior doctor.

The PERC rule excludes PE if **all of** the eight criteria are negative.

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All of the following eight criteria must be false for the PERC rule to exclude PE with <2 % miss rate.

1. Age ≥50
2. HR ≥100
3. Oxygen saturations <95%
4. Unilateral leg swelling
5. Haemoptysis
6. Surgery or trauma within the last four weeks requiring treatment with general anaesthesia
7. Prior PE or DVT
8. Exogenous oestrogen use

If the PERC rule is not passed and the patient is still deemed to be low risk, then d-dimer testing should be considered.

INVESTIGATIONS

ECG

- Usually normal unless massive PE.
- Sinus tachycardia next most common finding.
- Look for S1, Q3, T3 pattern or evidence of right heart strain (non-specific ST changes in the anterior leads, right axis deviation, p-pulmonale, RBBB)

CXR

- Usually done to rule out other pathology
- If moderate to high risk of PE and haemodynamically unstable – probably best to proceed straight to CT
- In PE, CXR may occasionally show small effusions, Hampton's hump (wedge density, area of pulmonary infarction)

ECHO vs. ED POCUS ECHO

If available- to look for RV dilatation or paradoxical septal motion.

D-dimer

Reassuring if negative to exclude PE - however negative d-dimer may not exclude PE adequately in high-risk patients, so needs to be used in conjunction with clinical probability

CTPA

For definitive diagnosis.

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MANAGEMENT

MASSIVE:

- INVOLVE SENIOR IMMEDIATELY
- Thrombolysis/embolectomy to be considered
- Respiratory and CVICU input

SUB-MASSIVE:

- Haemodynamically stable with evidence of RV dysfunction → consider thrombolysis/embolectomy but need to balance against risk of bleeding
- Discuss with senior and respiratory/CVICU if signs of instability
- Anticoagulation for those who are not for thrombolysis/embolectomy

NON-MASSIVE:

- Haemodynamically stable with normal RV function → anticoagulation, admit under General medicine or Respiratory Services

THROMBOLYSIS IN SUBMASSIVE/MASSIVE PE:

Use alteplase (see dosing below as per Middlemore Hospital guideline)

Body weight	**Alteplase dose regimen**
≥65kg	**Total maximum dose of 100 mg administered over 2 hours.** • 10 mg as an IV bolus over 1-2 minutes, immediately followed by • 90 mg as an IV infusion over 2 hours
<65 kg	**Total maximum dose of 1.5 mg/kg administered over 2 hours** • 10 mg as an IV bolus over 1-2 minutes, immediately followed by • the remaining dose as an IV infusion over 2 hours

In patients with increased risk of bleeding complications a 50 mg total dose can be considered in place of the 100 mg dose (10 mg load with the remaining 40 mg over 2 hours).

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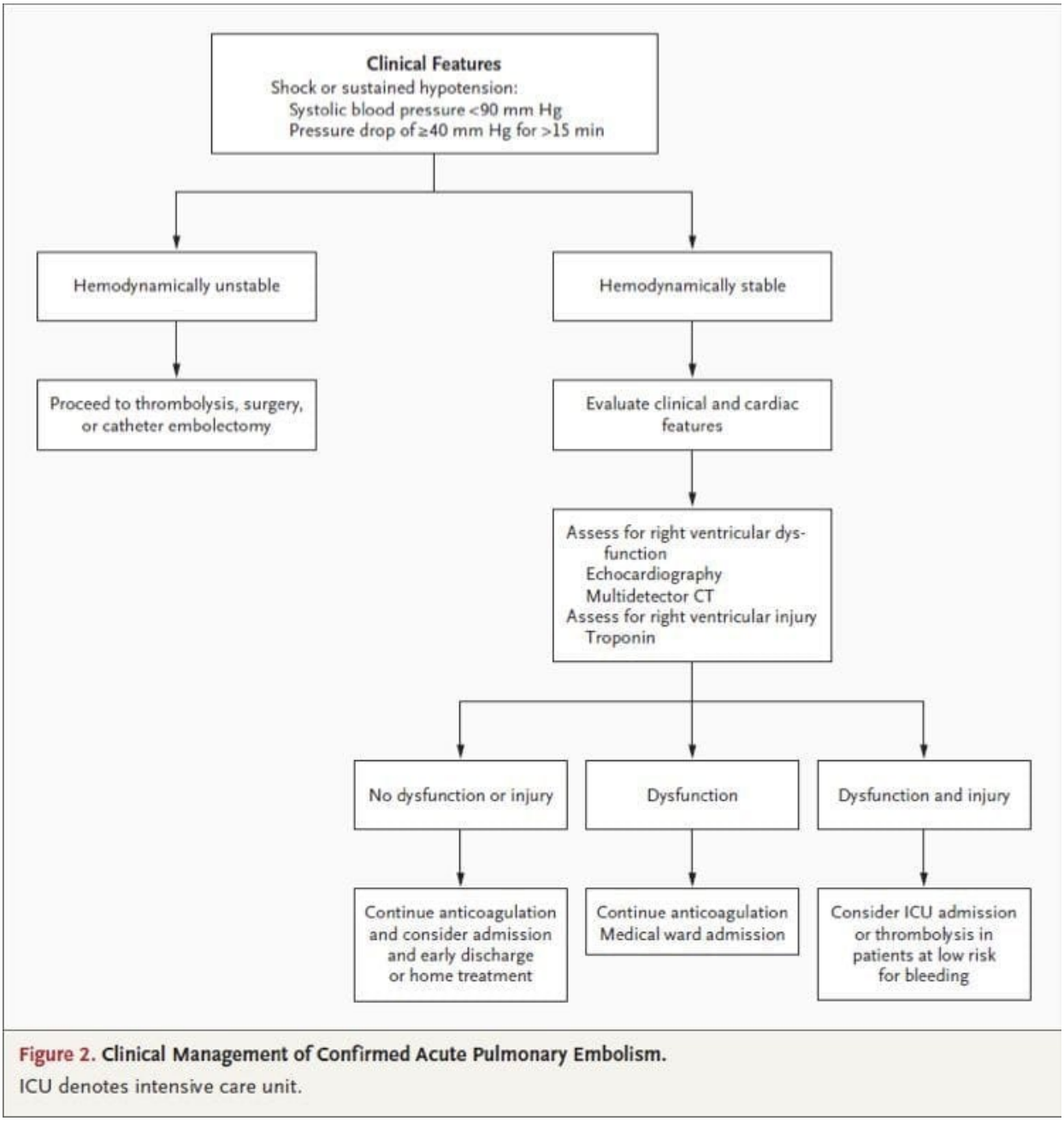

Figure 2. Clinical Management of Confirmed Acute Pulmonary Embolism.

ICU denotes intensive care unit.

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CARDIAC TAMPONADE

- Can present acutely from trauma or aortic injury vs. more slowly from cancer, infection or other aetiologies.
- Consider this diagnosis if the patient is shocked.

Associated risk factors/causes:

- Cardiac: acute MI/ pericarditis/ dissecting thoracic aortic aneurysm/ recent heart surgery or procedure
- Penetrating chest trauma
- Malignancy
- Renal failure

Physical findings:

- Tachycardia
- Pericardial rub
- “distant muffled heart sounds”
- Jugular vein distension
- Pulses paradoxus

Diagnosed with bedside ultrasound

- Pericardial effusion with features of tamponade:
  - right atrial systolic collapse
  - right ventricle diastolic collapse
  - distended IVC with no respiratory variability

ECG findings:

- Tachycardia
- Small voltages
- Electrical alternans

Treatment:

- Fluid bolus
- Pericardiocentesis
  (If the patient is haemodynamically unstable this should be performed at the bedside with ultrasound guidance – seek senior ED advice)

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TENSION PNEUMOTHORAX

- Can occur for many reasons, often secondary to trauma or less commonly from a simple spontaneous pneumothorax progressing to tension. Smoking and connective tissue disorders are risk factors for spontaneous pneumothorax.
- Tension pneumothorax is defined by the clinical presence of shock and hypoxia
- Traditional symptoms include the sudden onset of pleuritic chest pain and shortness of breath

Physical findings:

- May be unreliable or difficult to elicit
- Tachycardia
- Tachypnoea
- Hypoxemia
- Reduced/ absent ipsilateral breath sounds
- Hyper resonance to percussion of the chest wall
- Hypotension and jugular vein distension

Diagnostic tests:

- Tension pneumothorax is a clinical diagnosis
- Bedside ultrasound can confirm presence of pneumothorax:
  - loss of sliding lung on the side of the pneumothorax
  - “barcode” sign using M-mode on the side of the pneumothorax

Treatment:

- Requires IMMEDIATE decompression.
- If secondary to chest trauma, then immediate finger decompression followed by chest drain insertion.
- If not traumatic, then either immediate needle decompression at 2nd intercostal space mid-clavicular line (alternative location is the 5th intercostal space, mid-axillary line) followed by chest drain insertion or immediate chest drain insertion at 4th or 5th intercostal space mid axillary line.

BOERHAAVE’S SYNDROME (OESOPHAGEAL RUPTURE)

- Spontaneous oesophageal perforation as a result of a sudden increase in intra-oesophageal pressure combined with negative intra-thoracic pressure (i.e., severe straining or vomiting)
- Patients typically present with severe retrosternal chest pain
- Think of this diagnosis in alcoholics (history of vomiting) or patients with a history of recent procedure (e.g. endoscopy).

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Physical findings

- Unwell looking patient (febrile, tachycardic)
- Subcutaneous air crepitus

Diagnostic tests

- CXR: L pleural effusion +/- mediastinal air
- CT chest for definitive diagnosis

Treatment:

- Broad spectrum antibiotics
- NBM
- IV fluids
- Urgent surgical consultation

OTHER POTENTIAL DIAGNOSES AS CAUSES FOR CHEST PAIN

All patients with chest pain should have full history, examination and an ECG with the aim to consider and exclude life-threatening causes of the chest pain. There are multiple differentials that must be considered. This is a non-exhaustive list of additional differentials, with some suggestions for investigation if considered.

GORD / peptic ulcer disease

Possible presentation: burning retrosternal pain, acid regurgitation, sour/bitter taste in mouth, may be associated with food intake; recent NSAID use; tender epigastrium on examination; rigid abdomen with involuntary guarding suggests perforation.

Approach: CXR if considering perforated oesophagus or perforated PUD, trial of antacid.

Cholecystitis

Possible presentation: colicky RUQ pain (may radiate to back or right shoulder), bloating, nausea and vomiting, may be triggered by fatty meal; Murphy's positive on examination.

Approach: analgesia; bloods including FBC, LFTs and lipase; consider USS or surgical review.

Pancreatitis

Possible presentation: upper abdominal pain which may radiate to back, nausea and vomiting, may be triggered by eating, may have history of excess alcohol, gallstones; abdominal tenderness.

Approach: analgesia, bloods including FBC, LFTs and lipase; surgical review.

Pyelonephritis

Possible presentation: fever, flank pain, nausea and vomiting, dysuria or urinary frequency.

Approach: analgesia, bloods including inflammatory markers, urine specimen.

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Musculoskeletal (MSK) pain

Possible presentation: Pain usually localized, superficial, changing with position and reproducible on palpitation, relieved by simple analgesia, may have had recent history of strenuous exercise / heavy lifting

Remember that more sinister causes of chest pain should be actively considered and excluded even if the presentation is "typical" for musculoskeletal chest pain, as this presentation can overlap with more serious causes.

Approach: analgesia and review

Herpes zoster (shingles)

Possible presentation: constitutional symptoms (e.g., headache, fever, malaise), burning pain, itching, hyperaesthesia or paraesthesia, dermatomal distribution to pain, pain described as stinging/tingling/aching/numbing/throbbing interspersed with stabs of severe pain; appearance of characteristic vesicular rash over days.

Approach: clinical diagnosis; PCR swab from a vesicle.

Pneumonia

Possible presentation: Fever, productive sputum, dyspnea, pleuritic chest pain, auscultation revealing crepitations, bronchial breathing or decreased air entry.

Approach: CXR, antibiotics

Panic disorder/anxiety state

Possible presentation: Diagnosis of exclusion, can have wide-ranging symptoms; racing heart, shortness of breath or feeling unable to get adequate breath, feeling of impending doom, anxiety, sighing or taking deep breaths, paraesthesia in fingers, cramps.

Approach: reassurance, rebreather mask

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Altered Level of Consciousness

- A presenting symptom NOT a diagnosis.
- Underlying causes range from the reversible (e.g. hypoglycaemia) to irreversible (intracranial haemorrhage) and from the relatively benign (ETOH intoxication) to life threatening (encephalitis).
- Keep a wide differential and do not assume a benign cause until you have excluded serious underlying pathology.

INITIAL ASSESSMENT

- **Control seizures** as per usual seizure management.
- **Airway** – ensure airway patent and support as necessary – If GCS <9 airway is unprotected and patient may require intubation – seek help EARLY.
- **Breathing** – hypoxia and hypercarbia can cause obtundation – check Sats and VBG.
- **Circulation** – shock can cause an altered level of consciousness. IV fluid resuscitation as required
- **D** – formal GCS and pupil size and reactivity.
- **Don't ever forget the glucose** – seek and treat hypoglycaemia with 100 mL glucose 10% IV.
- If evidence of opiate toxicity (obtundation, respiratory depression, pinpoint pupils, history supports opiate use) consider Naloxone 40-100 microgram IV boluses repeated and titrated to response.

History and examination

It may be difficult to gain a full (or any) history from a patient with an altered level of consciousness. Utilise all avenues – relatives, ambulance handover and documentation, medical history and medication history on RCP, GP, rest home documentation. Determine pre morbid functional status.

Examination: GCS, temperature, neurological examination, full systems examination.

Investigations: targeted depending on history and examination.

System	Causes of altered LOC	Investigations to consider:
Metabolic	Hypo/hypergylcaemia Hypo/hypernatraemia Hypo/hypercalcaemia Hypo/hyperthermia Hypothyroidism Hypovolaemia Hypercarbia Hypoxaemia Hepatic encephalopathy	BSL, Venous Blood Gas ECG, Electrolytes, urea and creatinine, Liver function tests Thyroid function tests, Cardiac enzymes, Ammonia, ketones

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CNS	Seizure • Post-ictal state • Non convulsive status epilepticus Intracranial haemorrhage • Spontaneous • Traumatic Raised intracranial pressure • Bleed • Tumour • Hypertensive encephalopathy • Obstructive hydrocephalus	CT head – have a low threshold for doing a CT head in patients with altered level of consciousness where the cause is not immediately apparent, ESPECIALLY those with any signs of head trauma Coagulation studies
Toxins/ **Pharmacologic**	Alcohols • Intoxication • Withdrawal • Toxic alcohols (methanol, ethylene glycol) Illicit drugs • GHB/GBL • Opiates Medication overdose/supratherapeutic ingestions • Benzodiazepines • Zopiclone • Anticholinergics • Antidepressants • Antiepileptics • Antipsychotics • Opiates Carbon monoxide poisoning	VBG ETOH level (be aware that even patients with high ETOH levels can have co-existing serious pathology causing altered LOC) *** the utility of urine tox screening in the ED is limited and should be reserved for cases where diagnosis is still unclear despite history, examination and first line investigations/imaging – discuss with your SMO***
Infectious	Primary CNS • Meningitis • Encephalitis • Abscess Other site of infection • Pneumonia • UTI • Intra-abdominal • Skin/soft tissue	Septic screen – FBC, CRP, blood cultures, urine dip and microscopy, CXR, consider LP (raised ICP is a contraindication to LP – discuss with your SMO first).

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Other	Shock of any cause Psychiatric disorder • Acute • Chronic	

EARLY MANAGEMENT:

	Causes	**Management**
Raised Intracranial Pressure	Raised intracranial pressure from bleeds, traumatic or atraumatic	Immediate neurosurgical ± ICU consult. Temporising measures: elevate head of bed to 30-45°, normalise pCO_2, pO_2 and MAP, mannitol 0.5-1 g/kg IV over 15 mins, consider hypertonic saline or 4 Molar salt
	Raised intracranial pressure from malignancies	Immediate Oncology consult. Temporising measure: dexamethasone 8 mg IV
Toxic / Metabolic / Sepsis	Drugs	Consult ED senior and toxicology (refer to ED **Toxicology**)
	Hypoxia/Hypo-perfusion	Resuscitate with attention to ABCs, treat underlying cause
	Hypothermia	Rewarming
	Hyperthermia	Aggressive cooling
	Encephalopathies	Treat according to underlying cause
	Infections (meningitis, encephalitis) If immunocompromised consult ID early	Empiric treatment as per Script app guidelines Discuss with ID early
Endocrine causes	Hypoglycaemia (BSL<3)	100 mL of glucose10% IV
	Severe hyponatraemia (usually <120)	Consult Senior
	Myxoedema coma	Consult Endocrinology
Neurological	Post-ictal	Place in recovery position. Treat precipitating cause. Assess for new neurology
Psychiatric	Psychogenic	Supportive cares

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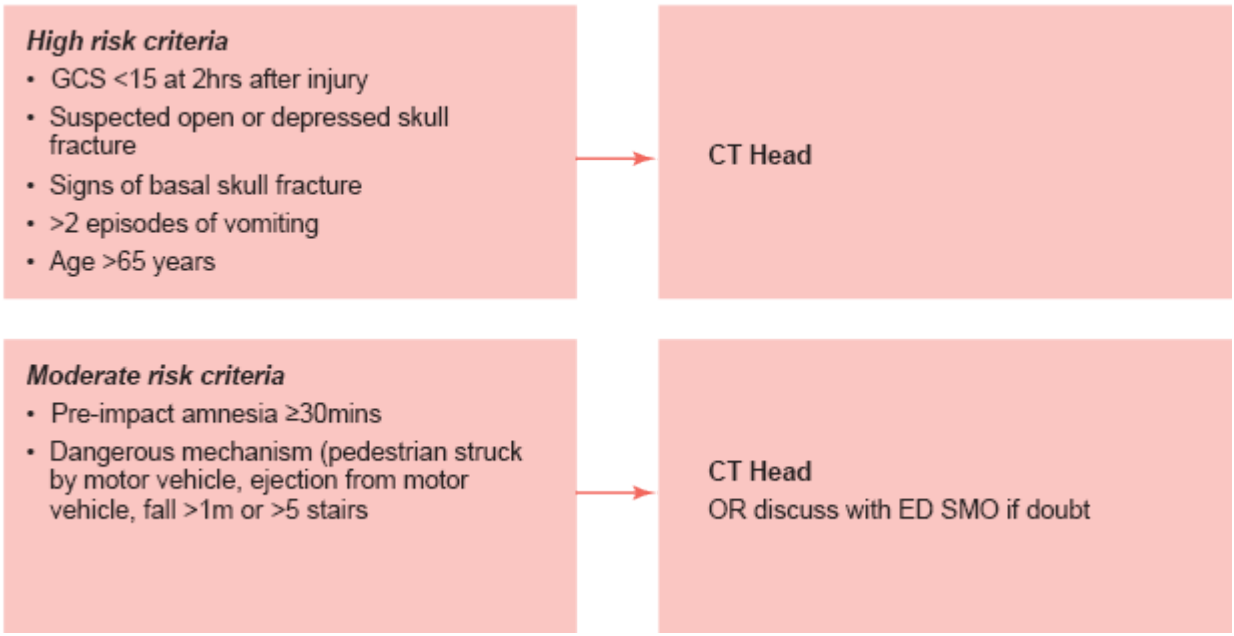
Head injury

CANADIAN CT HEAD RULE

This rule outlines indications for CT in a minor head injury. It applies to patients ≥16 years of age, with GCS 13-15 with loss of consciousness, amnesia to the head injury event or confusion (patients without this history rarely need a CT head). To use this rule, the patient must have no coagulopathy (and not be on anticoagulation) and no obvious open skull fracture. It is a guideline only.



All patients on clopidogrel, warfarin, dabigatran, rivaroxaban or any of the new DOACs with a head injury should have a CT head unless the trauma is of the most trivial nature.

All patients with a GCS of <13 and/or focal neurological signs need an urgent CT scan. Other indications for CT head may include blows to the head with a weapon (e.g., baseball bat, wooden plank, metal bar) to rule out depressed skull fracture. Any patient re-presenting to ED after a head injury with on-going symptoms or signs attributable to head injury should be considered for a CT scan after clinical assessment.

We use a Modified Westmead screening tool for concussion to help with decision making around who needs admission, who is for discharge and who requires referral to a Concussion clinic.

https://adhb.hanz.health.nz/adult-medical/AED-CDU/Pages/Concussion-and-Head-Injury.aspx

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Syncope

Definition: Transient loss of consciousness induced by temporary reduction in cerebral blood flow. Postural control is lost during the event and recovery is spontaneous.

ASSESSMENT

An accurate history is crucial to diagnosing the cause of syncope and there are five specific things to look for.

In general, you need to decide was this a faint or a seizure and if syncope, was the cause cardiac or not.

- Was there a prodrome? Sudden collapse without a prodrome is more suspicious for arrhythmia.
- What happened during the event – collateral history is crucial, especially for diagnosis of seizure.
- On a similar vein what happened afterwards – immediate recovery vs a post-ictal period.
- Has this happened before – exercise induced syncope, exposure to noxious stimuli.
- Always ask about family history – for example Brugada.
- Always consider accompanying symptoms which help guide further investigations – headache (SAH), chest pain (ACS/dissection), palpitations (arrhythmia), shortness of breath (PE), abdominal pain (AAA).

Your examination should focus on the cardiovascular and neurological systems– listen for murmurs, look for focal neurological signs, tongue or lip biting. Remember to consider pulsatile abdominal mass for AAA, melaena for UGI bleed.

Always consider the possibility of ectopic pregnancy in women of childbearing age (we now have point of care βHCG testing in the department).

An ECG should be performed on everyone with syncope – it is a relatively quick and simple test. This section isn't about teaching you how to read the ECG. There are various resources on the internet.

Look for:

- Ischaemia
- Conduction blocks
- Cardiomyopathy
- Intervals – PR (WPW), QT (short or long)
- Right heart strain for PE

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	Causes	Management
Neurological	Seizure	Treat precipitating cause if present. Consider anticonvulsant loading.
Cardiovascular	Arrhythmia	Anti-arrhythmics, Cardiology input
	Ischaemia	Treat as per ACS
	Obstructive lesions	Cardiology input
	Hypersensitive carotid sinus syndrome	Medical input
Cerebrovascular	SAH Intracerebral bleed	Analgesia, optimise ABCs, Neurosurgical input ± DCCM referral
Peripheral Vascular	Vasovagal	Fluid therapy
	Orthostatic	Consider stopping precipitating medications
	Hypovolaemia	Fluid resuscitate and treat underlying cause
Miscellaneous	Hyperventilation	Breathing techniques and rebreathing CO_2
	Hypoglycaemia	Administer glucose and treat precipitating cause
	Psychogenic	Address precipitating cause

DISPOSITION

Patients with syncope with no cause found on history and examination, and who have any of the following features should be treated cautiously.

- Abnormal ECG (new changes or non-sinus rhythm)
- Past history of heart failure
- Systolic BP <90 mmHg at triage
- Complaint of SOB
- Haematocrit <0.30

(San Francisco Syncope Rules)

These patients will most likely require an in-patient admission.

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Shock

Definition: Inadequate oxygen delivery and utilisation by vital organs due to a problem with the circulation.

CLINICAL RECOGNITION

- Low blood pressure (especially below 90 mmHg systolic)
- High pulse rate (particularly if greater than the systolic blood pressure reading)
- End organ effects: reduced level of consciousness, cool peripheries (it may be difficult to get an oxygen saturation reading), poor urine output.
- Consider shock in patients with high EWS scores

EARLY MANAGEMENT

- Remember to ensure a patent airway, and consider high flow oxygen
- Insert 2x large bore peripheral IV access
- Commence sodium chloride 0.9% resuscitation pending specific treatment
- If the patient clearly has severe haemorrhage, then blood products (initially O negative red cells, then type specific until cross-match available) should be the initial resuscitation fluid rather than crystalloid; activate the Massive Haemorrhage Protocol in this instance
- Fluid bolus must be rapid (e.g. 500 mL over 5-10 minutes), and monitor patient for response. Repeat as dictated by response.
- Seek help early: Call a Code Red.
- Working out the type of shock will guide on-going management:

Class of Shock	Examples	Treatment
Cardiogenic	Arrhythmia	DC shock, anti-arrhythmics
	Myocardial dysfunction	Inotropic agents
Obstructive	Tension pneumothorax	Needle decompression, intercostal chest drain
	Pericardial tamponade	Needle pericardiocentesis
	Massive PE	Thrombolysis or thrombectomy
Distributive	Septic	Fluids, vasopressors, antibiotics **NB: Meningococcal septicaemia is rapidly fatal and the signs and symptoms can be non-specific. If in doubt, take blood cultures and give benzylpenicillin 1.2 g IV immediately. See Script app for more guidance.**
	Anaphylaxis	Adrenaline boluses ± infusion
	Neurogenic in spinal trauma	Vasopressors

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	Drugs - beta blockers, ca channel blockers, clonidine	IV fluids, seek toxicological advice
Hypovolaemia	Haemorrhagic	Pressure on external bleeding
		Pelvic binder for unstable fractures
		Traction for displaced femoral shaft
		Laparotomy for abdominal bleeding
		Consider massive transfusion

Special considerations

- The elderly and those on medications such as β-blockers are less able to compensate and therefore will become hypotensive earlier, and without being tachycardic.
- There is a greater blood volume in advanced pregnancy and an ability to shunt blood from the placental circulation (at the expense of the foetus), therefore shock manifests later in the mother (but earlier in the foetus)
- In patients with known heart failure, use 250 mL fluid boluses and monitor closely.

Early Management of Severe Sepsis

TREATMENT PEARLS

- Early recognition of potential bacterial sepsis and appropriate treatment is important. Young people may not demonstrate haemodynamic instability (hypotension) until late in the piece, so if in doubt treat as sepsis until proven otherwise.
- In the presence of infection, a high EWS (>3) should raise suspicion for sepsis, while new organ dysfunction (e.g. AKI, delirium, hypoxia or lactate >2) is a danger sign and must be acted on.
- Resuscitation - be prompt and ask for senior help early. Sepsis with hypotension not responding to IV fluids should trigger an urgent DCCM review.
- Culture everything before giving antibiotics where possible, but do not delay antibiotics in the presence of severe sepsis.
- Source control may need surgery.

Volume resuscitation for on-going third space losses may be large, but avoid fluid overload. If getting to 30 mL/kg, review and/or ask for help. Vasopressors and respiratory support may be required. The basis of treatment is the support of failing organs and the prevention of organ failure through vigorous management and on-going correction of abnormalities.

On-going monitoring and assessment on a regular basis is required to attain optimal results. Pulse, blood pressure (MAP) and urine output (put in an IDUC and monitor fluid balance hourly) are the fundamentals, followed by resolution of biochemical abnormalities e.g. lactate.

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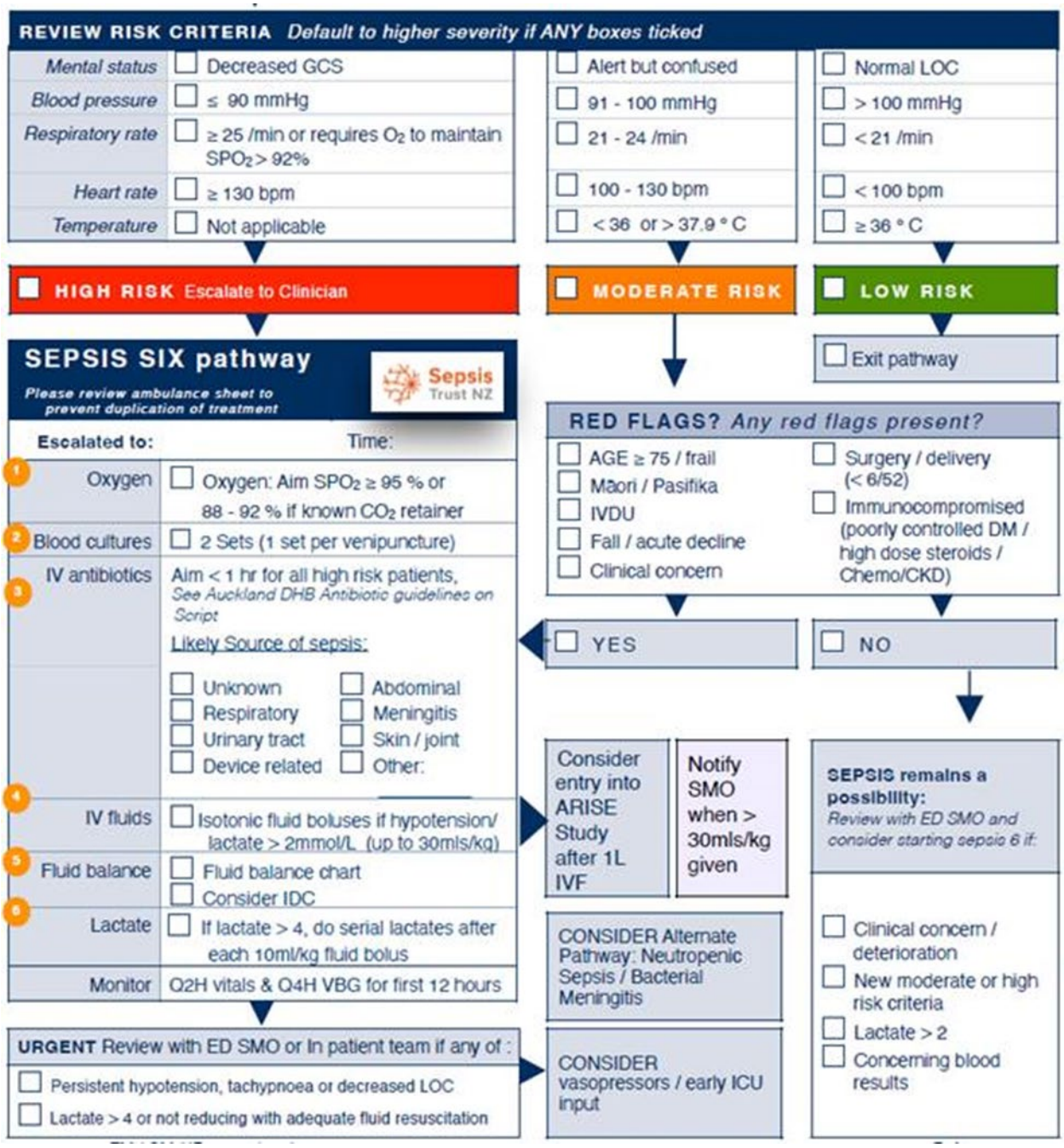

Note:

The initial resuscitation fluid is usually sodium chloride 0.9%. If the patient is still hypotensive after 30 mL/kg sodium chloride 0.9% then senior review and further fluid therapy and/or inotropes are required. The subsequent choice and rate of IV fluid may vary depending on the clinical circumstances. Note that hyperchloraemic acidosis may result from large volume sodium chloride 0.9% loads and a more physiologically balanced crystalloid such as Plasma-Lyte® should be considered after the initial fluid bolus.

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Anaphylaxis

Anaphylaxis is a systemic hypersensitivity reaction, usually rapid in onset, which can have life-threatening airway, breathing and/or circulation compromise. Anaphylaxis needs to be recognised and treated rapidly as death can occur within minutes. Delays in adrenaline administration are associated with increased mortality and biphasic reactions.

SIGNS AND SYMPTOMS

- Airway: pharyngeal or laryngeal oedema causing stridor, hoarse voice, dysphagia
- Breathing: bronchospasm, hypoxaemia, respiratory distress, cyanosis
- Circulation: hypotension, tachycardia
- Disability: loss of consciousness, confusion
- Exposure: urticaria, angioedema, pruritus, flushing
- GIT: abdominal pain, diarrhoea, vomiting

The World Allergy Organisation defines anaphylaxis as being **highly likely** if either of the following criteria are present:

1. Acute onset of cutaneous and/or mucosal tissue symptoms PLUS at least one of:
    a. Respiratory compromise
    b. Decreased blood pressure (decrease in SBP >30% from baseline or SBP <90 mmHg), or end-organ dysfunction (collapse, incontinence)
    c. Significant gastrointestinal symptoms (repeated vomiting, severe pain in the abdomen)
2. Exposure to a known or probable allergen PLUS laryngeal symptoms, bronchospasm or hypotension

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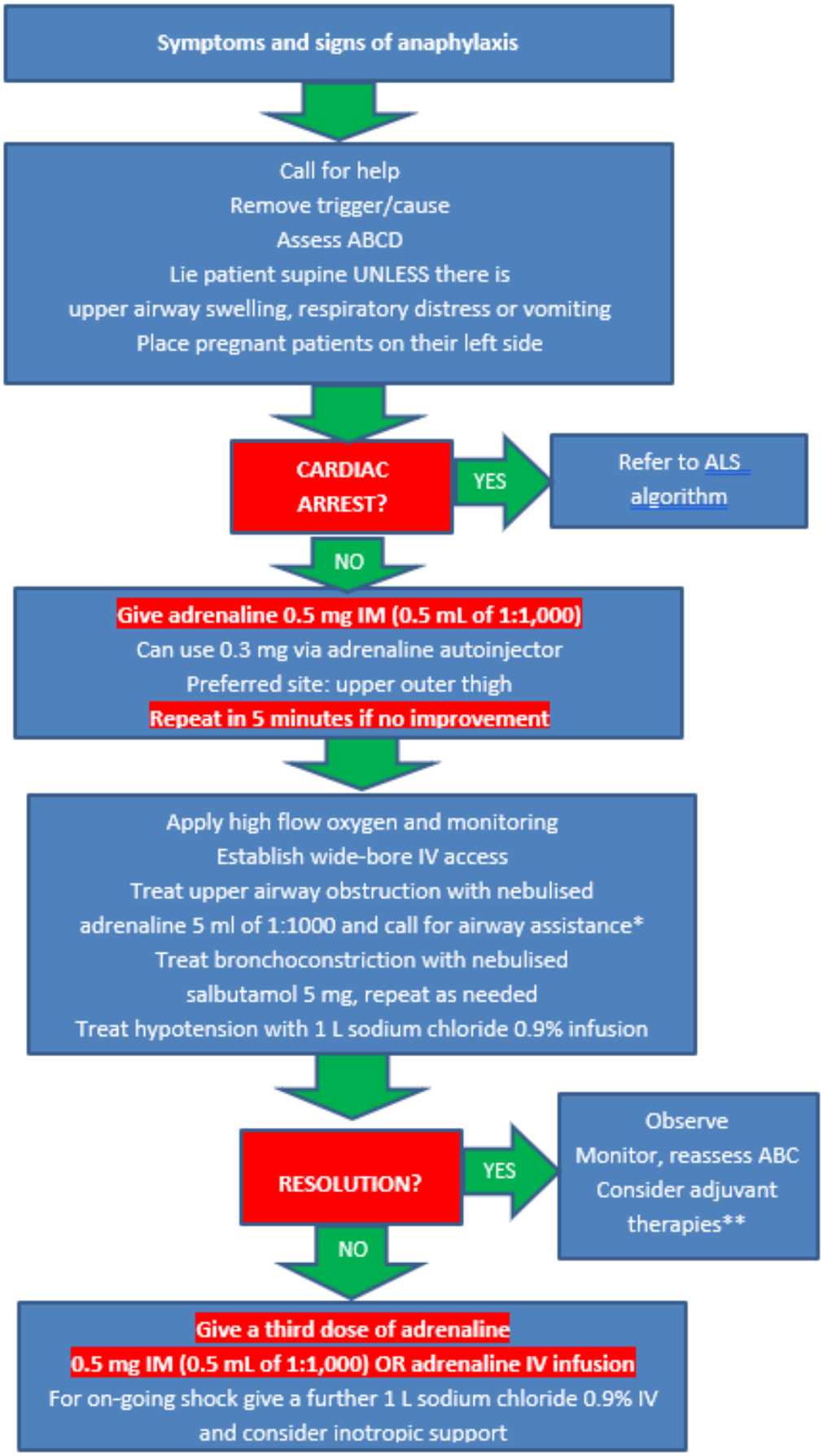
ACUTE TREATMENT



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*Immediate intubation should be performed in impending airway obstruction. Preparation for early intubation should occur if there is airway oedema or voice alteration. Intubation should be performed by the most experienced clinician available. Cricothyroidotomy may be required if the upper airway is severely oedematous.

Adjuvant therapies - these are **NOT used as initial or sole treatment.

- Antihistamines can help relieve cutaneous symptoms such as pruritus or urticaria e.g. cetirizine 10 mg PO or loratadine 10 mg PO. Some antihistamines e.g. chlorphenamine can cause hypotension when given in a rapid IV infusion.
- Corticosteroids are commonly used particularly in severe reactions requiring hospitalisation or known asthma and significant bronchoconstriction e.g. prednisolone 1 mg/kg (max 50 mg) PO or hydrocortisone 5 mg/kg (max 200 mg) IV. Benefits associated with corticosteroid use in anaphylaxis are unproven.
- Patients with a poor response to adrenaline, particularly those taking beta-blockers, can be given parenteral glucagon, although evidence is limited.

Biphasic Reaction

Defined as a recurrence of anaphylaxis symptoms after the initial episode has resolved without further exposure to the causative agent

Most occur within 12 hours but can be up to 72 hours

Affects approximately 5% of patients with anaphylaxis

Possible risk factors include: delayed adrenaline administration, slow response to adrenaline, need for repeated doses of adrenaline, need for IV fluids

Disposition

All patients with anaphylaxis should be observed until symptoms have resolved. Following administration of adrenaline ALL patients should be observed for **AT LEAST 4 HOURS** after the adrenaline was given.

- Reasons for admission for prolonged or overnight observation may include:
- Severe or protracted episode or previous history of such
- Concomitant illness e.g. severe asthma
- Slow response to adrenaline or second dose of adrenaline
- Delayed adrenaline administration >60 minutes
- Lives alone or remote from medical care

Discharge Advice

- Provide a written anaphylaxis emergency action plan (an example can be found at www.allergy.org.au/anaphylaxis)
- Teach the patient how to use an adrenaline auto-injector
- Provide two prescriptions and ensure that the patient is able to fill them
- Prevent recurrence by advising avoidance of trigger if known
- Ensure access to emergency medical services (e.g. advice to always carry a phone)
- Arrange follow up (GP, immunologist, report reaction to Medsafe if applicable)
- If trigger unknown or first episode or triggered by venom, please refer to Clinical Immunology
- Appropriate documentation (record allergy in clinical notes)

Further Resources

World Allergy Organization Anaphylaxis Guidance 2020 and www.allergy.org.au/anaphylaxis

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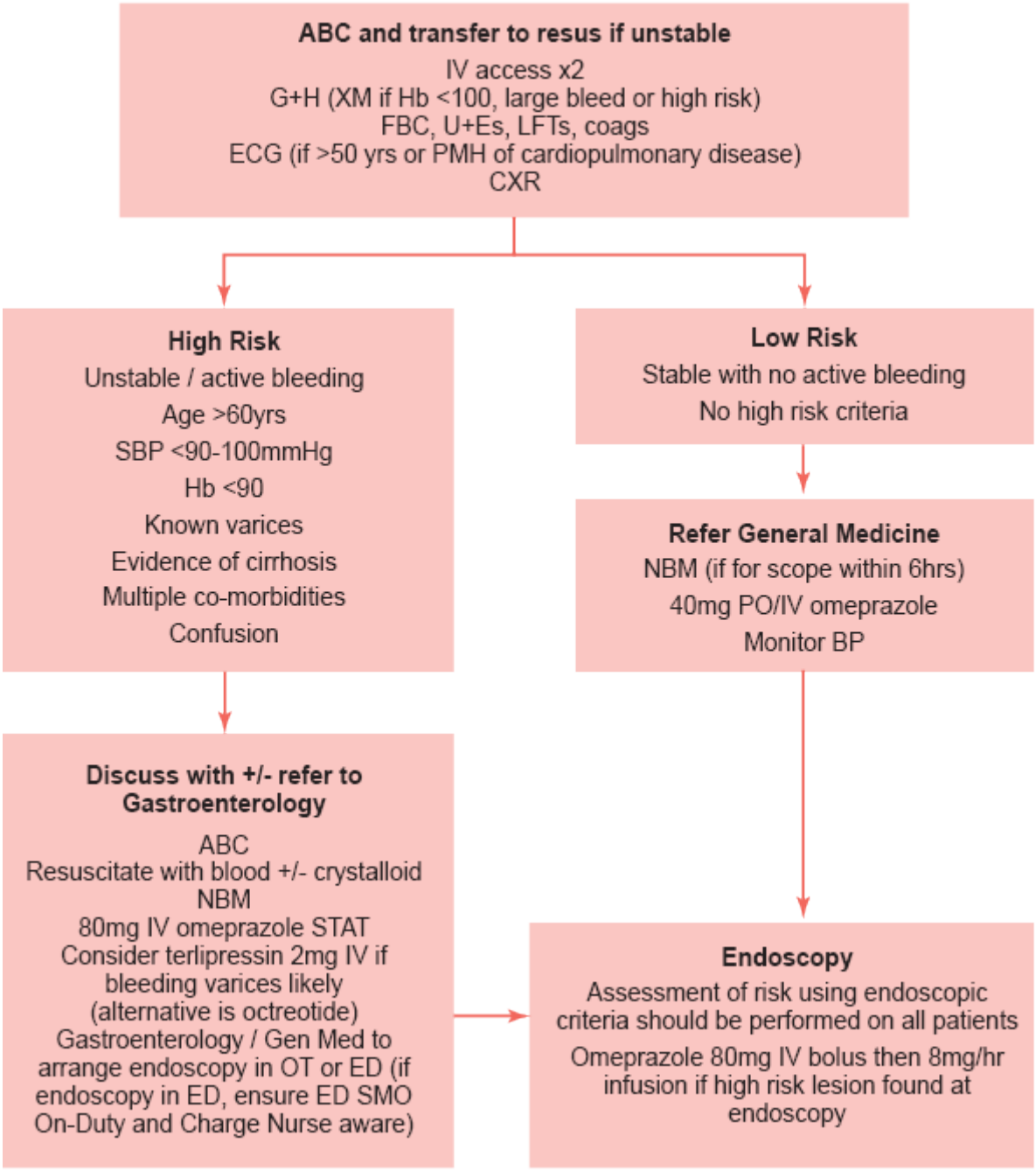
Upper GI Haemorrhage



MASSIVE HAEMORRHAGE PATHWAY

For more information, see the Patient Blood Management page:

https://adhb.hanz.health.nz/Pages/Patient-Blood-Management.aspx

The Massive Transfusion Protocol (MTP) has been replaced with a Massive Haemorrhage Pathway (MHP)

- The Adult Massive Haemorrhage Pathway (MHP) is a bundle of care with aims to stop the bleeding, mobilise resources, and early transfer to definitive care

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- It is a standardised guide to the transfusion of blood products
- It is written using best available evidence and expert consensus
- It provides a standardised approach to manage massive bleeding in adults across all hospitals in New Zealand

A **M**assive **H**aemorrhage **P**athway (MHP) encompasses **all** aspects of managing major haemorrhage. One *aspect* of this is *massive transfusion*.

- There is **emphasis on stopping bleeding**
- There is a **focus on communication** between the MHP coordinator, blood bank, treating clinicians and definitive care.
- **Standardising adjuncts** of care TXA, calcium, and maintaining normal physiological targets.

If you think a patient in the emergency department may have severe bleeding, ensure a Senior Registrar, Fellow, or SMO is involved in direct patient care and decision-making. There are three Major Haemorrhage Pathways: Code Crimson, Standard MHP, and Obstetric MHP which utilise different medications and blood products.

Activate a Code Crimson if the patient meets two or more of the following four criteria:
Pulse ≥120, BP ≤90, Penetrating truncal trauma, USS FAST Positive

A Code Crimson requires an Emergency Medicine SMO to be involved in direct patient care and if no ED SMO is present in the department (i.e., at night) they should be called in from home.

For the Standard MHP and Obstetric MHP, the patient will have massive bleeding with signs of shock and/or HR >120 and/or SBP <90.

Principles:

- **Blood is a precious resource, do not waste it. Approximately 65% of all major traumas do not require more than 1 unit of RBC over the next hour after hospital arrival.**
- If the patient has on-going severe bleeding, ensure an ED SMO or Fellow is involved in patient care and decision-making.
- All communication goes through the Team Leader. **Effective communication is key.**
- Ensure the patient has good vascular access. Consider the use of a rapid infuser Catheter (RIC line) or a “fat triple” central line early.
- Utilise the MHP coordinator for communication. **Effective communication is key**.
- Dedicate adequate resources to actual blood transfusion.
- **The Emergency Department is nearly always the wrong place for patients with an - blood transfusion requirement.** The patient needs to be expedited toward a place of definitive care where bleeding can be stopped.
- Warm the blood and replace calcium with each Pack.
- Learn about the contents, and utilise, the Advanced Resuscitation Trolley.

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Adult Massive Haemorrhage Pathway

Massive Bleeding PLUS
Shock Signs or **HR > 120** or **SBP < 90**

Code Crimson MHP	Standard MHP	Obstetric MHP
Trauma + ABC Score ≥ 2 + senior clinician approval	Medical or Surgical Bleeding	
2g Tranexamic Acid	**1g Tranexamic Acid**	**1g Tranexamic Acid**

Send Group + Screen
Initiate: Call Blood Bank 24015, Provide Patient Details
State "I am requesting (Crimson, Standard, Obstetric) Stat Pack"

Crimson Stat Pack	Standard Stat Pack	Obstetric Stat Pack
2 RBC & 2 FFP or 2 WB	2 RBC or 2 WB	2 RBC

Reassess: Ongoing Massive Bleeding + Shock?
Activate MHP, Identify Transfusion Coordinator, Call Blood Bank 24015
State "I am activating (Crimson, Standard, Obstetric) MHP"

Crimson Pack 1	Standard Pack 1	Obstetric Pack 1
Straight to Pack 2	2 RBC & 2 FFP or 2 WB	2 RBC, 3 Cryo

Pack 2
4 RBC, 4 FFP
3 Cryo

1g Calcium with every pack

Pack 3
4 RBC, 4 FFP
1 Platelet*

Alternating packs 2 & 3 until bleeding slowed

Then stop MHP, and start targeted transfusion

Bloods:
- repeat every 30min
- Blood gas
- iCa^{2+}
- FBC
- Coags
- Fibrinogen
- Viscoelastic if available e.g. TEG®

Coagulation Targets	If Not, Give
PR < 1.5 | APTT < 40	4 U FFP
Fibrinogen > 2g/L	3 U Cryoprecipitate
Platelets > 75 x 10^9/L	1 U Platelets**
Ionised Ca^{2+} > 1.1 mmol/L	1g Calcium

Obstetric Haemorrhage
- Manage Tone, Trauma, Tissue, Thrombin causes of haemorrhage
- Repeat TXA 1g 30 min after initial dose if significant ongoing bleeding

*See notes on page 2

NZBLOOD Te Ratonga Toto O Aotearoa

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CODE CRIMSON - ABC Score

- **Penetrating mechanism = 1**
- **SBP ≤ 90 mmHg = 1**
- **Positive eFAST*** = 1**
- **HR ≥ 120 bpm = 1**

Code Crimson requires senior clinician approval and input, as activation identifies the highest risk trauma patients and needs a multi-service approach.

eFAST scan accuracy relies on the skill level of the practitioner

Team Leader of the Resuscitation

- The team leader is the decision maker including activation of the MHP once the stat packs have been transfused
- Send urgent group & screen to blood bank
- Ensure Tranexamic Acid is administered, as a bolus through a fast flowing IV line

Transfusion Coordinator (e.g. Guardian, Coordinator)

- Supports the team leader
- Once the MHP has been activated, communicate with the blood bank team

Tasks (Delegated as Necessary)

- Once Stat Packs have been transfused - reassess the patient in conjunction with the team leader
- If required after stat pack - activate MHP, state which MHP pathway (i.e. code crimson/standard/obstetric MHP)
  - If senior clinician requests MHP activation immediately, stat pack is still issued while the blood bank prepares pack 1/pack 2
- Ensure blood bank have your name and contact number
- Organize adequate orderly/health care assistant support
- Repeat MHP bloods every 30mins
- Ensure 1g Calcium given with every MHP pack *(10mL CaCl 10% or 30mL Ca^{2+} Gluconate 10%)* as a bolus through fast flowing line
- Hand-over coordination role if patient location changes; ensure blood bank notified of new coordinators name and number
- Cease MHP once the patient is clinically stable, inform blood bank, move to targeted therapy
- Ensure transfusion documentation / checklists maintained; all swing labels retained

***Smaller Centres should** check Full Blood Count BEFORE giving platelets, avoid transfusing if PLT > 75 x 10⁹/L

Blood Bank Roles

- Process urgent group and screen
- Liase with transfusion coordinator
- Release Stat Pack and MHP Packs as per protocol / SOP
- Notify NZBS TMS as per SOP & manage inventory
- Ensure Blood Bank Tracking Sheet / Checklist documentation and eTraceline records maintained

Smaller Centres BEFORE releasing Pack 3, liaise with MHP coordination role to confirm PLT count is < 75 x 10⁹/L

MHP Runner

- This can be HCA/Orderly/RN or anyone else available to collect blood products from blood bank
- Liaise with the transfusion coordinator regarding product collection
- Stay with the MHP until you are released by the transfusion coordinator
- Return blood products to blood bank as directed by the transfusion coordinator

Infusion Standards

- RBC, FFP, Cryoprecipitate:
  - warmed
  - standard blood infusion set
- Platelets:
  - warmed or room temp
  - new infusion set preferred, not essential

Clinical Targets

- Surgical/radiological **control of bleeding** ASAP
- Normal **pH/base deficit**
- Normal body **temperature**
- **A lower MAP** may be tolerated until bleeding slowed
  - unless brain injury

NZBLOOD Te Ratonga Toto O Aotearoa

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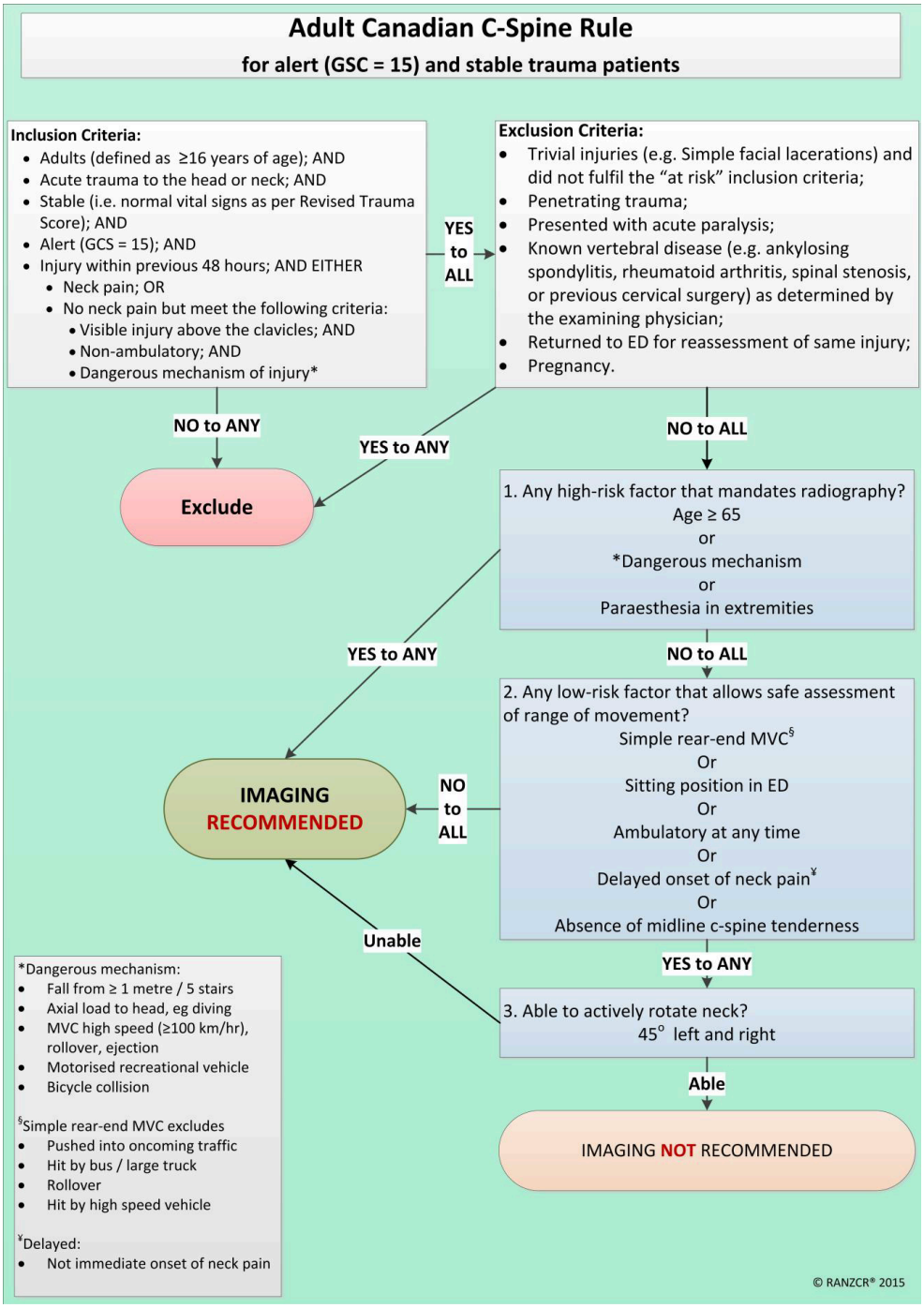
Cervical Spine Injury

Patients with neck pain following trauma is a common presentation to the Emergency Department.

Some patients can have their C spine cleared without imaging using clinical decision rules. The two most commonly used rules are:

- Canadian C spine rule
- NEXUS

Evidence suggests that the Canadian rule is more sensitive for detecting clinically significant cervical spine injuries and is the rule used by most EM physicians in the department.



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CERVICAL SPINE IMMOBILISATION

The practice of routinely placing a cervical spine collar on all trauma patients is being questioned. There are no randomised controlled trials demonstrating that cervical immobilisation prevents secondary spinal cord injury. In fact, there is a growing body of evidence that cervical spine collars may cause more harm in some patients.

The concerns regarding rigid cervical spine immobilisation are as follows:

- Collars can restrict cranial venous outflow thus increasing ICP and worsening head injury outcomes
- Collar placement and strict adherence to manual inline stabilisation can make advanced airway management more difficult and increase aspiration risk
- Collars can worsen neurological deficits in some patients
- Collars provide limited motion control
- Collars can lead to pressure injuries even after a short period
- Collars are uncomfortable and can increase cervical spine pain

St. Johns have recently adopted an algorithm to decide whether to place a cervical spine collar in the pre-hospital setting.

Patients may arrive to the ED with a lanyard around their neck stating that the cervical spine is not cleared.

Whether to place a C spine collar on a patient in the ED can be a tricky decision – if you have any doubt, talk to the ED SMO on duty. You will see that many patients do not have their cervical spine cleared but are not immobilised while waiting for imaging.

However, patients with neurological deficits from suspected cervical spine injury should have a hard collar placed unless contraindicated.

Choice of initial cervical spine imaging:

There has been a move to use CT imaging as initial imaging modality but there are some situations where plain imaging may be a better first choice. This will depend on a number of factors.

- Clinical suspicion of injury including the mechanism of injury and any neurological deficits
- Age of the patient
    - elderly patient's C spines are very difficult to interpret on plain films
    - we try to limit radiation exposure to younger patients
- If the patient is going to have a CT head (or other CT trauma scans) performed as well

There is an "ED SMO PROTOCOL" for requesting CT cervical spines – this removes the need to discuss the request with the on call Radiology Registrar. You will need to discuss this with the ED SMO prior to using this protocol however.

Clearing the cervical spine after imaging:

If the patient has normal imaging and no focal neurological findings, the patient can then have their cervical spine cleared. The old practice of placing these patients in semi-rigid collars with outpatient review if they still have persistent severe pain has been largely disregarded.

If patients are deemed fit for discharge, ensure they have adequate analgesia, ACC documentation completed and good return advice (return if worsening pain, neurological deficit etc.). They should follow up with their GP and can consider physiotherapy as an outpatient.

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Patients with normal CTs but persisting neurological deficits should be discussed with the on-call Orthopaedic Registrar for consideration of admission and MRI.

Violent / Agitated Patient

These patients are complex and high-risk – involve your senior doctor early. Protect yourself, staff and patients. If there is the possibility of a weapon, call the police.

The Emergency department has in house MAPA trained security guards. **Please use the Duress alarms in AED or call a Code Orange via 777 operator, if faced with a security threat**. If you think a patient waiting for assessment requires urgent multi-service input (ED, mental health, security) you can put out a Behaviour Of Concern (BOC) call via the 777 operator, although mental health will not attend between 2300 and 0800.

A differential diagnosis for causes for violent behaviour

- Head injury
- Substance abuse and intoxication or withdrawal
- Underlying mental illness
- Hypoxia
- Metabolic disturbances/hypoglycaemia
- Infection: meningitis, encephalitis, sepsis
- Hyperthermia or hypothermia
- Seizures: postictal or status epilepticus
- Vascular: stroke or subarachnoid haemorrhage
- Behavioural problem

Predictors of an ORGANIC cause of violence / agitation

- >40 years
- No history of mental illness
- Disorientation
- Stupor or lethargy
- Visual hallucinations
- Illusions
- Abnormal vital signs

Verbal de-escalation

- Allow patient time to express concerns
- May settle if concerns discussed and support offered
- Ascertain cause of behaviour

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- Be calm and even
- Offer courtesies – phone, food, regular orientation to place, person, time
- Encourage the patient to choose help, e.g. "This medication will help calm things down"
- Always be calm. Never be aggressive or threatening in response. If aggression escalates and violence seems imminent withdraw and seek help.

Non-pharmacological management is crucially important

The aim of tranquilisation is:

- To control dangerous behaviour
- Facilitate assessment and management
- ROUSABLE SLEEP not unconsciousness
- May require brief period of physical restraint to administer – 5-point restraint; involve Security early

If you start chemical sedation you must be prepared to be responsible for the patient's airway, breathing, circulation, bladder care, hydration and nursing care. Ensure that the patient is **safely** monitored after sedation.

Detaining Patients

If an unwell patient wishes to leave **and does not have decision-making capacity** you can detain them for further assessment/treatment as per Right 7(4) of the Code of Health and Disability Services Consumer's Rights 1996, which says that if someone does not have capacity you can make decisions in their best interests ("Duty of Care"). Whether someone has decision-making capacity is based on your clinical assessment – **does the patient understand what the situation is and what the options/risks are?** If they have capacity and wish to leave, you cannot legally detain them, even if their medical problem is high-risk. **Document these decisions thoroughly.**

If the problem is a mental health issue and **you have a reasonable belief that there is a significant risk of harm to the patient or someone else if they leave, or you believe the patient cannot take care of themselves** then detaining them under the Mental Health Act 1992 may be appropriate. Discuss this with your senior doctor and/or the Mental Health team.

Having patients removed from ED

This is a difficult decision – **involve your senior doctor**. If a patient is agitated and violent, your assessment suggests the issue is a behavioural problem, is not consistent with a significant medical/traumatic/mental health condition, and you don't think further treatment in ED is required or appropriate under the circumstances you can have the patient removed by security or phone the police to have the patient taken into custody. Doing this requires a reasonable degree of certainty that there is no major illness or threat to life/limb, and that having the patient removed is the safest course of action. **Document these decisions thoroughly.**

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Protect yourself, staff, and patients

Call security if needed.

If concern about safety or severe agitation, call 777 to put out "Code Orange" (assembles security plus duty Clinical Nurse Manager). Consider BOC Call between 0800-2300h (assembles security, ED doctor, mental health clinician). **Involve your senior doctor early.**

Consider whether the patient needs further ED assessment/treatment or whether removal from ED is more appropriate.

Consider differential diagnosis

Psychiatric

Toxicological (including ETOH)

Medical (e.g., head injury, hypoxia, metabolic disturbance (e.g., low BSL), infections, hyper/hypothermia, seizures, CVA, SAH, behavioural, and many more.

Non-pharmacological Measures

Move to low stimulus room.

Attempt verbal de-escalation in a calm non-confrontational manner.

Offer courtesies (e.g., phone, food).

Pharmacological Measures

If needed to facilitate assessment and management.

Endpoint = rouseable sleep (not unconsciousness).

Be prepared to be responsible for patient's ABC, bladder care, hydration, and nursing care.

Antipsychotics

(Beware: prolonged QTc and decreased seizure threshold)

Droperidol 10 mg IV or IM

Olanzapine 5-10 mg po

(Droperidol is contraindicated in neuroleptic malignant syndrome, long QT syndrome, Parkinsons disease, and dementia. Please refer to AED intranet site for further information on use of droperidol.)

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Hypothermia

Definition (core temperature):

Mild: 32-35°C – no change in LOC

Moderate: 30-32°C – altered LOC

Severe: 25-30°C – unresponsive
If <28°C high risk for ventricular fibrillation, <30°C fixed dilated pupils (mimics brain death)

A low reading core temperature probe is required (e.g. rectal). Standard thermometers do not go below 35°C.

Causes for hypothermia

- Age (elderly and infants at risk)
- Environmental
- Sepsis
- Trauma
- Endocrine
- Toxicological
- Complications of hypothermia ± from initial precipitating event

Resuscitation

- Airway
- Breathing: warmed humidified oxygen
- Circulation: warmed IVF (dehydration is frequently present)
- Defibrillation and anti-arrhythmic drugs are less effective at low body temperatures
- Vital organs are protected by hypothermia
- CPR should not be abandoned until the patient has been warmed beyond 32°C (the patient is not dead until they are "warm and dead")
- Rewarming: Remove all wet clothing. Cover with warmed dry blankets (foil blanket can be put over the warm blankets but blankets must be replaced as they become cool)
- Warmed IV fluids (contribute little to re-warming but help prevent further cooling)
- Forced air warming blankets (Bair Hugger) can be used for moderate hypothermia
- Severely hypothermic patients in cardiac arrest or who are unconscious and bradycardic require active core-rewarming - extra-corporeal techniques (e.g. cardiopulmonary bypass), irrigation with warmed fluids of body cavities (pleural space, peritoneal space)

Changes to usual CPR process

- Check pulse and respirations for up to 60 seconds

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- Double interval between drugs until >30 degrees
- Consider 3 stacked shocks then defer defibrillation until >30 degrees
- Continue CPR until 32 degrees
- Use normal rates for CPR

Factors associated with increased survival

- Rapid onset
- Children
- Accidental hypothermia
- Drug/alcohol related
- Available resources for prolonged resuscitation i.e. access to HD / Cardiopulmonary bypass/ECM

Toxicology

SOURCES OF INFORMATION

- Toxicological advice can be sought from the Emergency Medicine Consultant/Fellow or Senior Registrar 24/7. Toxicology textbooks can be found at ED Staff Base (Toxicology Handbook).
- TOXINZ website: http://www.toxinz.com/ Login: DEM Password: DEM01
- National Poisons Centre
- App – Austin Health Clinical Toxicology Guidelines

GENERAL APPROACH TO TOXICOLOGY PATIENTS – RESUS RSI DEAD

- Resuscitation
- Risk Assessment
- Supportive Care
- Investigations
- Decontamination
- Enhanced Elimination
- Antidotes
- Disposition

Resuscitation

Generally, treat along standard lines. For some agents, avoidance of acidosis is critical (tricyclic antidepressants, salicylate).

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- Airway – along standard lines. Consider early intubation with severe caustic burns.
- Hypoventilation – consider using capnography. Be aware that oxygen use may mask significant hypoventilation and hypercarbia.
- Hypotension – differentiate between vasoplegic, cardiogenic and arrhythmogenic shock
    - Vasoplegia – Vasopressors – Noradrenaline, Vasopressin, Methylene Blue
    - Cardiogenic – Adrenaline – consider High Dose Euglycaemic Therapy – ECMO
    - Arrhythmia
        - Sodium Channel Blockade – Sodium Bicarbonate 1-2 mmol/kg
        - Long QT – cardioversion, magnesium, overdrive pacing.
- Hypoglycaemia – treat as usual.
- Seizures – first line treatment is benzodiazepines. Avoid phenytoin in toxicology seizures.
- Aggressive behaviour – benzodiazepines, anti-psychotics *(see information above)*.
- Temperature management – hyper and hypothermia
    - Temperature >39.5 is a medical emergency – may require intubation and paralysis to avoid heat generation from muscle hyperactivity.

Risk assessment

Once any initial resuscitation has occurred, an accurate risk assessment is CRITICAL. Refer to a toxicology reference or discuss with a toxicologist.

- Toxin(s)
- Dose
- Acute vs. staggered vs. chronic
- Route of administration
- Formulation of agent – immediate vs. controlled/slow release
- Time since ingestion
- Patient factors
- Toxidromes evident (see below)
- Potential complications
- If unexpected clinical events are occurring, the risk assessment needs to be revised. Consider and be ready for the worst-case scenario.

Predict potential complications and prepare for them. Examples include coma, aspiration, urinary retention, rhabdomyolysis, hypo/hyperthermia, seizures, arrhythmia, cardiovascular and respiratory complications. Many self-poisonings exhibit delayed toxicity, especially slow-release formulations.

Supportive cares

- Supportive cares are the mainstay of treatment for most self-poisonings.

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- Consider hydration, fluid balance and electrolytes, temperature control, reassurance and sedation for agitation, catheterisation for urinary retention (common for drugs with anticholinergic effects), pressure and skin care.

- Sedation for treatment may be required – refer to "Violent/Agitated Patient" section.

- Toxicology references will provide information on how long a patient needs monitoring and/or observation for before they are "medically cleared". Be cautious with slow-release preparations and patients with significant comorbidities.

Investigations

- ECG for all – many ingestions have cardio-toxic features (e.g. tricyclic antidepressants) – in particular look for QRS prolongation, large R waves in AVR, and prolonged QT interval.

- Paracetamol and ALT level for all.

- Renal function and electrolytes, glucose.

- Other investigations that will aid in risk assessment or alter management (e.g. iron level, lithium level, digoxin level, carboxyhaemoglobin, methaemoglobin).

- Urine toxicology testing is not routinely done – in most cases it does not alter management.

Decontamination

- Consider GI tract, skin, eyes.

- Charcoal 50 g (if airway is protected, and no evidence of bowel obstruction or perforation. Not to be used if risk of seizure): ingestion occurred <2 hours ago, high risk OD, absorbable by charcoal (e.g. tricyclic antidepressant, paracetamol), only in patients with minimal aspiration risk. Refer to toxicology reference.

- Whole bowel irrigation: life-threatening, sustained release formulation (e.g. iron, slow release calcium channel blockers) or toxin not bound to charcoal.

Enhanced elimination

- Urinary alkalinisation (e.g. aspirin)

- Multi-dose activated charcoal (e.g. carbamazepine)

- Haemodialysis (e.g. lithium, ethylene glycol)

ANTIDOTES

- Many common self-poisonings do not require antidote therapy.

- Indications for, dosages of, and endpoints of antidote therapy can be found in a toxicology reference or by consulting a Toxicologist.

Refer to toxicology references for specific antidotes – some considerations are listed below:

- N-Acetylcysteine (paracetamol) – this is the most common antidote prescribed in ED. See below for more details. Treatment is not always straight forward, there are many nuanced decisions to make so seek expert help (ED SMO/Fellow or NZ National Poison Centre)

- Naloxone (opioids) – bag mask ventilation is the most important first step. Titrate naloxone gradually to avoid precipitating severe withdrawal. Titrate in 40-100 microgram aliquots

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- Glucose (sulphonylureas, insulin, beta blockers, salicylates, ethanol)
- Sodium bicarbonate (tricyclic antidepressants, sodium channel blockers, aspirin)
- DigiFAB® (digoxin)
- Ethanol (methanol and ethylene glycol)
- Methylene blue (methaemoglobin)
- Lipid emulsion (local anaesthetic toxicity)
- Octreotide (sulphonylureas)
- Hydroxycobalamin (cyanide)

Disposition

- Severe poisonings may require DCCM or CVICU admission
- Most patients are observed in ED until "medically cleared". Consider ED short-stay admission as per local policies. Typically, patients with chronic digoxin toxicity, chronic lithium toxicity and lead poisoning are referred to general medicine as these patients often have multiple medical comorbidities that need to be optimised.
- Psychiatric assessment for all cases of intentional self-poisoning; refer to patient's management plan if available.
- Recreational drug use – consider CADS referral/drop in clinic. Consider prescription of thiamine on discharge.
- Occupational exposure – Public Health

TOXIDROMES

In an unknown ingestion, a particular pattern of clinical presentation may help to identify a "toxidrome" that may indicate a class (or classes) of drug.

Helpful signs include mental status, pupil size, dry/diaphoretic skin, dry/moist mucous membranes, temperature, neuromuscular findings (hypertonia, hyper-reflexia, clonus) and urinary retention.

Anticholinergic

Syndrome consisting of: delirium, sinus tachycardia, dry skin, hallucinations, mydriasis, hyperthermia, and urinary retention (common).

- Antihistamine, scopolamine (hyoscine hydrobromide)
- Tricyclic antidepressants
- Antipsychotics (haloperidol, chlorpromazine, olanzapine, quetiapine)
- Atropine, ipratropium bromide
- Oxybutynin
- Datura plant

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Cholinergics

Syndrome consisting of: miosis, bronchorrhea, bronchospasm, bradycardia, diarrhoea, vomiting, urination, and salivation. Life threatening issues related to significant respiratory compromise and bradycardia.

- Organophosphates/carbamate insecticides
- Myasthenia gravis drugs (neostigmine, pyridostigmine)
- Alzheimer's dementia drugs (donepezil)
- Chemical warfare nerve agents
- Nicotine
- Mushrooms

Serotonin toxicity

Use Hunter Criteria to diagnose Serotonin Toxicity. Syndrome comprising of: clonus (ocular and motor), agitation, diaphoresis, hypertonia, hyperthermia and hyper-reflexia. Ingestion of agents with different mechanisms of action on the serotonin system is associated with high-risk toxicity and life-threatening hyperthermia.

- SSRIs, SNRIs, tricyclic antidepressants, MAOI, lithium
- Tramadol, amphetamines/MDMA, metoclopramide, ondansetron, sodium valproate
- Ginseng, St John's Wort

Sympathomimetic

Syndrome of excessive stimulation of sympathetic nervous system and can present with agitation, hypertension, tachycardia, and diaphoresis. Check for complications – seizures, arrhythmias, dissection, intra-cranial haemorrhage and injury. Generally supportive care and benzodiazepines are sufficient for treatment.

Note: recreational drug formulations are constantly evolving and clinical presentations can vary depending on the market. If the patient is capable of giving a history, please document the recreational drug form and appearance to help identify new emerging drugs.

MANAGEMENT OF PARACETAMOL POISONING

Please refer to the NAC calculator under the Toxicology heading on the AED intranet site for all paracetamol poisonings.

For full guidelines on paracetamol poisoning, please refer to the 2019 Australasian Guidelines published in the Medicine Journal of Australasia. Please seek toxicological advice from the Emergency Medicine Consultant/Fellow or Senior Registrar as they should be able to help ensure the appropriate guidelines are followed.

Chiew, Angela L et al. "Updated guidelines for the management of paracetamol poisoning in Australia and New Zealand." *The Medical Journal of Australia* vol. 212,4 (2020): 175-183. doi:10.5694/mja2.50428.

All flow charts are available on TOXINZ – Login: DEM Password: DEM01.

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Beware that there are several different types of paracetamol ingestions, and each has special considerations. If you are unsure, discuss with the NZ National Poison Centre. The following advice is taken directly from the 2019 Australasian summary guidelines.

Charcoal

Give 50 g of charcoal if a patient (if patient awake enough and co-operative) with a potentially toxic ingestion (>200 mg/kg OR >10 g total) presents within:

- 2 hours of standard formulation paracetamol
- 4 hours of modified release (paracetamol osteo) formulation
- 4 hours of an ingestion >30 g (massive overdose). It is possible that charcoal may have benefit even after 4 hours, please discuss with a toxicologist.
- DO NOT GIVE if patient is sedated from co-ingestants. Consider risk/benefit when giving activated charcoal to patients, especially if other medications may cause sedation and/or seizures. Do not insert an NGT just to administer activated charcoal in paracetamol poisoning.

Acute immediate release Paracetamol overdose management

- Follow the flow chart in the Australasian Guidelines.
- Measure paracetamol levels and ALT – plot paracetamol level on nomogram – give N-Acetylcysteine if paracetamol is above nomogram line.
- If a patient presents at >8 hours post ingestion, then start N-Acetylcysteine immediately pending paracetamol levels. Treatment within 8 hours is associated with a good outcome.
- Utilise the NAC calculator for prescription – accessed on the AED and CDU homepage of Hippo. ED staff are well versed in prescribing NAC so feel free to contact the supervising ED SMO/Fellow for advice.
- N-Acetylcysteine dose is dependent on weight – maximum weight for calculations is 110 kg.

Repeated supratherapeutic paracetamol poisoning management

Patients who ingest excessive paracetamol for a therapeutic purpose (e.g. pain, viral illness) or ingest therapeutic doses of paracetamol and have symptoms of acute liver injury (e.g. abdominal pain, nausea and vomiting) are managed as per repeated supratherapeutic ingestion flow chart in the Australasian guidelines.

If the ingestion is deliberate or intentional, they should be managed as per acute intentional ingestion.

Massive ingestion (>30 g or level >twice treatment line on nomogram)

- Consider charcoal (see previous notes).
- Patients with a very high initial paracetamol concentration (greater than double the nomogram line) are at increased risk of acute liver injury if given standard N-Acetylcysteine regimens. Those with an initial paracetamol concentration greater than double the nomogram line may benefit from an increased dose of N-Acetylcysteine. The second bag should be doubled to 200 mg/kg intravenous N-Acetylcysteine over 16 hours (instead of 100 mg/kg over 16h). Select “Double Dose” on the NAC calculator.
- Patients with even higher concentrations (e.g. ≥ triple the nomogram line) may benefit from even higher N-Acetylcysteine doses. These patients should be discussed with a clinical toxicologist or the NZ National Poison Centre.

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- At completion of N-Acetylcysteine, check paracetamol level and ALT. N-Acetylcysteine to continue if ALT increasing or paracetamol level >66 µmol/L. If paracetamol level remains significantly elevated (>660 µmol/L) then continue double dose NAC.

Refer to gastroenterology/liver transplant team if:

- INR greater than 3.0 at 48 hours or greater than 4.5 at any time;
- Oliguria or creatinine greater than 200 µmol/L;
- Persistent acidosis (pH <7.3) or arterial lactate greater than 3 mmol/L;
- Systolic hypotension with blood pressure below 80mmHg, despite resuscitation;
- Hypoglycaemia, severe thrombocytopenia, or encephalopathy of any degree; OR
- Any alteration of consciousness (Glasgow Coma Score <15) not associated with sedative co-ingestions.

Cessation of on-going treatment with NAC

Some patients will require on-going treatment with N-Acetylcysteine if:

- Persistently high paracetamol concentration greater than 66 µmol/L; or
- ALT greater than 50 U/L and increasing (if baseline ALT >50 U/L)

N-Acetylcysteine is generally continued at the rate of 100mg/kg over 16h (max weight 110 kg). Higher infusion rates may be warranted for massive paracetamol ingestions, especially if the paracetamol concentration is more than 660µmol/L at the completion of the initial N-Acetylcysteine infusion – a Clinical Toxicologist should be consulted in such cases. Regular clinical review and blood tests at least every 12 hours are recommended for patients requiring prolonged treatment.

Criteria for cessation

In patients who require N-Acetylcysteine beyond 20 hours, it can be ceased if all the following criteria have been met:

- ALT or AST decreasing
- INR <2.0; and
- Patient is clinically well

AND

For modified release ingestions and patients with an initial paracetamol concentration greater than double the nomogram line, paracetamol concentration should be <10 mg/L (<66 µmol/L).

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Medicine

Blood Products and Transfusion

Transfusion advice:

Blood Bank. Staff will refer you on for specialist advice if needed: Haematologist, Transfusion Medical Specialist or Transfusion Nurse

During normal working hours, Registrar advice/consults are as follows:

- Transfusion Medicine Specialists: available 24/7.
- General/malignant Haematology Consults Registrar
- Out-of-hours Haematology Registrar

REQUESTING BLOOD IN AN EMERGENCY

Ring Blood bank and state clearly that you need blood now. Information to have when calling for advice:

1. Name, NHI, age and patient location, name of product
2. Introduction stating problem/question/brief history
3. Anticipated transfusion needs and urgency

WHEN TO CALL BLOOD BANK

- All urgent requests for blood, including to activate the Massive Haemorrhagic Pathway (MHP). See protocols: https://adhb.hanz.health.nz/Policy/Massive%20Haemorrhagic%20Pathway%20-%20Adult.pdf https://adhb.hanz.health.nz/Toolkit/Adult%20Massive%20Haemorrhage%20Pathway.pdf.
- Following a transfusion reaction.
- If the patient identity details on the blood does not match the patient's details.
- When requesting unusual products (e.g. matched platelets) or scarce products (e.g. Zoster Immunoglobulin).
- If in doubt about a dose or any other aspect of transfusion.
- Listen carefully to the concerns and advice of the senior nurses.

When deciding to transfuse ANSWER ALL OF THE FOLLOWING

- Knowing the risks, consider "would I want blood if I were the patient?", or "would I (for example) simply take iron supplements?" **When in doubt, consult your senior**
- What are the specific indications for transfusing this patient?
- What improvement in the patient's physiological condition (not lab result) am I aiming to achieve?
- Can I minimise blood loss to reduce the patient's need for transfusion (e.g. cell salvage or tranexamic acid)?
- Are there any other treatments I could give instead of transfusing (e.g. an iron infusion/script for oral iron)?
- Do the benefits of transfusion outweigh the risks for this particular patient?
- Has the patient been given a clear explanation of the potential risks and benefits of a transfusion in his/her case and has the patient consented?

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- documentation to order or administer blood components?
- Will a trained person monitor this patient and respond immediately if any transfusion reactions occur (see also section on overnight transfusions)?
- Check that there are appropriate samples for relevant testing at the Blood Bank and that the tests are completed.

CONSENT FOR RECEIVING BLOOD PRODUCTS

The patient must receive adequate information as to:

- Reasons for the transfusion
- Risks (see below)
- Benefits
- Alternatives
- Adverse sequelae that may result if the transfusion is not received

Written informed consent must be obtained prior to transfusion of blood components. There is a specific blood consent form. It is important to obtain blood transfusion consent at the same time as consent for surgery or anaesthesia, if there is a chance that blood transfusion will be needed with the surgery (>1% likelihood).

Consult the list of operations that should have blood Group and Screen completed prior to surgery.
https://adhb.hanz.health.nz/site/Anaesthesia/DeptPoliciesGuidelines/Preoperative%20Blood%20Tests%20by%20Specialty%20and%20Procedure%20-%20Adult.xlsx

Consent for transfusion:
https://www.clinicaldata.nzblood.co.nz/resourcefolder/documents/consent/Auckland_consent_form.pdf

Estimates of the risks from transfusions

- Minor allergic reaction or rash in 1-2% of transfusions.
- Major incompatibility reaction in 1:100,000 transfusions (1 case per year in NZ).
- No case of HCV or HIV has been acquired in NZ via transfusion since viral screening was introduced. The risk is less than 1:7,000,000.
- The risk of acquiring Hepatitis B infection from transfusion is less than 1:700,000 transfusions (1 case per 5-10 years in NZ).
- HTLV-1 virus transmission is much less than 1:100,000 transfusions (no cases reported in 20 years in NZ) Serious bacterial infection risk is less than 1:100,000 transfusions (<1 case per years in NZ).
- Risk of acquiring CJD/vCJD from transfusion is very low and has not been reported in NZ (but has in the UK).
- Transfusion related acute lung injury (TRALI) is less than 1:100,000 transfusions (approx. 1 case per year in NZ).

SAMPLES FOR BLOOD BANK

Why are they so fussy?

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"Wrong Blood in Tube" (WBIT) is when the blood is not from the patient named on the tube. Through the vigilance of the Blood Service, most errors are picked up before they result in injury or death. **If the wrong blood sneaks through, there is a 1 in 3 chance of an ABO incompatible transfusion and a 1 in 10 chance that the patient may die as a result.**

The following simple, good-practice rules will help keep your patient safe.

Whenever you take and label blood for cross-matching, go through these three steps:

1. **While at the patient's bedside**, ask the patient to state their full name and birth date and check these against the request form and wristband. If the patient cannot communicate, check the patient's wristband with another person.

2. Now take the blood into the pink or purple top tube.

3. Then, while still at the patient's bedside, **handwrite** the patient's details (name, NHI, DOB) on the tube and sign the tube and sign the form x 2 (as test requestor and collector's declaration). Printed labels on the tube are not accepted.

If you made any mistake, take the sample again. Your patient's life depends on getting this right. The above three steps involve several safety checks. **Check twice, label once. The standard of sample labelling is tightened in NZBS. Blood bank aims for zero labelling errors in sample for testing.**

How to take a group and screen: https://www.clinicaldata.nzblood.co.nz/resourcefolder/sample.php?dhbid=1

HOW TO GIVE A BLOOD PRODUCT TRANSFUSION

Prescribe the transfusion on the medication chart, including the rate that it is required. The recommended rates for an adult without risk of circulatory overload for non-emergency transfusions:

- RBCs over 2-3 hours
- Fresh frozen plasma (FFP) over 90 mins
- Cryoprecipitate over 30 mins
- Platelets over 30 mins

https://www.clinicaldata.nzblood.co.nz/resourcefolder/redcells.php?dhbid=1

The nurse will fill out the blood bank request form and order the blood. Blood product transfusions must be started within 30 mins of issue time to avoid wastage. See lanyard tool.

Product request form: https://www.nzblood.co.nz/assets/Transfusion-Medicine/PDFs/111F159.pdf

Overnight transfusion

In less well-staffed areas (e.g. wards), giving blood at night is associated with increased risk of patient harm. Overworked staff may not notice adverse reactions, especially in poorly lit wards or administration may be less well-controlled. Areas such as CDU/HDU/short stay are designed to allow transfusion at night and are considered to be lower risk at night. Do not transfuse on lower-acuity wards (e.g. general medical wards), unless there is a pressing need for blood that night. If the patient is that unwell, they may be better managed in a higher-acuity area. As a general rule, a patient this ill must be discussed with a senior staff member, and the discussion documented.

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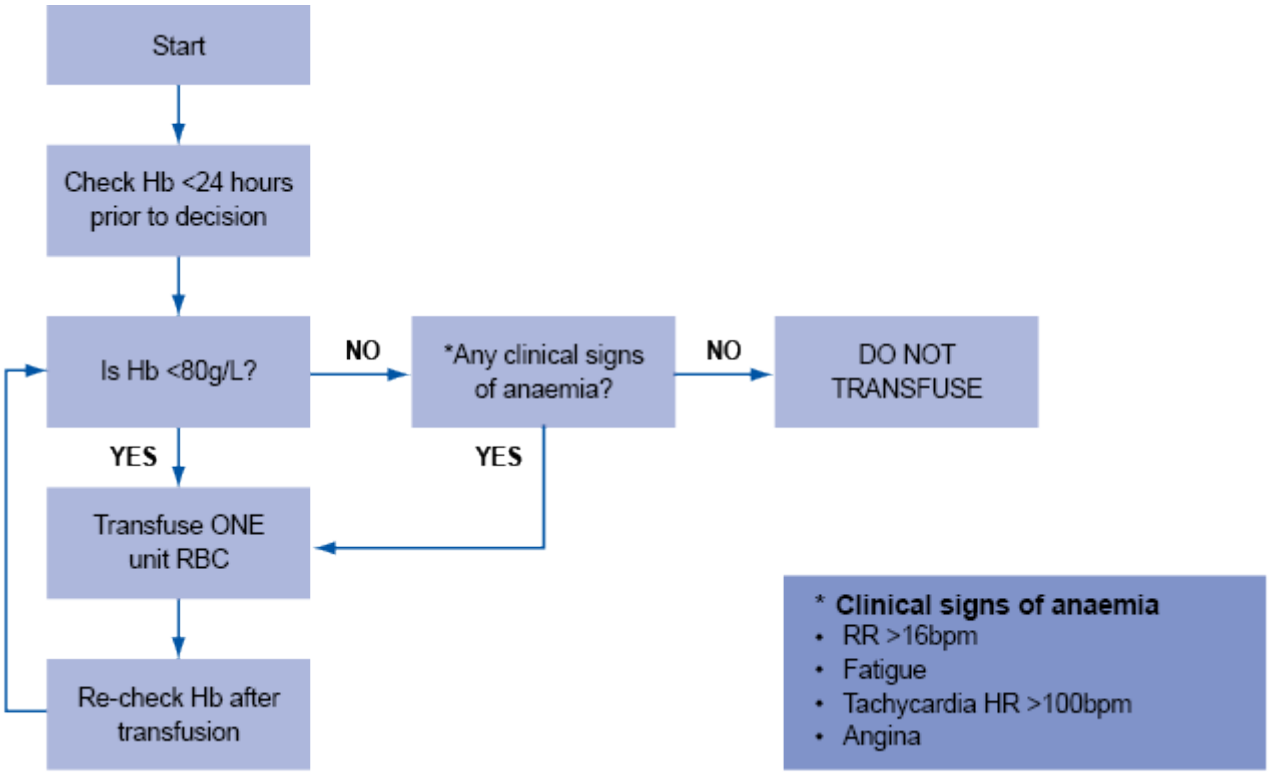
ANAEMIA AND RBC TRANSFUSION

- Longstanding anaemia is often well tolerated and does not require transfusion.
- In acute blood loss, transfusion is usually appropriate if the patient's Hb is <70 g/L. It may be appropriate between 70 and 90 g/L if the patient is unstable, e.g. has angina or is actively bleeding.
- Transfusion is likely to be inappropriate if the Hb is >90 g/L.
- Transfusing patients with immune haemolysis can be hazardous – discuss with Haematologist/Transfusion Specialist.
- Unless the patient is actively bleeding, transfusion is generally for symptomatic treatment. Transfuse one unit at a time and re-evaluate between units.
- In all, except rare circumstances, the target for the post- transfusion Hb should be 70-90 g/L.
- One unit of red cells should raise the Hb in an average adult by 10 g/L.

GUIDELINES FOR RED CELL TRANSFUSION IN PATIENTS NOT ACTIVELY BLEEDING



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TRANSFUSION REACTIONS

FIRST MILD REACTION

Symptoms

- Mild febrile reaction: Temperature increase <1.5˚C from baseline, haemodynamically stable, no respiratory distress and no other symptoms
- Mild allergic reaction: Occasional urticarial spots and no other symptoms

Action

1. Check label and recipient identity
2. Stop transfusion
3. Consider the need to prescribe paracetamol for pyrexia or antihistamines for urticaria. Corticosteroids are not indicated.
4. Resume transfusion and review the patient with increased monitoring, e.g. Temp/HR/RR/BP at 15-30 minute intervals
5. Send ATR (Adverse Transfusion Reaction) notification form to Blood Bank
6. Document in patient's clinical notes. If symptoms increase, treat as a moderate or severe reaction.

https://www.clinicaldata.nzblood.co.nz/resourcefolder/index.php?dhbid=1 (available under Blood Resources on the Te Toka Tumai (Hippo) intranet site)

MODERATE AND SEVERE REACTIONS

Symptoms may include:

- Fever ≥1.5˚C from baseline with or without rigors/chills
- Unexpected tachycardia or change in blood pressure
- Acute breathlessness, desaturation, wheeze, stridor or cyanosis. Consider calling CODE RED
- Facial oedema ± pharyngeal or laryngeal oedema
- Extensive erythematous or urticarial rash
- Acute pain in the transfusion arm
- Chest or loin pain
- Severe apprehension
- JVP acutely elevated, onset of crepitations in lungs
- Haemoglobinuria

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Action

1. **Stop transfusion**. THEN:
    - Urgent medical review required
    - Check label and recipient identity
    - Maintain ABC and monitor vital signs
    - Comfort patient and keep patient informed
2. Replace infusion set; administer sodium chloride 0.9% to keep vein open and/or maintain blood pressure
3. Treat and stabilise patient
4. Obtain specimens based on clinical signs/symptoms (collect away from site of cannula):
    - Blood group serology: One group and Screen (EDTA) tube: send ASAP to Blood Bank with completed form + infusion set + attached blood bag (sealed in a plastic bag).
    - If haemolysis suspected: send full blood count, blood film, coagulation screen, creatinine and electrolytes, haptoglobin, bilirubin, LDH and complete a urinalysis.
    - If sepsis is suspected: send blood cultures to Microbiology.
    - If respiratory distress present: send blood gases.
5. Notify Blood Bank promptly by phone and discuss further transfusion needs and/or any special requirements.
6. For all severe transfusion reactions: inform the NZBS Transfusion Medicine Specialist (TMS) immediately for clinical advice and support. Also discuss with a more senior member of your team.
7. Document in clinical notes.

https://www.clinicaldata.nzblood.co.nz/resourcefolder/menu_reactions.php?dhbid=1 (available under Blood Resources on the Te Toka Tumai (Hippo) intranet site)

ADJUNCT TREATMENT

- Sepsis likely: broad spectrum antibiotics as per severe sepsis antibiotic guidelines.
- Anaphylaxis/anaphylactoid reaction: as per anaphylaxis guidelines; depending on severity can include IM adrenaline and antihistamines.
- Transfusion Associated Circulatory Overload (TACO): diuretics and oxygen, positive airway pressure.
- Transfusion Related Acute Lung Injury (TRALI): respiratory support.
- If HLA antibodies suspected: Transfusion Medicine Specialist (TMS) or Clinical Haematologist will advise.
- Recurrent severe allergic reactions: discuss with TMS or Clinical Haematologist. Use of washed cellular components may be required.
- Acute haemolysis: discuss with TMS. Maintain blood pressure, force diuresis and alkalinise urine.

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THROMBOCYTOPENIA

- A platelet transfusion may be indicated for the treatment or prevention of haemorrhage in patients with thrombocytopenia or significant platelet function disorders.
- The platelet count is the primary trigger for using platelets, with active bleeding and other clinical risk factors for bleeding also influencing the decision to transfuse.
- Indications for transfusion:
- Bone marrow failure:
    - Platelet count <10 x 10^9/L in the absence of risk factors
    - In the presence of risk factors (e.g. fever, antibiotics, or evidence of haemostatic failure) transfuse if platelet count <20 x 10^9/L
    - Surgery/invasive procedure: maintain the platelet count >50 x 10^9/L. For surgical procedures with a high risk of bleeding (e.g. ocular or neurosurgery) it may be appropriate to maintain the platelet count at 100 x 10^9/L.
    - Platelet function disorders: May be appropriate in inherited or acquired disorders. In this situation, the platelet count is not a reliable indicator.
    - Bleeding: Platelet transfusion is appropriate for anyone with platelets <50 x 10^9/L and a significant head injury (before a CT scan). Transfusion is likely to be appropriate in any patient in whom thrombocytopenia is considered to be a major contributing factor to the bleeding.
    - Massive haemorrhage/transfusion: aim to maintain the platelet count at or >75 x 10^9/L (or >100 x 10^9/L in the presence of diffuse microvascular bleeding).
- Dose: 1 unit of platelets is a therapeutic dose (note 1 unit includes donations from 4 donors)
- Discuss with Haematologist.

COAGULOPATHY

- Cryoprecipitate is potentially indicated if bleeding occurs with a fibrinogen level below 1.5 g/L.
- Due to the physiological variation in normal clotting factor levels, the use of FFP and cryoprecipitate should be guided by timely tests of coagulation (e.g. PR, APTT, fibrinogen, and TEG).
- For bleeding patients, aim to maintain the PR at <1.5, the APTT at <1.5 times the control and fibrinogen >1.5 g/L.
- FFP standard dose: 15 mL/kg bodyweight.
- Cryoprecipitate standard dose: 1 unit/30kg bodyweight.

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Specific considerations

Liver disease, acute DIC, massive transfusion or cardiac bypass: FFP may be appropriate in the presence of bleeding and abnormal coagulation. In the absence of bleeding, FFP is unlikely to be appropriate.

Warfarin effect	FFP is rarely indicated in warfarin reversal. See section on warfarin reversal
Liver disease	These patients are often hypercoagulable despite an abnormal INR. Consider checking coagulation with a TEG before transfusing
Chronic DIC	FFP is generally not indicated
Single factor deficiencies	Use specific factors if available (e.g. factor VIII or IX) Note that patients on long term factor replacement should not change brands
Low fibrinogen (<1 g/L)	Use cryoprecipitate if bleeding

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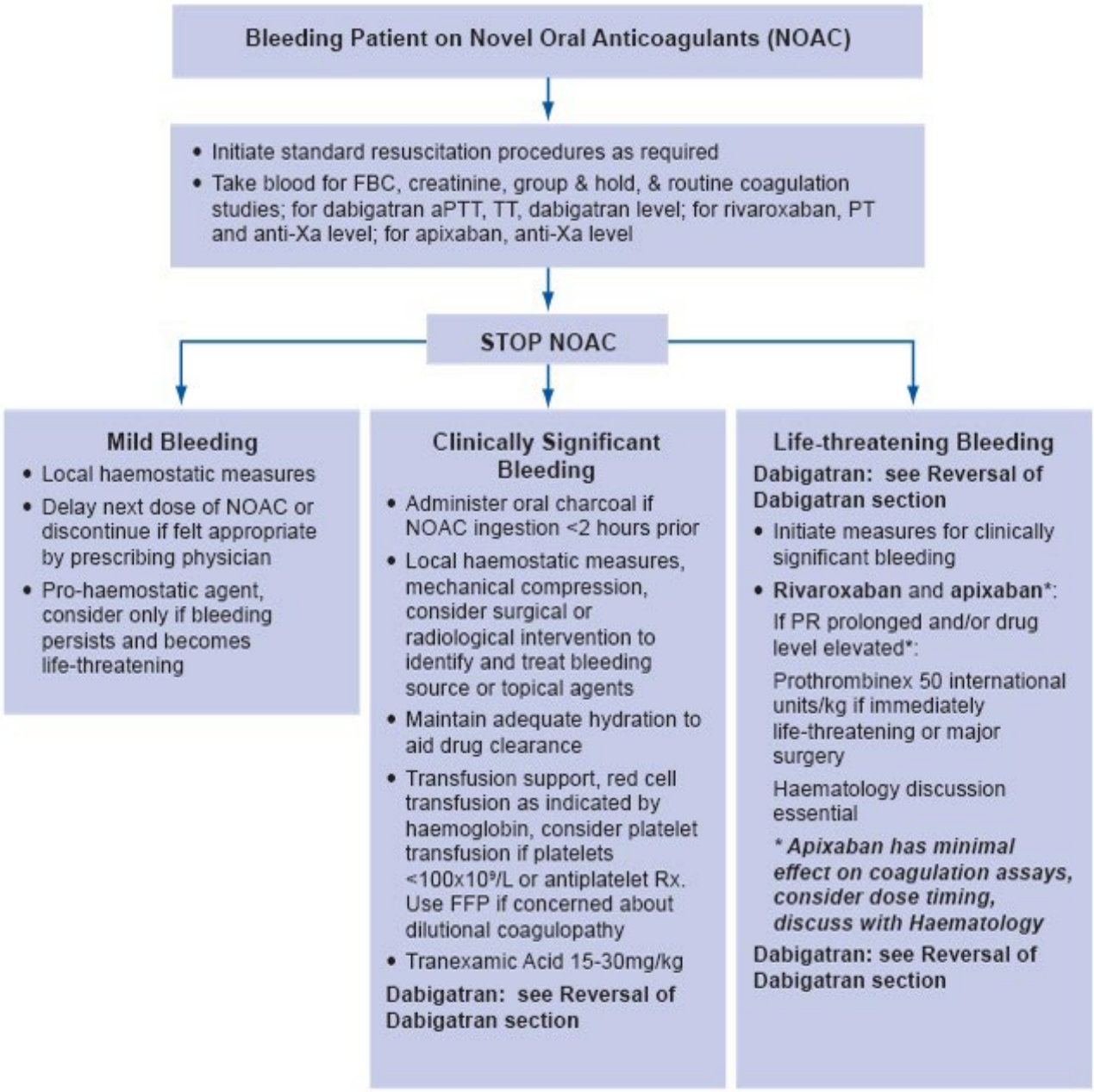
BLEEDING PATIENT ON NOAC



For ANTICOAGULANT REVERSAL GUIDELINES for bleeding complications as well as for pre-operative management, please refer to the Thrombosis and Anticoagulation chapter and the Anaesthesia Services chapter.

PREOPERATIVE MANAGEMENT OF ANTICOAGULANTS

Patients presenting for surgery on warfarin, dabigatran or rivaroxaban require a stepwise plan for cessation or maintenance of the medication depending on the indication, CHADS-VASc score and the type of surgery.

For a summary of anticoagulants and what to do:

https://adhb.hanz.health.nz/site/Anaesthesia/DeptPoliciesGuidelines/Anticoagulants%20and%20Antiplatelet%20Agent%20-%20Elective%20Surgery%20Quick%20Guides.pdf

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Relevant costs as of 2022:

Group and screen test	$54
RBC	$372
FFP	$260
Platelets	$1000
Cryoprecipitate	$487
Intragam P 12g bottle	$1576

ADDITIONAL RESOURCES

- Patient Blood Management (PBM) Team
- Transfusion Nurse Specialist
- Blood Resource folder on the Te Toka Tumai (Hippo) intranet under B for Blood Transfusion
- Patient Blood Management (PBM) on Te Toka Tumai (Hippo) intranet under 'P' https://adhb.hanz.health.nz/Pages/Patient-Blood-Management.aspx
- Transfusion Medicine Handbook, available from Blood Bank
- NZBS website: http://www.nzblood.co.nz
- New Zealand Blood Service patient information brochures, available from Blood Bank
- Notification and Investigation of Adverse Transfusion Reaction, available from Blood Bank

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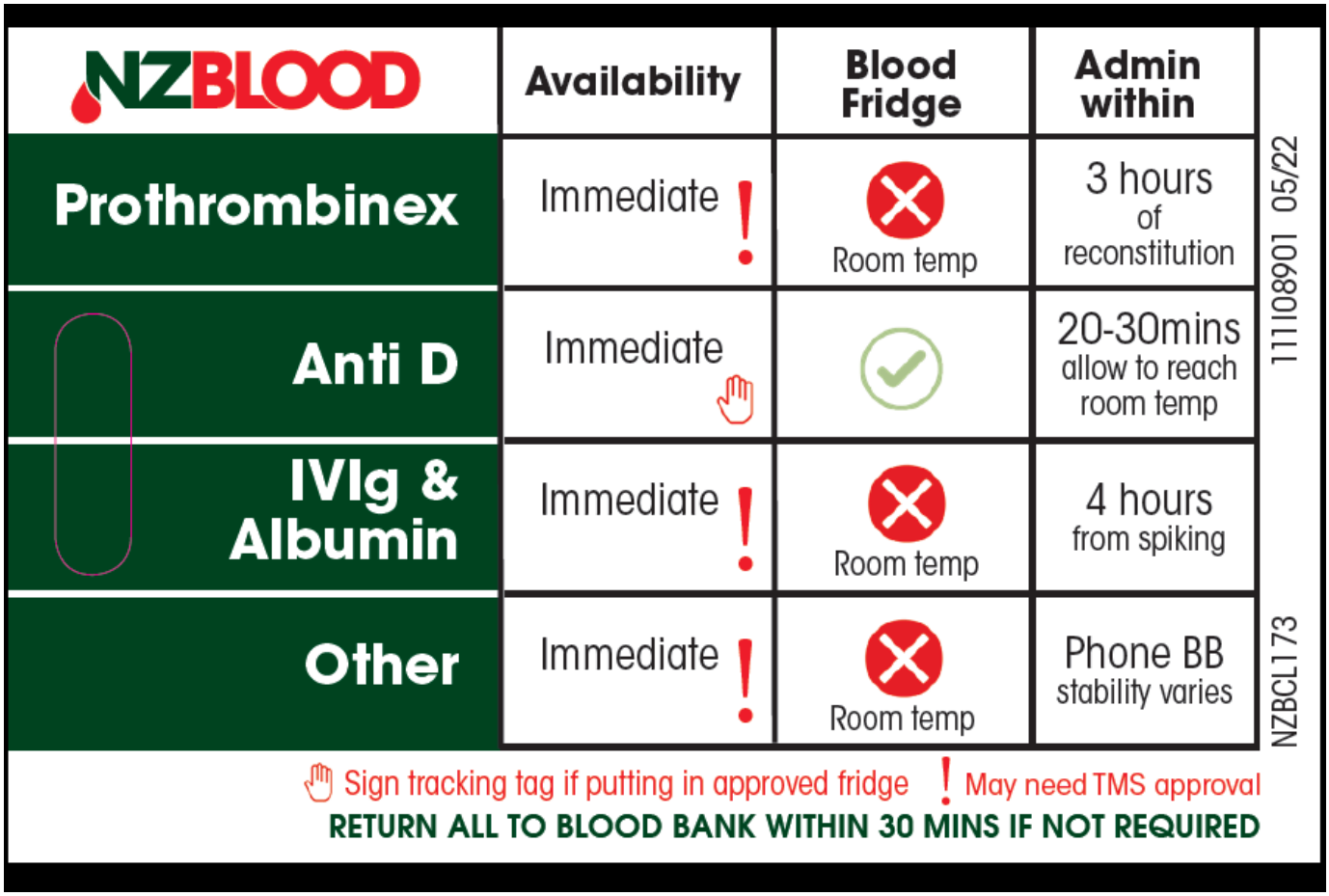

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Adult Massive Haemorrhage Pathway

Massive Bleeding PLUS
Shock Signs or **HR > 120** or **SBP < 90**

Code Crimson MHP	Standard MHP	Obstetric MHP
Trauma + ABC Score ≥ 2 + senior clinician approval	Medical or Surgical Bleeding	
2g Tranexamic Acid	**1g Tranexamic Acid**	**1g Tranexamic Acid**

Send Group + Screen
Initiate: Call Blood Bank **24015**, Provide Patient Details
State "I am requesting (Crimson, Standard, Obstetric) Stat Pack"

Crimson Stat Pack	Standard Stat Pack	Obstetric Stat Pack
2 RBC & 2 FFP or 2 WB	2 RBC or 2 WB	2 RBC

Reassess: Ongoing Massive Bleeding + Shock?
Activate MHP: Identify Transfusion Coordinator, Call Blood Bank **24015**
State "I am activating (Crimson, Standard, Obstetric) MHP"

Crimson Pack 1	Standard Pack 1	Obstetric Pack 1
Straight to Pack 2	2 RBC & 2 FFP or 2 WB	2 RBC, 3 Cryo

Pack 2
4 RBC, 4 FFP
3 Cryo

10ml CaCl OR 30ml CaGluconate with every pack

Pack 3
4 RBC, 4 FFP
1 Platelet*

Alternating packs 2 & 3 until bleeding slowed

Then stop MHP, and start targeted transfusion

Bloods:
- **repeat every 30min**
- Blood gas
- iCa^{2+}
- FBC
- Coags
- Fibrinogen
- Viscoelastic if available e.g. TEG®

Coagulation Targets	If Not, Give
PR < 1.5 | APTT < 40	4 U FFP
Fibrinogen > 2g/L	3 U Cryoprecipitate
Platelets > 75 x 10^9/L	1 U Platelets**
Ionised Ca^{2+} > 1.1 mmol/L	1g Calcium

Obstetric Haemorrhage
- Manage Tone, Trauma, Tissue, Thrombin causes of haemorrhage
- Repeat TXA 1g 30 min after initial dose if significant ongoing bleeding

*See notes on page 2

NZBLOOD Te Ratonga Toto O Aotearoa

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Cardiology

CARDIOLOGY INTRANET SITE

WHO TO CALL

On-call Registrars

After hours and weekends

On-call Registrar for Acute/Admitting (24/7 and after 1600h on the weekend)
On-call Registrar for Ward Referrals (0800-1600h)

Weekdays 0800-1600h

CCU Acute/Admitting and referrals from ward 42 and CVICU
Registrar for Ward Referrals
Cardiology Echo Registrar
Paeds/ACHD
Cath Registrar
EP Registrar
APU/CDU

- **Suspected STEMI**: Call on call CCU Registrar. If on-call CCU Registrar is not immediately available and the diagnosis is definite, call the Interventional cardiologist for STEMI
- **Cardiac Rhythm Monitoring** service for wards: call Acute CCU/ward 34. Refer to CRM policy and decision tree available on intranet
- **Echo Department**
- **Consultants** are on call for intervention, Cardiology (Ward 31), and Acute Cardiac Care Unit (CCU) at all times (24/7). They can be contacted on their mobile via the operator. If a Registrar is not available phone on-call Consultant.

DOES A PATIENT NEED TO BE ADMITTED TO THE ACUTE CARDIAC CARE UNIT?

Discuss with on-call CCU or Ward Referral Registrar.

Decision is made on a case by case basis. Acute clinical scenarios can include:

- Acute coronary syndromes (ACS): STEMI, non-STEMI and unstable angina, Takotsubo syndrome
- Complex arrhythmias e.g. VT, SVT, fast AF, complete heart block

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- Acute pulmonary oedema
- Cardiogenic shock
- Severe hypertension
- Some congenital heart disease patients
- Need for intravenous infusions e.g. Glyceryl trinitrate (GTN), dopamine, dobutamine, milrinone

There is no age limit for admission to CCU.

Acute STEMI

STEMI – ECG DIAGNOSIS

The initial diagnosis of STEMI is based on history and ECG changes.

Transfer to Catheterisation Laboratory should not be delayed for further investigations or results, unless there is a clear clinical indication.

The diagnosis of STEMI requires ST-elevation ≥1 mm in 2 contiguous leads (I and aVL; or II, III, aVF) or ≥2 mm in chest leads V1-3 in males and ≥1.5 mm V1-V3 in females, or LBBB (not known to be old) or RBBB with or without ST elevation:

- ECG must be done immediately on arrival and repeated 15 minutes later.
- Leads V7-V9 (posterior leads) must be recorded especially if there is prolonged (>20minutes) ischaemia without ECG changes or ST depression in V1-V3. This is to evaluate the possibility of circumflex occlusion (≥0.5mm) for which urgent angiography and PCI is indicated.
- All patients with inferior infarctions must have V3R and V4R leads recorded (right-sided leads) to detect RV infarction.

Other ECG findings where urgent angiography and PCI may be considered:

- ST-elevation ≥1 mm in aVR indicates proximal left anterior descending (LAD) or left main stenosis, anterior T wave inversion (Wellens) indicates proximal LAD stenosis, widespread ST depression in ≥8 leads indicates left main stenosis or severe 3 vessel disease.
- **Blood tests:** baseline high sensitivity (hs) troponin (repeated at 3 hours), FBC, electrolytes, creatinine and eGFR calculation (is mandatory, important for medication dosing and risk assessment), glucose and HbA1c, LFTs, lipids.
- Anticoagulation screen is not necessary nor is an urgent CXR (must not delay going to Cath Lab).

Calculate **GRACE score** (see risk assessment under non ST-elevation ACS).

https://www.mdcalc.com/grace-acs-risk-mortality-calculator

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ACUTE MANAGEMENT OF STEMI

Call the on call CCU Registrar who will phone the on call interventional cardiologist and PCI team immediately for acute STEMI

- Aspirin 150-300 mg po STAT (soluble or chewed if enteric coated) if not already given during this episode. Ticagrelor 180 mg po STAT (even if clopidogrel has been given) followed by 90 mg po BD. Note that for patients post fibrinolytic therapy, ticagrelor (with a loading dose) or clopidogrel 75 mg po daily (if ≥75 years of age, no loading dose) should be started at 24 hours.
- O2 by face mask for continuing or recurrent chest discomfort, SOB, heart failure, or shock if spO^2 <95%.
- Treat acute pulmonary oedema as appropriate (see separate section).
- Sublingual glyceryl trinitrate (GTN) and IV morphine (if GTN ineffective) for pain relief.
- IV antiemetics should be given with morphine (metoclopramide 10 mg or cyclizine 25 mg).

PRIMARY PCI

The earlier reperfusion therapy is administered after symptom onset the greater the survival benefit. "Time is muscle" and it is important to fast track treatment and to urgently assess suitability for reperfusion aiming for a door to device time of <90 minutes. Most contraindications are not absolute.

- All patients presenting with STEMI ≤12 hours after symptom onset should be considered for primary PCI. Co-morbidities that may preclude this therapy include dementia (increased cerebral bleeding), advanced frailty, risk of increased bleeding complications, and renal failure approaching the need for dialysis. Discuss with Cardiology Registrar.
- After >12-24 hours, reperfusion therapy may still be of benefit, if there are on-going symptoms or haemodynamic compromise (HR≥100 beats/min, BP≤90 mmHg).
- If the patient is in cardiogenic shock, reperfusion therapy may be urgently indicated.
- Fibrinolytic therapy may have been administered at other hospitals prior to transfer to Auckland City Hospital for rescue PCI or angiography within 2-24 hours.

On-going management after STEMI

ANGIOTENSIN CONVERTING ENZYME (ACE) INHIBITORS

- All patients should receive ACE inhibitors beginning 2 hours after admission if the systolic BP is >100mmHg. Start with low doses (e.g. perindopril 2 mg daily) and increase over several days to maximally tolerated doses.
- If a choice has to be made between β-blockers and ACE inhibitors because of hypotension (BP<110mmHg), prioritise β-blockers if tachycardic or on-going ischaemic symptoms; otherwise, ACE inhibitors are the preferred initial therapy because of effects on cardiac remodelling.
- If patients are intolerant of ACE inhibitors, they should be started on an angiotensin II receptor blocker (ARB).

β-BLOCKERS

- Oral β-blockers should be started within 3 hours in all patients who are in NYHA class I or II and without contraindications.

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- Commence with caution in patients with asthma requiring regular inhaled therapy, or if systolic BP <110 mmHg, heart rate <50 bpm or PR interval >0.24s.

- Don't use if Mobitz type 1 or greater heart block.

STATINS

Statins are indicated in all patients without contraindications and should begin immediately on day 1 (e.g. Atorvastatin 80 mg daily). The target LDL-C is <1.4 mmol/L.

HYPERTENSION

- If systolic BP ≥140 mmHg, start ACEi and assess response.

- If already on ACEi, add β-blocker and consider amlodipine or diuretic.

- If systolic BP ≥160 mmHg, consider administering IV Glyceryl trinitrate (GTN), particularly in patients with pulmonary oedema.

DIABETES

- In patients with a blood glucose ≥11 mmol/L, an insulin regimen should be given as recommended in the Diabetes chapter.

- A Variable Rate Intravenous Insulin Infusion (VRIII) is not recommended.

RENAL FAILURE

Refer to the Renal Medicine chapter, especially in relation to angiography.

Complications of myocardial infarction

The majority of deaths in hospitalized patients are due to LV pump failure or mechanical complications, including myocardial rupture.

- A number of mechanical complications may occur including:

  Mitral regurgitation, ventricular septal defect and free wall rupture – all of which require urgent echocardiography. Call the Registrar immediately.

- Arrhythmias (ventricular or atrial) are frequent. For treatment, see section on arrhythmias.

- If patients have on-going ischaemia (an ECG should be obtained during symptoms to document the degree and extent of ischaemia) urgent angiography should be considered.

- Delayed complications may also occur, including post-myocardial infarction syndrome and DVT/PE.

CARDIOGENIC SHOCK

The presence of shock due to left ventricular dysfunction following MI implies ischaemia/ infarction of a large area of myocardium, and without urgent PCI or Coronary Artery Bypass Grafting (CABG), is associated with 70-80% in-hospital mortality.

- Shock is defined as hypotension for ≥30mins (systolic BP ≤90mmHg or requiring inotropes to keep the systolic BP >90 mmHg for 30mins) unresponsive to fluid resuscitation.

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- In patients without important comorbidity, the interventional team should be contacted immediately with a view to proceed to angiography and PCI. Oxygen and inotropic support should be commenced immediately. Contact CVICU if patient does not respond to initial resuscitation, particularly if associated hypoxaemia not corrected by supplemental O2.

- Urgent echocardiography is required to assess LV and RV function and to assess for the presence of complications of MI.

RIGHT VENTRICULAR INFARCTION

This is diagnosed clinically or by ST-elevation (≥ 1mm) in right precordial leads (V3R, V4R) or on echocardiography. Patients may have a raised JVP, hypotension and clear lung fields.

- All patients should get adequate fluids e.g. at least 2 litres in the first 24h. Hypotensive patients should have a fluid challenge e.g. 200 mL of sodium chloride 0.9% IV over 10-15 minutes.

REINFARCTION

Approximately 2% of patients experience reinfarction in hospital and this is associated with increased mortality and more frequent heart failure, cardiogenic shock and ventricular arrhythmias.

Diagnosis is based on symptoms, ECG changes and a 20% re-elevation of hs-troponin levels.

- hs-troponin should be measured at the onset of symptoms and repeated after 3 hours

- Urgent angiography should be considered

Early and ongoing management of ACS

Evidence-based medical therapy should include (unless contraindicated):

- Aspirin po 100 mg (enteric coated) daily.

- Ticagrelor po 180 mg STAT and 90 mg po BD continued for 1 year. A shortened duration (e.g. 3 or 6 months) may be considered in patients with a higher bleeding risk. Special Authority application needed. Ticagrelor is currently started after admission if presenting with non-STEMI. In clinically stable patients, dual antiplatelet therapy can be deferred until coronary angiography, if within 48 hours.

- Clopidogrel 300 to 600 mg loading dose then 75 mg once daily is an alternative P2Y12 inhibitor to ticagrelor. It may be indicated in some patients e.g. intolerant of ticagrelor, on dialysis, moderate hepatic dysfunction, severe lung disease, ≥Mobitz type 1 conduction system disease.

- Enoxaparin (clexane) 1 mg/kg BD (maximum 100 mg Q12H) is recommended in patients with non-STEMI until coronary angiography. Reduce dose to 1 mg/kg once daily if severe renal impairment (eGFR <30 mL/min).

- β-blockers (e.g. carvedilol, bisoprolol, or metoprolol CR) with titration to full dose as tolerated in patients with left ventricular ejection fraction <50%.

- ACE inhibitors or ARB with titration to full dose as tolerated.

- Statin therapy: Usual treatment is Atorvastatin 80 mg/day. Ezetimibe (requires special authority) should be started or instructions given to GP to do so if LDL-C is >2 mmoL/L despite full dose statin.

- Nitrates are indicated for angina (GTN spray and/or isosorbide mononitrate). Patients who have been fully revascularized are unlikely to benefit from nitrates.

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- Calcium channel blockers do not improve prognosis following myocardial infarction. They can be used for symptomatic angina e.g. felodipine ER 2.5mg daily and increased gradually (if required) to 10 mg daily.

- Patients with left ventricular thrombus should be anticoagulated with the plan to repeat echocardiography at 3 months.

- Spironolactone is recommended in patients treated with β blockers and ACE inhibitors/ARBs who have a left ventricular ejection fraction ≤40% and either heart failure (defined as the presence of basal crepitations, pulmonary hypertension on a chest X-ray, or a third heart sound) or diabetes, provided the CrCl is >30 mL/min, and potassium is <5.0 mmol/L. Consider eplerenone 25 mg daily if intolerant to spironolactone (requires special authority).

Echocardiography

TTE should be performed in all patients to assess left and right ventricular function, presence of cardiac thrombi or pericardial effusions, valve structure and function, chamber size and to assess alternative diagnoses. e.g. Takotsubo syndrome.

All patients should have an echo to assess ejection fraction before discharge.

The All NZ Acute Coronary Syndromes – Quality Improvement System (ANZACS-QI)

All New Zealand Acute Coronary Syndrome – Quality Improvement (ANZACS-QI) is a decision support system for cardiovascular disease (CVD) management, for patients after they have experienced an acute cardiovascular event.

ANZACS-QI includes a CVD and Diabetes Decision Support module, an Acute Coronary Syndrome (ACS) Assessment form and a coronary angiography assessment form for the catheter/PCI lab (Cath/PCI Lab form). There is also an EP device database and a Structural Heart database.

It should be completed before hospital discharge in patients admitted with an ACS, or who have a device implanted.

Linked to these databases is a research module which is utilised by Research teams around New Zealand.

Workflow-management prompts are built into the system and users will have access to many or all of the following depending on their individual access level:

- On-line resource library
- Extensive reporting tools
- Data Extract Tool
- Patient search and history views
- Multi-tier user structure
- Patient management status
- Filtered quick links

Please ask the CCU nurses to show you how it works.

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Cardiac rehabilitation

Most patients should be referred to the Cardiac Rehabilitation Service and encouraged to attend rehabilitation programmes, to quit smoking, undergo regular exercise (30 minutes of brisk walking or equivalent on most days of the week), and have a cardio-protective diet. The rehabilitation nurse will tailor advice to the individual patient about return to work, sexual activity and flying.

Indications: post cardiothoracic cardiac surgery (includes CABG, valves and aortic dissections), acute coronary syndrome (ACS), moderate CAD on angiogram, myocardial infarction with non-obstructive coronary arteries (MINOCA), spontaneous coronary artery dissection (SCAD), Takotsubo syndrome.

Patients not suitable: severe confusion and dementia, active psychosis, extremely frail or for palliative care. Renal dialysis patients are seen on a case by case basis (as per patient's wishes).

Contacts

Referral pathway. We screen referrals ourselves, however you can contact any of the team:

Wendy Marshall

Jenna Keepa

Cathy Gasparini

Sarah Jane Brown

Susan Reed

Information needed on referral: If you need something specific like follow up of BP management, AF heart rate management please let us know.

For **driving guidelines** see *Medical Aspects of Fitness to Drive* issued by the Land Transport Safety Authority (available on the wards) or in pdf format:

https://www.nzta.govt.nz/resources/medical-aspects/?%20category=&subcategory=&audience=&term=Medical+Aspects+of+Fitness+to+Drive

In general, patients should not drive for 1 day post-angiogram and 2 weeks post-MI.

For heavy truck drivers, 3 months off work is required. Advice needs to be tailored for individual patients e.g. those with LV ejection fraction ≤35%, heart failure, continuing arrhythmias, or complications of PCI.

SMOKING CESSATION

All patients should be advised to stop smoking and commenced on nicotine patches or lozenges on the first day after admission (consult Specialist Smoking Cessation Nurse).

DISCHARGE

The discharge summary is an important document.

It is important to include the final diagnoses, results of relevant investigations, plans for ongoing management and follow-up, and changes to medication and reasons.

The Cardiology Discharge Summary template includes an ACS Medication checklist. This must be completed for all Cardiology patients, to ensure the correct bundles of care are being prescribed, that we are

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explaining any variances from recommended best practice and are ensuring clear communication with our patients and primary health colleagues.

Many STEMI patients can be discharged on day 3 with transfer to the transition lounge rather than needing a bed in CCU. Patients from Northland District Health Board catchment can be transferred back to the base hospital on day one for continuing management, including rehabilitation.

Adult Congenital Heart Diseases (ACHD)

Specialist Staff

Consultants – Drs Tim Hornung, Clare O'Donnell, Ivor Gerber, Boris Lowe, Kathryn Rice, Chethan Kasargod

Nurse Practitioner – Ms Jane Hannah

Nurse Specialists – Ms Christine Armstrong, Ms Stephanie Jones, Ms Grace Bradford

Contacts

Please contact the Nurse specialist (NS) if an ACHD patient is admitted to your specialty e.g. Fracture Femur in a Cyanotic patient, appendicitis in Fontan patient etc. The team will either review them in person or provide phone advice as necessary.

- Nurse Specialist or ACHD Fellow (Mon-Fri 0800-1600h)
- After-hours call on-call Cardiology Registrar

ACUTE CARE

Initial treatment is usually the same as for other adult cardiology patients. Principles of resuscitation are the same.

For more complex ACHD patients who need to go to theatre for non-cardiac or cardiac procedures, it is advisable to discuss with an ACHD anaesthetist.

- The patient and family are likely to know much more than us about their heart condition and the surgeries they had – be prepared to listen. Good history taking is the key as always.
- Chest pain in young patients with congenital heart disease may need further evaluation, e.g. coronary artery implantation issues etc.
- In-patients with shunt lesions (ASD/VSD/ PDA/ Eisenmenger's etc.) – use IV filters (available in ED and Cardiology wards) to avoid systemic embolism i.e. stroke. However, in a lifesaving situation such as cardiac arrest when a drug/ fluid needs to be admitted STAT, IV filters cannot be used because of their slow flow rate.
- Cyanotic patients (e.g. Eisenmenger's) should have a high Hb. Coagulation results may be unreliable in patients with high Hb unless the citrate in the tube is adjusted. Venesection is rarely indicated in these patients. Please discuss with ACHD Consultants before venesection.
- Fontan Palliation does not mean they are palliative – please actively treat. Fontan circulation thrives on preload. A normal JVP may still mean the patient is dehydrated, so assess fluid status carefully. Most of them require fluid replacement if they are NBM.
- Complex ACHD patients (e.g. Mustard/ Sennings repair, Fontan etc.) are prone to tachyarrhythmias but also have background sinus node dysfunction. This needs to be taken into account when deciding on arrhythmia management.

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- Coarctation (repaired or unrepaired) patients: check BP in both arms (BP in left arm may be falsely low).
- Fever in ACHD patients with prosthetic materials or untreated shunt lesions or new murmurs warrants careful investigation (blood cultures, imaging etc.) if no other primary source of infection is found.
- If a pregnant ACHD patient is admitted for any reason, inform our Nurse Specialist or Fellow on the numbers provided above.

How to organise Cardiac CT including CCTA (CT coronary angiogram)

Inpatient cardiac CT: send e-mail to the group email labeled #ADHB-Cardiac CT. This can be found on the global address book.

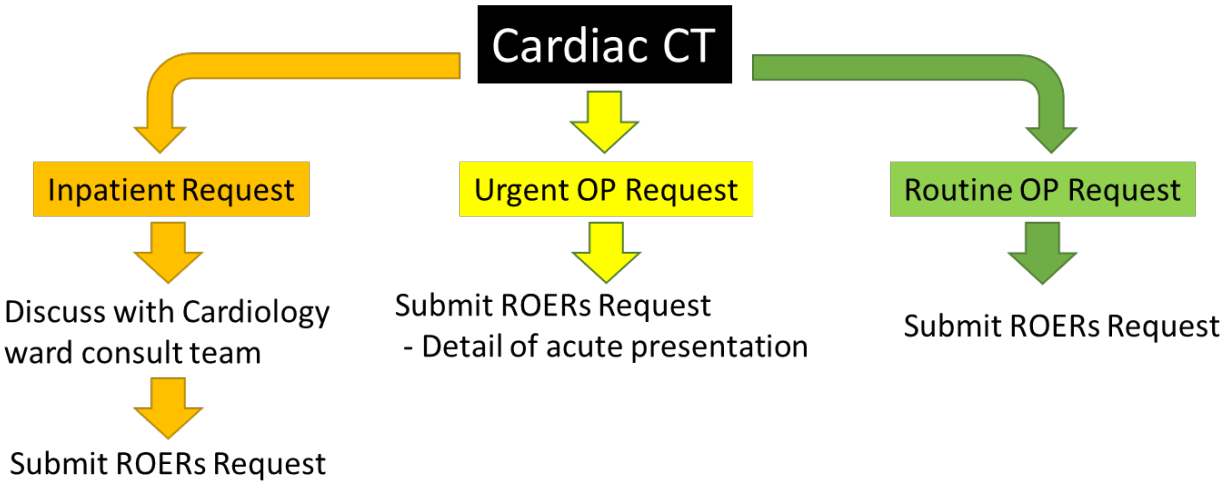
All inpatient requests should be discussed with on-call Cardiology Registrar who will discuss with on-call Cardiologist to ensure appropriateness of CT request and to guide downstream management.

- Once CT is deemed appropriate by the Cardiology ward consult team, ROERs request can then be submitted – and email patient details including renal function and resting heart rate to: #ADHB-Cardiac CT.
- In patients presenting with low to intermediate risk acute chest pain with negative troponin, early outpatient CCTA can be performed within 7 days. At time of discharge, ROERs request should be submitted with details of the acute chest pain to ensure CTCA is performed within 7 days of discharge.

Patient preparation

- Recent renal function test
- 18G IVL in the antecubital fossa on the right
- HR of <70 bpm
    - This can be achieved with metoprolol tartrate 1-2 hours prior to scan time

Figure. Cardiac CT request workflow



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Cardiac CT

Common indications:

- Coronary CT angiogram (CCTA / CTCA)
- Transcatheter aortic valve replacement CT imaging (TAVR CT)
- Pulmonary vein isolation CT (PVI CT)

Coronary CT Angiogram (CCTA / CTCA)

- Coronary computed tomography angiogram is a dedicated ECG-gated cardiac CT scan evaluating the coronary arteries for coronary atherosclerotic disease.
- This involves radiation dosing and use of iodine-based contrast injection.

What are the indications for CCTA?

- CCTA is an excellent diagnostic tool in the exclusion of obstructive coronary disease in the following cohort of patients
    - Patients with stable chest pain
    - Patients with troponin negative acute chest pain

When is CCTA not appropriate?

- When clinical suspicion of obstructive coronary disease is high
- Inability to provide consent
- Inability to lie flat for 15 mins
- Anaphylaxis with iodine-contrast agent
- Renal impairment with eGFR <30 mL/min/1.73m^2
- Contra-indication to iodine-contrast agent such as untreated thyroid disease
- Tachycardia (HR >80 bpm) where IV metoprolol is contra-indicated

Acute rheumatic fever and rheumatic heart disease

Acute rheumatic fever (ARF) and rheumatic heart disease continue to be a significant concern in New Zealand. Recurrences of rheumatic fever are likely in the absence of preventative measures and may cause further severe cardiac valve damage (rheumatic heart disease (RHD)), leading to heart failure, strokes and premature death. Bacterial endocarditis is a common complication of RHD, and antibiotic prophylaxis is indicated for these individuals.

Contacts

- If you have a patient with possible or suspected acute rheumatic fever, or rheumatic heart disease not under regular follow up with Cardiology, go to https://adhb.hanz.health.nz/Pages/Rheumatic-Fever-and-Rheumatic-Heart-Disease.aspx for all contact numbers, information relating to diagnosis, management and current guidelines.

- The Rheumatic Fever Nurse Specialist

Bacterial endocarditis

- Bacterial endocarditis should be considered as a cause for fever of unknown origin, especially if in association with heart failure, cardiac murmurs or embolic phenomena.
- Have a high index of suspicion of infective endocarditis (IE) for patients with prosthetic cardiac valves, previous IE and congenital heart disease (especially those with shunts, conduits, prosthetic material, or residual defects).

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- It is vital that blood cultures (3 separate sets) are taken before treatment is started.
- Infectious disease (ID) consultation is essential when the diagnosis is strongly suspected.

Investigations

- It is vital that blood cultures (3 separate sets) are taken before treatment is started
- ECG
- MSU, before therapy
- Electrolytes, Ca^{2+}, glucose, creatinine, eGFR, LFTS + differential
- Echocardiogram

Treatment

Note: Treatment should be initiated after blood cultures are taken, and ONLY after consultation with ID

- Usual initial therapy: benzylpenicillin 1.2 g IV q4h (flucloxacillin 2 g IV q4h should be used if staphylococcal sepsis suspected e.g. IV drug user) + gentamicin 3 mg/kg IV daily (with advice from ID about ongoing therapy)

Monitor: Daily assessment for signs of on-going sepsis (fever), valvular regurgitation (new or changing murmur), cardiac failure, embolic phenomena (assess all peripheral pulses and fundi daily), arrhythmias and regular ECGs, especially for the development of a prolonging PR interval in patients with aortic valve endocarditis.

Notify your Registrar immediately if any of the above events occur or if any other related new findings are noted, as these findings are usually an indication to consider surgery. Renal function and antibiotic levels should be closely monitored (twice weekly for gentamicin). Baseline and weekly audiometry should be organised when gentamicin is prescribed.

Outpatient treatment: Some patients may be suitable for home therapy when medically stable and if surgery is not indicated.

Assessment of acutely hypertensive patient

KEY SYMPTOMS

- Chest discomfort (acute coronary syndrome/aortic dissection)
- Back pain (possible dissection)
- SOB (heart failure)
- Headache (encephalopathy)
- Nausea and vomiting
- Reduced level of consciousness (LOC) (seizures, encephalopathy)
- Headache + sweats + palpitations (phaeochromocytoma – but rare)
- Drug intake (including recreational): NSAIDs, steroids, sympathomimetics, liquorice, cocaine, amphetamines, erythropoietin, cyclosporin

KEY SIGNS

- BP – right versus left arm (possible dissection)
    - Use correct cuff size
- Impaired LOC
- Reduced O^2 saturation (heart failure)
- Diastolic murmur (AR/dissection)

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- Chest crackles/raised JVP (heart failure)
- Renal bruit
- Radio-femoral delay (coarctation)
- Fundoscopy (retinal haemorrhage/papilloedema)
- Focal neurology (encephalopathy, stroke, etc.)

INVESTIGATIONS

- Electrolytes, creatinine, eGFR, glucose and lipids
- ECG, chest Xray
- Urine dipstick/urinalysis
- Echocardiography for LV hypertrophy, LV function
- Renal ultrasound/plasma metanephrines/aldosterone and renin as needed

HYPERTENSIVE URGENCY OR EMERGENCY?

HYPERTENSIVE URGENCY

- Often asymptomatic, no strict BP definitions
- Hypertension (>180/120 mmHg) without end organ damage

Management – hypertensive urgency

- Not necessary to immediately restore a "normal" blood pressure.
- Rapid falls in blood pressure may promote ischaemia (cardiac, cerebral, renal).
- Hypertensive urgency can usually be treated with oral medication and bed rest. Control BP over hours to days. Monitor BP 1-4 hourly. Ultimately combination therapy is usually required.

Consider initially (orally):

- Calcium channel blockers
    - Felodipine ER 2.5-5 mg daily
    - Amlodipine 5 mg daily

- β blockers (uptitrated as tolerated)
    - Metoprolol CR 23.75-47.5 mg daily (max 195 mg/24h)
    - Labetalol 200 mg po every 2 hours (max 1200 mg/24h)

- ACE inhibitors e.g. perindopril 4 mg daily or lisinopril 10 mg daily

HYPERTENSIVE EMERGENCY

- Not necessarily defined by absolute BP alone. **It is the presence of progressive end-organ damage** (e.g. encephalopathy/aortic dissection/heart failure/acute coronary syndrome/intracranial haemorrhage/fundal haemorrhage or papilloedema)
- Thus: BP 160/100 mmHg + pulmonary oedema = hypertensive emergency.

Management – hypertensive emergencies

- May need parenteral therapy e.g. IV GTN

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- Reduce mean arterial BP by no more than 25% (within 1 hour) and then to 160/100 mmHg within few hours
  Note exception: Aortic dissection ideally requires lowering of systolic BP to <100 mmHg rapidly

Treatment

- If heart failure or fluid overload present – IV frusemide +/- IV GTN
- If cardiac ischaemia – IV/po metoprolol or labetalol
  - IV metoprolol 5-10 mg initially followed by metoprolol CR 23.75-95 mg po daily
  - IV labetalol 20 mg over 1 minute (40-80 mg boluses may be repeated at 5-10 min intervals to a total of 300 mg or can give 300 mg infusion at 2 mg/min)

Heart function service

Indications

- HFrEF or HFpEF
- Any patient with heart failure symptoms/signs who the team feel would benefit from introduction/up-titration of guideline based heart failure therapy (including stable HF)
- Patients who require fluid management/education (including complex fluid management in HFpEF)
- Patients that require rapid up-titration including those with early discharge
- IV diuresis in outpatient setting (Ward 38)
- OP iron infusions in patients with HFrEF

Referral process

- For in-patients call the heart function service phone during working hours.
- Can also send e-referral online to heart failure service – these are triaged regularly.
- Please include name of SMO in charge of care.

Specific requirements/patients not suitable

- Patients must be willing to engage with service and have commitment to follow-up.
- Consider early referral to Maori and Pacific health navigators for suitable patients.
- Patients with severe renal dysfunction/significant other organ dysfunction who are unable to have medication up-titration should not be referred.
- Patients with a guarded prognosis may be better served with primary care follow-up.

Team members

Helen McGrinder (Nurse Practitioner)

Maria Mathews (Nurse Specialist)

Melinda Copley (Nurse Specialist)

Prof Rob Doughty (Cardiologist)

Shakiya Ershad (Cardiologist)

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Acute Heart Failure

Syndrome comprised of:

- Symptoms (breathlessness on exertion or at rest, fatigue, fluid retention, ankle oedema)
- Signs (tachycardia, 3rd heart sound, elevated JVP, ankle oedema, lung crackles, hepatic congestion, hepatojugular reflux, diaphoresis)
- Chest x-ray (pulmonary venous congestion, interstitial pulmonary oedema, pleural effusions, cardiomegaly)
- Underlying abnormality of cardiac structure or function on echocardiography

Once heart failure is diagnosed, treatment should be instigated and efforts made to determine the underlying cause.

AETIOLOGY

Common underlying disease processes include:

- Ischaemic heart disease
- Hypertension
- Cardiomyopathy
- Valvular heart disease
- Myocarditis
- Recreational drugs e.g. methamphetamine, cocaine
- Others including toxins (e.g. alcohol, cytotoxic drugs, congenital heart disease, cor pulmonale)

Other factors commonly contribute to exacerbations of heart failure, for example:

- Arrhythmias (particularly atrial fibrillation)
- Infection
- Concomitant medical therapy (NSAIDs, steroids)
- Non-adherence to medical therapy and lifestyle recommendations (fluid and salt restriction, diuretics, etc.)
- Other medical conditions (anaemia, thyrotoxicosis, renal failure, etc.)

INVESTIGATIONS

- NT-proBNP is very useful if diagnosis of heart failure is uncertain in a breathless patient. Should not be performed routinely on admission, to assess prognosis or titrate therapy
- Echocardiogram may be required acutely to assess LV & RV systolic function, LV diastolic function, valvular function, pulmonary artery pressure, hypertrophic cardiomyopathy, etc. Also may allow identification of precipitating cause and provide prognostic information (severity of systolic or diastolic dysfunction)

Identification of precipitating cause

- ECG (cardiac rhythm, myocardial ischaemia, myocarditis, pericarditis, takotsubo syndrome, LVH)
- Blood tests (electrolytes, creatinine, eGFR, FBC, thyroid function, consider ferritin, iron saturation, iron-binding capacity)
- Arterial blood gas if acutely unwell

When to refer to Cardiology

1. Acute pulmonary oedema
2. Unable to lie flat

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3. Systolic BP ≤90 mmHg
4. PaO_2 <90% despite oxygen administration
5. Ejection fraction ≤35%

THERAPY

Management of acute pulmonary oedema:

1. ABC, sit patient upright, ECG/BP monitoring.
2. Oxygen to maintain SaO2 >95%.
3. Frusemide 40 mg IV; repeated prn to initiate diuresis. Effective dosages vary and patients already on frusemide may require higher doses. Frusemide infusion may also be considered.
4. Consider IV GTN if there is no rapid improvement with above therapy and patient is not hypotensive.
5. Consider inotropes e.g. dopamine, dobutamine or milrinone.
6. Opioids relieve dyspnoea and anxiety but routine use is not recommended. There are controversies regarding the potentially elevated mortality risk in patients receiving morphine.
7. Consider assisted ventilation e.g. continuous positive airways pressure (CPAP) via face mask or intubation/ventilation in severe pulmonary oedema.
8. Consider early involvement of CVICU.

Management of patient with cardiogenic shock/pre-shock i.e. compromised cardiac output with poor peripheral perfusion and/or hypotension BP<90 mm/Hg for 30 minutes despite fluid loading: Call on-call acute CCU Cardiologist immediately

1. Early involvement of CVICU
2. Treat correctable causes early e.g. heart block, STEMI, rapid AF
3. Inotropic therapy may be required
4. Acute cardiac catheterisation and primary PCI may be indicated

Heart Failure with preserved ejection fraction (HFpEF) and heart failure with mid-range ejection fraction (HFmrEF)

Diagnosis requires:

- The presence of symptoms and/or signs of HF
- A 'preserved' EF is defined as LVEF ≥50% and 40-49% for mid-range
- Objective evidence of other cardiac functional and structural alterations underlying HF
- Elevated NT-pro BNP

Diuretics are recommended in congested patients with HFpEF or HFmrEF in order to alleviate symptoms and signs.

Further management of patients with heart failure and management of chronic heart failure:

1. All patients admitted with heart failure should be referred to the heart failure Nurse Specialists.

2. During the in-patient stay daily weighing is mandatory; aim for effective diuresis to achieve clinical dry weight.

3. Consider appropriate additional medications for patients with chronic heart failure including:

    a. ACE inhibitor / angiotensin II receptor blocker therapy (aim to titrate to maximum tolerated dose against BP and creatinine). ARBs are preferred for transition to valsartan with sacubitril (Entresto®). See below.

    b. β-blocker therapy: initiate at low dose (carvedilol 3.125 mg BD, metoprolol CR 23.75 mg daily, bisoprolol 1.25 mg daily). **Note:** β-blockers remain contraindicated at the time of acute

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pulmonary oedema. In general beta-blockers should be continued in patients with decompensated heart failure already on a beta-blocker, unless there is a specific reason to stop.

c. Spironolactone in patients with NYHA Class III/IV heart failure (moderate to severe symptoms) and LVEF <35%. Start with 25 mg daily. **Note:** risk of hyperkalaemia when combined with ACE inhibitor therapy, therefore monitor potassium. Withhold if potassium >5.5 mmol/L. Spironolactone is contraindicated in patients with severe renal failure but can be prescribed if the CrCl is >30 mL/min and potassium is <5.0 mmol/L.

d. Oral amiodarone (200 mg TDS) can be considered for AF rate control. If IV amiodarone is required, it should be given via a central line if possible due to the risk of thrombophlebitis. Use a large bore peripheral vein if a central line is not available and oral administration is not appropriate. For IV amiodarone, initially give 150 mg over 30 minutes (and repeat), then reassess to see if further intravenous administration is necessary. It is best to switch to oral therapy as soon as able to avoid sclerosing veins.

e. Valsartan with sacubitril (Entresto®) should be initiated if NYHA class II to IV, ejection fraction ≤35%, and patient is receiving optimal standard chronic heart failure treatment (requires special authority). Must have ACEi stopped for 36 hours before starting because of risk of angioedema.

DISCHARGE

Appropriate follow up with the patient's GP +/- outpatient clinic and heart failure nurse should be arranged on discharge. General practitioners may refer to the heart failure care pathway.

Cardiac Arrhythmias

General considerations

- A clinical assessment of the patient is paramount. If there is evidence of haemodynamic compromise a Code Red should be called. If the patient is pulseless a Code Blue should be called irrespective of the rhythm present.
- Understanding the patient's past arrhythmia history is a key aspect of future arrhythmia management. This includes what specific arrhythmias the patient has previously had, and how they were treated. For example, a patient with previous SVT that failed to respond to adenosine 6 mg but reverted with 12 mg should receive 12 mg initially if they have further SVT.
- A careful review of medications is important; both prior to hospital and during the hospital stay. For example, pre-operative withdrawal of rate slowing medications in a patient with permanent atrial fibrillation can contribute to rapid ventricular rates post operatively.
- A 12 lead ECG is the key investigation for patients either with or suspected to have a cardiac arrhythmia.
- Key additional investigations include haemoglobin, creatinine, potassium, and sodium. Other investigations that should be considered include magnesium, calcium, acid/base, thyroid function, and chest x-ray. For patients treated with digoxin, consider measuring the digoxin level as appropriate.
- Telemetry / Flexible cardiac monitoring is not a treatment for arrhythmia and its use should be discussed with your Registrar and/or Consultant.
- Discuss all patients who you have provided treatment for an arrhythmia with your on-call Registrar in the first instance and then decide whether a subsequent referral to the General Medical or Cardiology Registrar is appropriate.

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Specific arrhythmias and considerations

Sinus bradycardia, 1st degree AV block, type 1 second degree block (Wenckebach)

- These can be considered to be at the more benign end of the arrhythmia spectrum.
- Acute treatment is only required if the patient is symptomatic with dizziness, syncope, heart failure, angina, or has evidence of end-organ hypoperfusion. These issues seldom occur when the heart rate is greater than 40 bpm, but often does when less than 30 bpm.
- Initial treatment, when required, is atropine 0.6 mg.

Type 2 second degree AV block and third degree (complete) AV block

- These are seldom benign and can result in severe bradycardia.
- If severe bradycardia occurs, initial treatment is atropine 0.6 mg.
- When managing these patients it is important to consider suitable placement in a monitored area where rapid and at times emergent treatment can be provided. Please always discuss with Registrar or Consultant.

Supraventricular tachycardia

- Initial management is with vagal manoeuvres, such as the Valsalva. The efficacy of the Valsalva manoeuvre is increased by slight elevation of the feet (perhaps 10-20 cm above the hips when lying flat).

- Second line management with adenosine should be provided under the supervision of a Registrar or Consultant. This should be administered in an environment with continuous cardiac monitoring. The usual initial dose is 6 mg or 12 mg. Airways disease is not a contra-indication to adenosine. Lower doses (such as 3 mg or 6 mg) can be considered for those with prior heart transplant or those on dipyridamole. Note theophylline antagonises the effects of adenosine (making it less effective) so higher adenosine doses may be required in patients taking theophylline.

- Cardioversion is reasonable if severe haemodynamic compromise is present, though adenosine remains preferred in this situation due to its rapid time to effect.

Atrial fibrillation and flutter

- The primary goals of management are to identify any potential precipitant and to provide ventricular rate control.

- If tachycardia is due to (or contributed to by) the withdrawal of the patient's usual medical rate control treatment, discuss restarting this with your Registrar.

- If the ventricular rate is >110 bpm use metoprolol tartrate 25 mg, or diltiazem 60 mg (not extended release) which can be repeated 2 hours later (onset of action for oral metoprolol is within one hour).

- Oral amiodarone 200 mg TDS can be used as a second line rate control medication in the acute setting. If IV amiodarone is required, it should be given via a central line if possible due to the risk of thrombophlebitis. Use a large bore peripheral vein if a central line is not available and oral administration is not appropriate. For IV amiodarone, initially give 150 mg over 30 minutes (and repeat), then reassess to see if further intravenous administration is necessary. It is best to switch to oral therapy as soon as able to avoid sclerosing veins.

Wide complex tachycardia and ventricular arrhythmias

- These should be treated as per ACLS guidelines and dependant on patient wishes regarding goals of care and resuscitation status.
- Where active treatment is warranted, a referral to the Cardiology Registrar is appropriate.

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Patient referrals

- For advice on arrhythmia management please contact the on-call Cardiology Registrar or Consultant.
- Cardiology, Cardiothoracic Surgery, and CVICU teams should refer to the Electrophysiology Registrar if need specialist cardiology advice.

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Dermatology

WHO TO CALL

- Dermatology Registrar **via the Contact Centre**.
- There is always a ward registrar on call and an after-hours Registrar to discuss referrals and/or give advice. Available between 8am and 10pm for Auckland City Hospital in-patients 7 days of the week including public holidays.
- Dermatology Department **–** to speak to the nursing team at Greenlane Clinical Centre.
- If you require an inpatient review, please ring us to discuss the patient. We are only onsite at Auckland Hospital from 0800-1030h on most days as we have clinics at GLCC in the afternoons. All referrals therefore need to be made the previous afternoon or as early as possible in the morning.
- You can also send an e-referral to Dermatology on RCP and this is encouraged. Please also send photographs with your referral as this helps us immensely with triaging your referral.
- When sending a photograph, it would be preferable to send an overall photo so that the distribution of the rash can be seen as well as a few close up photos of the rash to appreciate its morphology.
- All e-referrals for lesions must be accompanied by a photograph. These will be triaged to an outpatient clinic.

WHEN TO REFER (ADHB Dermatology referral guidelines)

Urgent: dermatological emergencies as listed below.

Acute: in-patients with dermatological conditions related to current admission or directly affecting their care or where review may shorten hospitalisation.

Outpatient: biopsy proven skin cancers on the head, neck or legs or in immunocompromised patient, pigmented lesions suspected as melanoma, longstanding dermatoses where management is complicated or diagnosis is unclear. All referrals for suspected skin cancers must be accompanied by clinical photographs and sent via e-referral.

DERMATOLOGICAL EMERGENCIES

1. TOXIC EPIDERMAL NECROLYSIS (TEN) AND STEVENS JOHNSON SYNDROME (SJS)

- Often a side effect of medications. Associated drugs: antibiotics (e.g. cotrimoxazole, penicillins, cephalosporins), anti-convulsants (e.g. carbamazepine, lamotrigine), allopurinol, NSAIDs, antifungals, antivirals (e.g. aciclovir); anti-retrovirals (e.g. nevirapine)
- Patients with HIV may have a higher incidence
- For most drugs this reaction develops within the first month
- Usually a prodromal illness of several days duration with fever, cough and respiratory symptoms, difficulty swallowing, sore "gritty" eyes or arthralgias

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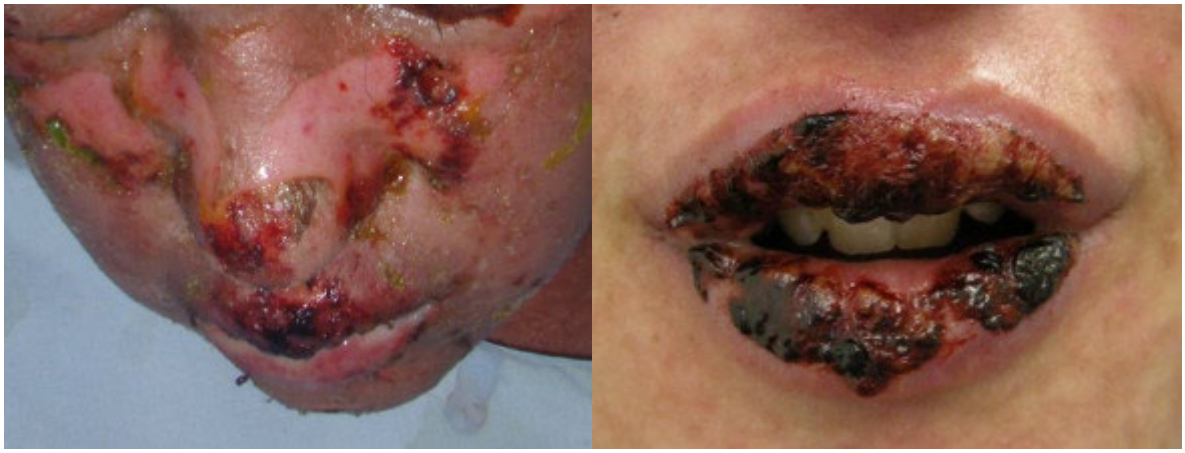
Skin signs include:

- Tender/painful red skin rash (exanthem or "measles-like") often on the trunk initially but spreads to involve all the skin
- Purpura or target like lesions
- Progression into flaccid blisters
- Multiple blisters may merge and result in extensive skin detachment
- Mucosal involvement is prominent and severe – crusting and ulceration of lips and oral mucosa, conjunctivitis, genital ulcers.

These patients look very ill, are extremely anxious and are in considerable pain.

SJS and TEN are distinguished by the percentage of body surface with skin detachment: SJS has less than 10% Total Body Area (TBA) skin detachment; Overlap SJS/TEN 10-30% TBA; TEN greater than 30% TBA.



Management

- Contact Dermatology team promptly
- Removal of the offending agent
- Supportive cares including analgesia, accurate fluid balance and monitoring for electrolyte imbalances. An in-dwelling urinary catheter (IDC) may be needed.
- Treat any secondary infection (prophylactic antibiotics are not recommended)
- Transfer to Middlemore Hospital Burns Unit following discussion with the Burns Team
- Topical antiseptics and paraffin dressings
- Burst blisters should not be debrided but act as natural dressings
- Eye involvement requires urgent ophthalmology assessment
- Appropriate mouth cares- this may require ORL or dental involvement
- Genital involvement in women requires gynaecological assessment and management

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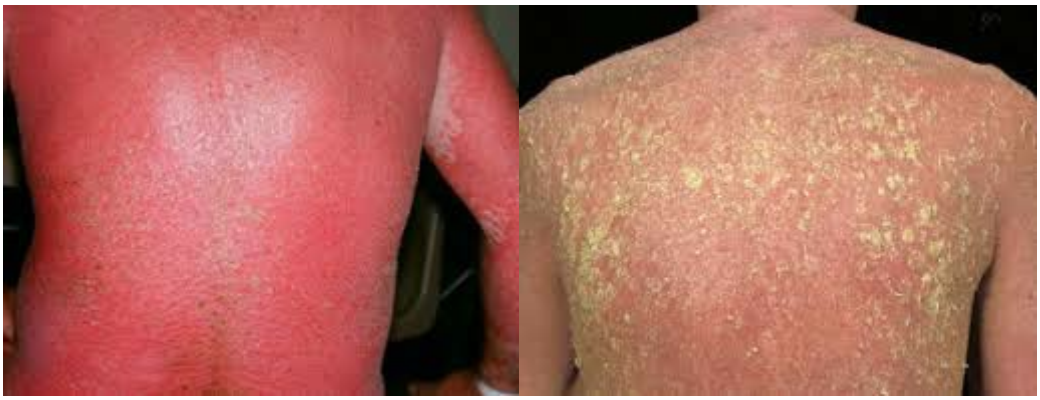
- Limited evidence suggests early treatment with agents including cyclosporin, cyclophosphamide, intravenous immunoglobulin, and plasmapheresis may have some benefit; but supportive management is the mainstay of treatment
- The role of systemic corticosteroids in management is controversial

2. ERYTHRODERMA

- Reddening of the skin involving 90% of the body
- It may be associated with skin peeling ("exfoliative dermatitis")
- The most common pre-existing dermatoses to result in erythroderma include
    - Eczema
    - Psoriasis
    - Pemphigus and other immunobullous disorders
    - Cutaneous T-cell lymphoma
    - Medications
    - Systemic disease such as occult malignancy, Graft vs. Host disease, or HIV
    - Idiopathic in 30% of cases



Treatment

- Hospitalisation
- Contact Dermatology team
- Identify and treat underlying cause if possible (requires skin biopsy)
- Discontinue all unnecessary medications
- Monitor fluid balance, urine output, caloric intake and temperature
- Often topical steroids and emollients (e.g. betamethasone valerate 0.1% cream BD and a 'very greasy' emollient BD). Sometimes the topical steroid is given under occlusion. **See table below for emollient options.**
- Antibiotics if secondary infection is present

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- Treat symptomatically for itch (e.g. loratadine 10-20 mg daily, promethazine 25 mg nocte)

3. EXTENSIVE PUSTULAR PSORIASIS

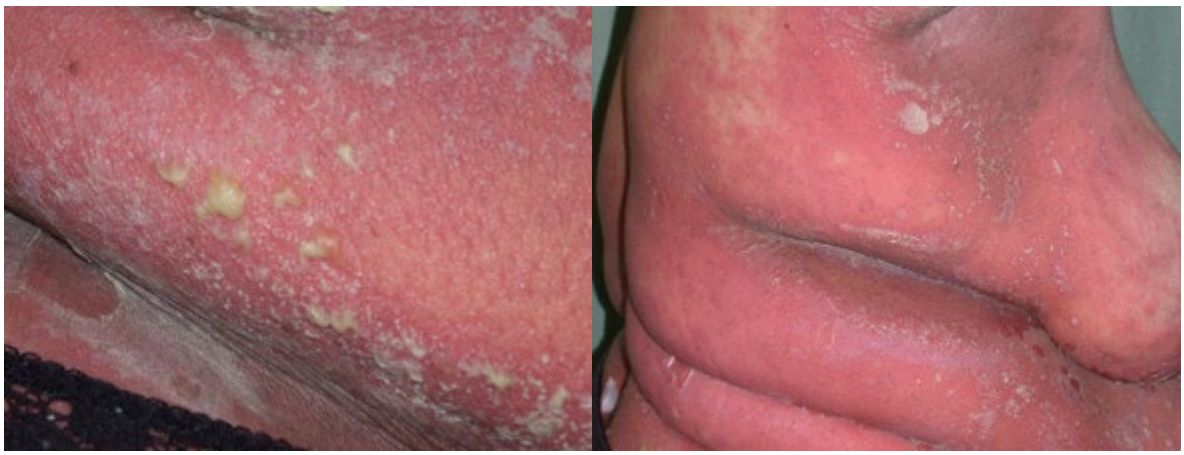
- This is a rare form of psoriasis
- Red, tender skin with widespread sterile pustules
- The patient frequently is systemically unwell or may become unwell rapidly
- Most cases are idiopathic but some have a history of Chronic plaque psoriasis
- Possible triggers include:

  1. Withdrawal of corticosteroids

  2. Infection

  3. Pregnancy

  4. Medications e.g. lithium, salicylates (e.g. aspirin), indomethacin, iodide and some β-blockers



Management

- Accurate fluid balance and correction of electrolyte imbalance – monitor for hypocalcaemia
- Contact Dermatology team
- Topical treatment with emollients and sometimes mild-to-moderate potency topical corticosteroids (e.g. triamcinolone acetonide 0.02% cream BD and a 'very greasy' emollient® BD). **See table below for list of available emollients.**
- Sometimes systemic medications are used such as methotrexate or acitretin in discussion with Dermatology

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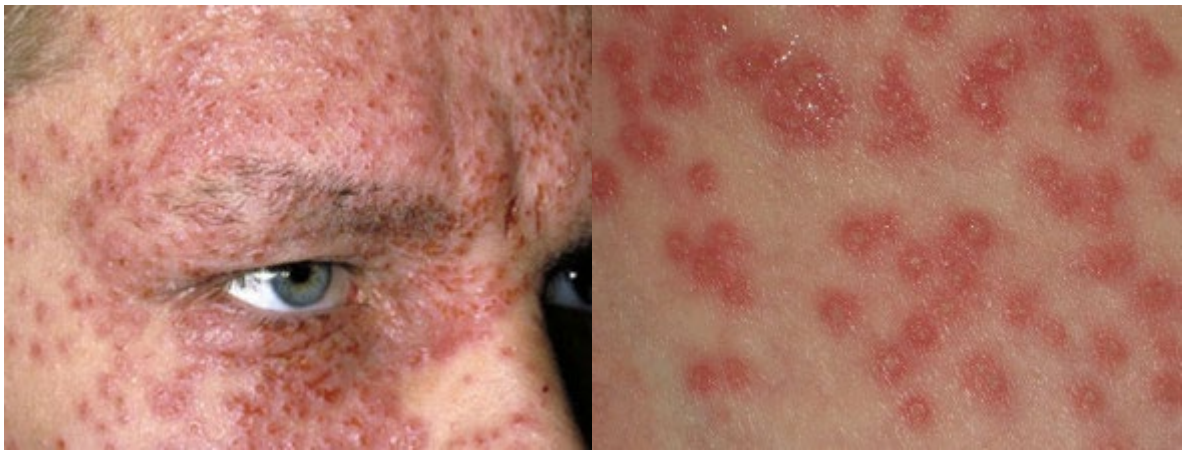
4. WIDESPREAD AND FACIAL ECZEMA HERPETICUM

- Caused by *Herpes simplex* virus (HSV) type 1 or 2
- Most commonly this is seen in patients with atopic dermatitis, but can occur in any pre-existing chronic skin disorder
- Most often presents as crops of punched out crusted lesions on the face and upper trunk
- Swab the area with viral swab and send in medium to lab for PCR
- Management involves analgesia, emollients and antivirals (e.g. oral valaciclovir 1 g TDS for 7-10 days. In-patient use requires Infectious Diseases approval)
- Avoid topical steroids
- Periocular involvement requires urgent Ophthalmology assessment



5. BLISTERING SKIN DISORDERS

Pemphigus vulgaris

- Pemphigus vulgaris is an autoimmune blistering disease
- Most patients first present with lesions on the mucous membranes (mouth and genitals)
- Flaccid blisters and erosions on the skin and mucous membranes
- Tends to occur between the ages of 30 and 60 years
- Blisters usually develop on the skin after a few weeks or months, and these easily rupture leaving painful erosions

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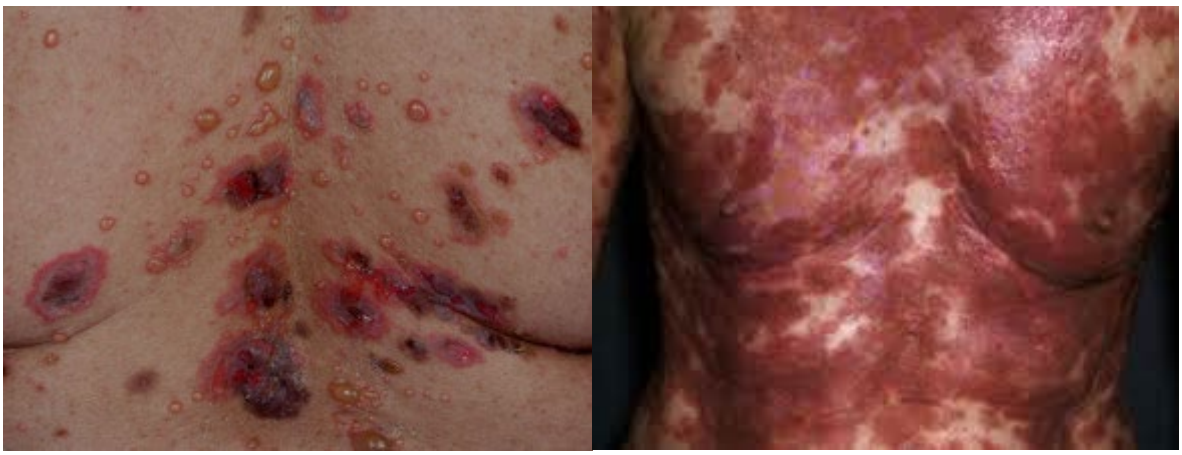
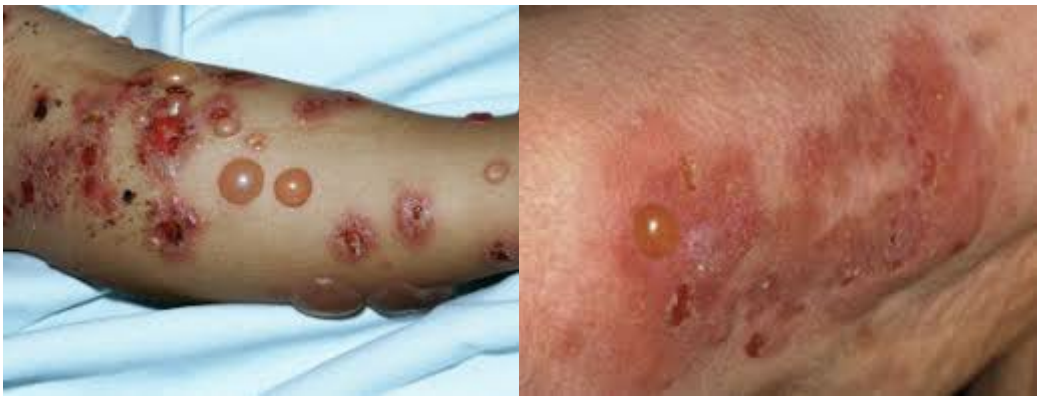


Bullous pemphigoid

- Bullous pemphigoid is an autoimmune blistering disease.
- It can be associated with medications, in particular, vildagliptin.
- Most patients first present with itchy lesions or an itchy rash on the non-mucous membrane skin surfaces. Mucous membrane involvement is rare.
- Tense blisters and erosions on the skin are present.
- It is more common in older patients (>60yr)
- Blisters usually develop on the skin after a few weeks or months, and these easily rupture leaving erosions
- Bullous pemphigoid can be complicated by secondary infection of erosion and widespread blistering



Management

- Contact Dermatology team
- Supportive care of fluid and electrolyte balance
- Careful wound care is needed and non-stick sheets should be used.
- Investigations include a skin biopsy for histology and direct immunofluorescence. Blood tests for 'skin autoantibodies' should be done.

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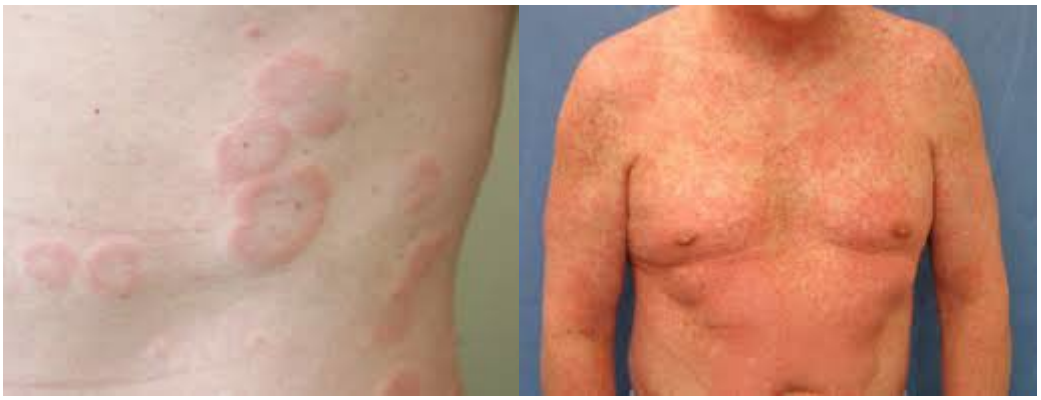
- Antibiotics may be needed to treat or prevent bacterial infections
- Oral, ophthalmologic and genitourinary assessment is necessary in pemphigus vulgaris as the mucous membranes are often involved
- Systemic corticosteroids are the mainstay of treatment (e.g. oral prednisone 0.5-1 mg/kg daily or pulsed intravenous methylprednisolone)
- Very potent topical corticosteroids may be more appropriate in limited bullous pemphigoid in elderly patients
- Steroid-sparing agents include methotrexate, azathioprine, tetracyclines, dapsone, nicotinamide and others. Used in discussion with Dermatology

ACUTE REFERRALS

1. DRUG ERUPTIONS

- Drug eruptions can occur within days to a few weeks after commencing a new medication, the use of a combination of medications, and occasionally a change in the brand of a medication.
- Drug eruptions are very common and have many and varied presentations.
- History is the key tool in diagnosis. Ask about all medications prescribed and alternative/ complementary medication use
- Long term medications are less likely to cause a drug eruption.
- Ask about new medications in the last 3 months and try and **draw a timeline from starting a medication to the beginning of symptoms**. The last medication added is the most likely culprit, but not always.
- Medication withdrawal results in improvement. This usually occurs quickly but can sometimes take many weeks.
- Adverse drug eruptions can be dangerous, especially TEN and drug hypersensitivity syndrome (DHS).



Concerning features

- Mucous membrane involvement
- Widespread confluent erythema or erythroderma

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- Skin pain
- Blistering, purpura or necrosis
- Urticaria that includes tongue or throat swelling
- High fever
- Lymphadenopathy, arthralgias or arthritis
- Abnormal blood count, hepatic or renal dysfunction

Management

- Stop the responsible medication
- Supportive cares: fluid balance, analgesia, nutrition, electrolyte correction etc.
- Treatments vary depending on the reaction type
- Emollients and oral antihistamines are often useful
- Topical corticosteroids (e.g. betamethasone valerate 0.1% cream) and on some occasions systemic agents are also used
- Once the offending medication is confirmed, report reaction to the Centre of Adverse Reaction Monitoring (CARM) and complete an ADHB CR0008 (Clinical Alert) form

Examples of some drug eruptions

i. Exanthematous drug reactions (toxic erythema)

- Abrupt onset (5-10 days)
- Symmetrical erythematous macules and papules usually over the trunk
- Sometimes erythematous or urticated patches and plaques
- May progress to drug hypersensitivity syndrome, erythroderma or SJS/TEN
- A morbilliform eruption with internal organ involvement e.g. hepatitis and fever may be DHS which has a mortality rate up to 10%

ii. Drug-induced urticaria

- May occur with or without angioedema
- Up to three weeks after first exposure and within minutes on re-challenge
- Type I hypersensitivity reaction
- Direct release of inflammatory mediators from mast cells on first exposure to the drug
- ACE inhibitors may cause recurrent angioedema without urticaria, rarely commencing months or years after starting
- The combination of urticaria, fever and arthralgia (sometimes lymphadenopathy, nephritis, endocarditis) may be serum sickness associated with antibiotic use e.g. cefaclor

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iii. Fixed drug eruption

- Recurrent rash occurring at the same site each time a medication is taken
- e.g. antibiotics, paracetamol, food dyes

iv. Purpura

- e.g. heparin, enoxaparin, warfarin, antibiotics, NSAIDs

v. Drug-induced photosensitivity

- e.g. doxycycline, quinine, isotretinoin, amiodarone

vi. Drug-induced pigmentary changes

- e.g. oestrogen/progesterone, minocycline, amiodarone, anti-malarials, hydroxyurea

vii. Miscellaneous skin manifestations that can be related to drugs

- e.g. erythema nodosum

2. ECZEMA (DERMATITIS)

- This is a papular squamous disorder i.e. composed of papules and scale
- Skin may be itchy, red and swollen and have vesicles and blisters in the acute phase
- Thickened (lichenified) skin and sometimes pigmentary changes in the chronic phase
- It can be caused by endogenous factors such as a genetic predisposition
- Flares triggered by physiological and psychological stress including changes in the environment
- Eczema may be exogenous caused by medications, allergens, photo aggravated etc
- Examples of some more common dermatitis patterns: Atopic dermatitis, Irritant contact dermatitis, Allergic contact dermatitis, Asteatotic dermatitis, Discoid eczema (Nummular dermatitis), Seborrhoeic dermatitis, Gravitational dermatitis (Stasis eczema), Autosensitisation dermatitis

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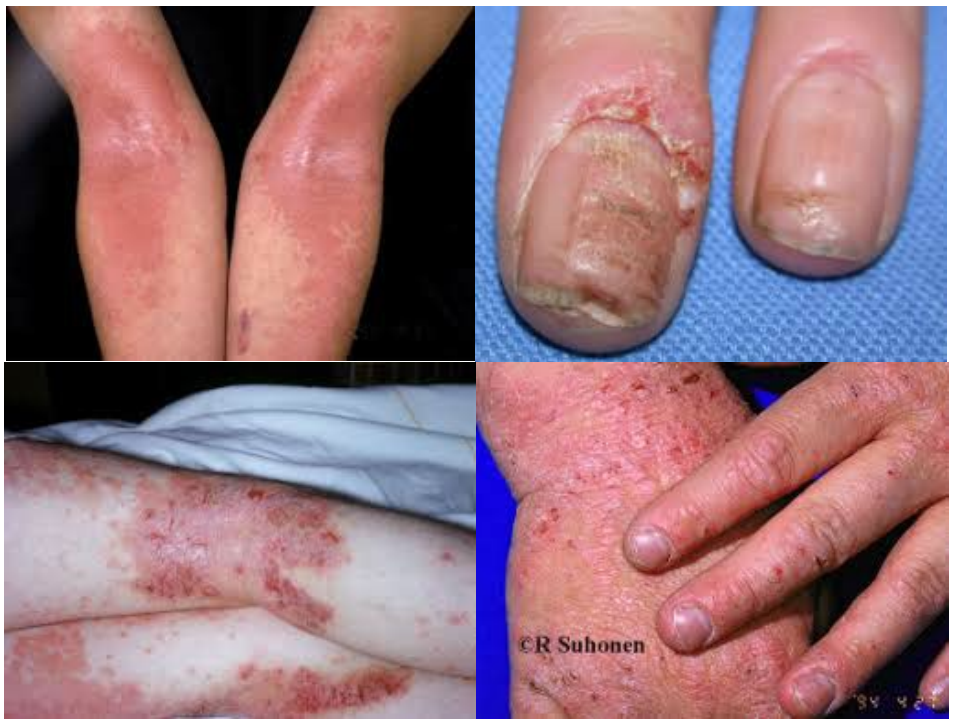

General principles in managing eczema

- Avoid: precipitants (e.g. perfumes), long and hot baths, soap, irritants (e.g. dust, water, solvents, sweat, detergents), tight fitting occlusive clothing
- Use soap substitutes (e.g. emulsifying ointment)
- Use emollients; apply liberally and often
- Topical steroids to irritated, itchy and inflamed patches of eczema
- Antibiotics when infection complicates eczema
- Antihistamines, antiseptics and oily bath preparations as adjuvant treatments
- Refer to Dermatology if no improvement

3. CHRONIC PLAQUE PSORIASIS

- Well defined erythematous scaly plaques
- Commonly involves extensor surfaces of limbs (elbows and knees) and scalp
- Any area of the body can be involved, ranging from mild to very extensive
- Flexural or "inverse" psoriasis is another type; affects body folds and genitals

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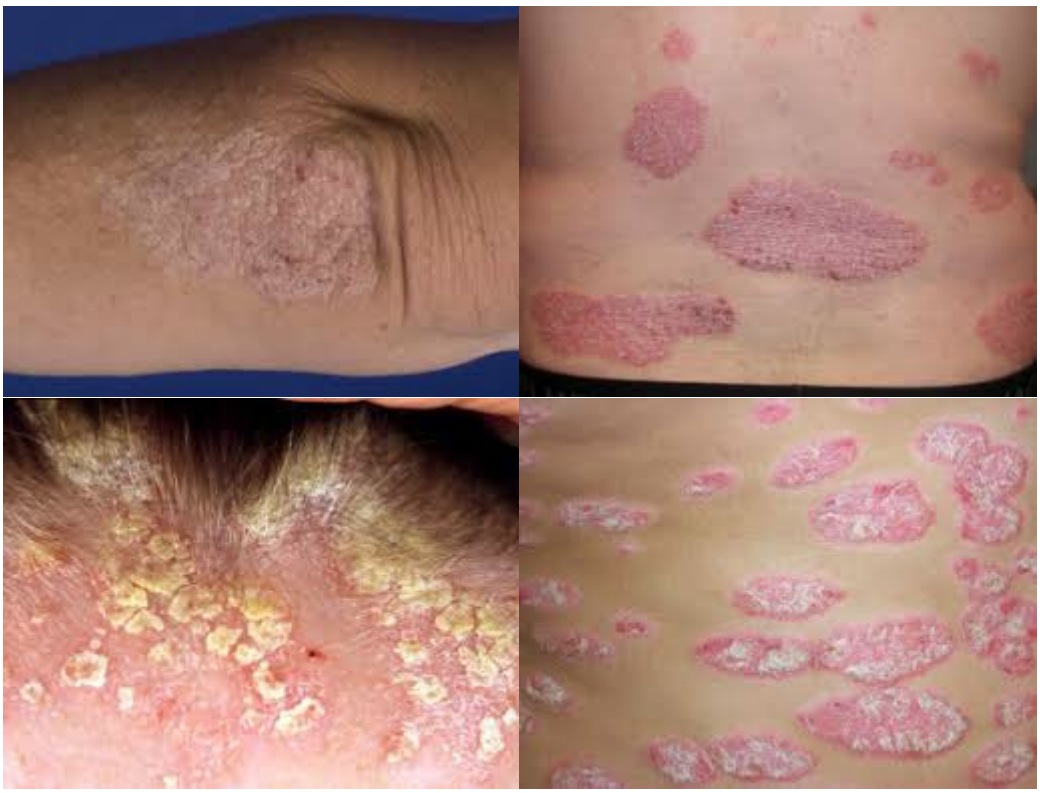

Management of psoriasis

- Mild psoriasis is generally treated with topical agents alone
- Calcipotriol ointment alone or in combination with topical corticosteroid (calcipotriol and betamethasone gel or ointment) for limited psoriasis
- Tar ointments e.g. coal tar solution 5% in emulsifying ointment or in fatty cream
- Salicylic acid in either aqueous cream, cetomacrogol cream or betamethasone valerate 0.1% cream, all compounded by Pharmacy
- If extensive (>10% TBSA) and poorly controlled then systemic agents such as methotrexate, acitretin and ciclosporin can be considered. Discuss with Dermatology team.
- Systemic corticosteroids are best avoided due to risk of severe withdrawal flare of psoriasis and adverse effects

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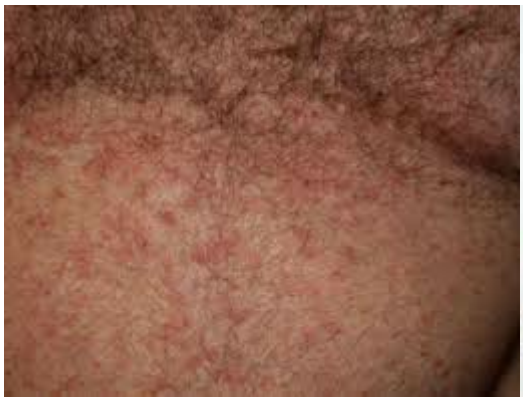
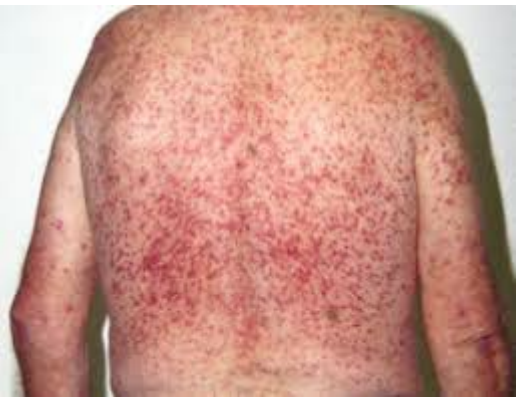
4. GROVER DISEASE (TRANSIENT ACANTHOLYTIC DERMATOSIS)

- Commonly seen in middle aged or elderly men but can affect women
- It usually involves the back and upper chest but may be more widespread involving the proximal extremities
- Characterised by discrete, round papules which are skin coloured or erythematous
- Papules may be excoriated, crusted and are extremely itchy
- It tends to resolve spontaneously but has a chronic relapsing course
- Exacerbating factors include friction, heat, sweating and prolonged bed rest

Management

- Keep the affected area cool
- First line therapy includes antihistamines, moisturisers and mild topical steroids (hydrocortisone 1% cream)
- May have benefit: calcipotriol cream, tetracyclines, phototherapy and retinoids

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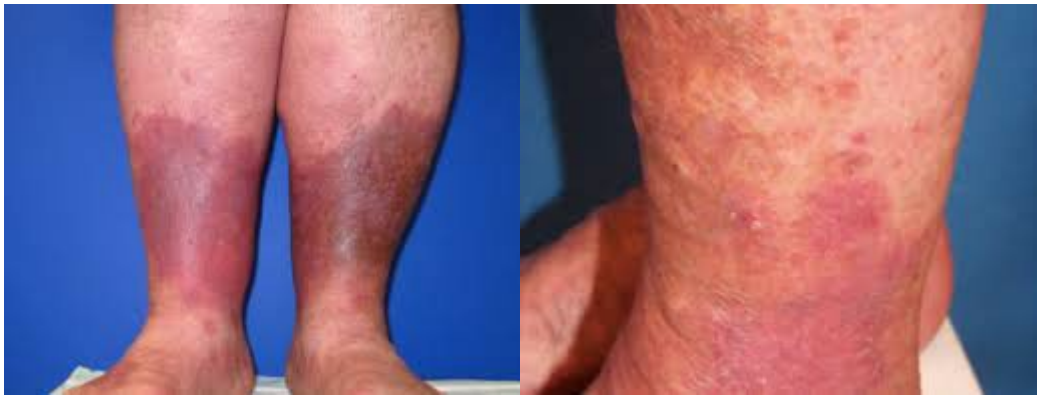
5. STASIS DERMATITIS (GRAVITATIONAL DERMATITIS)

- Also known as venous eczema
- Often bilateral, though one leg may be more affected than the other
- Common condition seen in the setting of chronic venous insufficiency
- Auto-eczematisation may occur, leading to generalised acute dermatitis



Why does it look like cellulitis?

- Cellulitis is rarely if ever bilateral
- The first sign of chronic venous insufficiency is usually pitting oedema
- Stasis purpura can result in pigmentary changes with haemosiderin deposition
- The oedema becomes worse and can spread and mimic cellulitis
- Erythema and scaling become prominent over years and can involve the entire lower leg
- Scratching can result in weeping and crusting
- The dermatitis and ulcers frequently become colonised with bacteria

Management

- Reduce swelling in the leg
    - Avoid standing for long periods
    - Elevate feet when sitting and sleeping
    - Take regular walks
    - Compression bandaging or hosiery is useful (ABPIs >0.9) during the acute phase of the eczema
- Topical treatment of the eczema/dermatitis
    - Potassium permanganate soaks or baths to dry up oozing patches. Tablets are Section 29 and not funded on discharge.

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- Topical steroid: begin with a potent steroid cream (betamethasone valerate 0.1% cream or hydrocortisone butyrate (Locoid®) 0.1% cream/ointment), and then after a few days change to a more mild cream such as hydrocortisone 1% cream.
- Preparations with coal tar may also be useful
- Use a moisturising cream frequently. **See table below for list of available emollients.**

- Surgical strategies are available but do not replace the ongoing need for the above therapies

TOPICAL CORTICOSTEROIDS AND EMOLLIENTS

CORTICOSTEROIDS

- Potent steroids are used for limited duration
- Caution on thin skin, skin folds, children, older adults
- Lowest effective potency used for maintenance therapy
- Side effects include: atrophy/striae, folliculitis, skin fragility, cataracts and glaucoma with peri-ocular use, masking/aggravating fungal infections etc.

Potency	Generic Name	Brand Name
Mild	○ 1% hydrocortisone cream	
Moderate	○ 0.02% triamcinolone acetonide (cream or ointment)	○ Aristocort®
Potent	○ 0.1% betamethasone valerate (cream or ointment) ○ 0.1% hydrocortisone butyrate (cream, lotion or ointment) ○ 0.1% mometasone furoate (cream, lotion or ointment)	○ Beta® ○ Locoid® ○ Elocon®, m-Mometasone®
Very potent	○ 0.05% clobetasol propionate (cream or ointment)	○ Dermol®

- One fingertip unit (FTU) is the amount of topical steroid that is squeezed out from a standard tube along an adult's fingertip, from the very end of the finger to the first crease in the finger
- Example: to treat an area of skin the size of an adult hand you will need 1 FTU for each application or 0.5 g per dose. If the dose is once a day, then a 30g tube should last about 60 days of treatment.
- Dose of cream in a fingertip unit varies with age

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- Adult male: one fingertip unit provides 0.5 g
- Adult female: one fingertip unit provides 0.4 g
- Children of four years approximately 1/3 of adult amount
- Infants six months to one year approximately 1/4 of adult amount

One hand	1 FTU
One arm	3 FTUs
One foot	2 FTUs
One leg	6 FTUs
Face and neck	2.5 FTUs
Trunk, front and back	14 FTUs
Entire body	Approximately 40 FTUs

EMOLLIENTS

- Role in skin barrier function restoration and maintenance
- Need for frequent and long-term application
- Choice of emollient is a balance between efficacy and compliance
- Prescribe plenty (e.g. for widespread eczema, may need up to 500g emollient per week + additional quantity if used as a soap substitute)
- Thin preparations are often better tolerated and have better compliance than greasy preparations, but may not be as effective
- Avoid aqueous cream

Common preparations

Thin	Cetamacrogol cream (non-ionic cream)
Intermediate	Cetomacrogol cream + 10% glycerol (e.g. Sorbolene® with glycerine – no longer funded; generic available)
Moderately greasy	Cetostearyl alcohol + paraffin liquid + white soft paraffin (Fatty cream, O/W fatty emulsion)
Very greasy	Paraffin liquid + white soft paraffin + wax-emulsifying (emulsifying ointment) 50:50 white soft paraffin:liquid paraffin (healthE® ointment, Duoleum® brand is currently not funded on discharge)

Useful online references

- http://www.dermnetnz.org/
- Skin chapter in NZ Formulary (https://nzf.org.nz/nzf_6227)

Photographs courtesy of DermNet

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Diabetes

WHO TO CALL

- Diabetes Registrar 0830-1600 Monday to Friday
- Diabetes Nurse Specialist inpatient team 0830-1600 Monday to Friday
- The Auckland Diabetes Centre (outpatient service) is located at reception G, Building 4, Level 1, Greenlane Clinical Centre.

In general, initial referral to the diabetes nurse specialist (DNS) is appropriate for most questions – they have extensive knowledge and experience in diabetes management.

The DNS is also able to arrange patient education and follow up if needed.

The Diabetes Registrars are available for advice or reviews during working hours, particularly when there are medical considerations that may complicate diabetes management.

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ORAL MEDICATIONS OR INJECTABLES

Generic Name	Medication Class	Mode of Action	Starting Dose	Maximum dose	Side Effects	Contraindications
Metformin	Biguanide	Insulin sensitiser	250-500 mg ONCE or TWICE daily	3 g daily	GI upset, diarrhoea	Withhold if fasting (reduce lactic acidosis) Stop if CrCl <15 mL/min 500 mg/day if CrCl 15-30 mL/min 1 g/day if CrCl 30-45 mL/min 2 g/day if CrCl 60-120 mL/min
Vildagliptin	DPP IV inhibitor	Incretin enhancer	50 mg ONCE daily	50 mg BD	Nausea, vomiting, dizziness	Stop if eGFR <15 mL/min 50 mg/day if eGFR 15-45 mL/min Stop if AST/ALT >2.5x baseline
Glipizide **Gliclazide**	Sulfonylurea	Insulin secretagogue	2.5 mg BD 40 mg BD	20 mg BD 160 mg BD	Hypoglycaemia, weight gain	Use with caution if eGFR <30 mL/min
Empagliflozin	SGLT2 inhibitor	Glycosuria	10 mg ONCE daily	25 mg ONCE daily	Genitourinary infections, euglycaemic ketoacidosis, hypotension, dehydration	Avoid starting if eGFR <30 ml/min Withhold in all acute illness*** Withhold 3 days prior to planned surgery If not withheld, measure glucose, pH & ketones. If ketones > 1.5 mmol/ l and/or pH< 7.3 postpone surgery. Unplanned surgery – consult perioperative guidelines
Dulaglutide*	GLP1 agonist	Incretin mimetic	1.5 mg subcut weekly	1.5 mg subcut weekly	Nausea, vomiting, injection site reactions	Avoid if background of pancreatitis, MEN2 syndrome, thyroid cancer. Avoid if Cr/Cl <15 mL/min
Acarbose	Alpha glucosidase inhibitor	Reduces glucose absorption	50 mg TDS	100 mg TDS	Flatulence, diarrhoea	Chronic GI disorders Stop if eGFR <30 mL/min
Pioglitazone	Thiazolidinedione (TZDs)	Insulin sensitiser	15 mg ONCE daily	45 mg ONCE daily	Weight gain, fluid retention	Stop if NYHA Class III or IV CHF, osteoporosis, or high risk of, history of bladder cancer

Table 1: Oral diabetes medicines, dosing, side effects and contraindications

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***Exenatide / Liraglutide = are also daily GLP1 agonist injections, currently not funded in NZ**

Special considerations

As per NZSSD (2021) guidelines https://t2dm.nzssd.org.nz SGLT2 inhibitors or GLP1 agonists are now considered 2nd line treatment in patients with Type 2 diabetes who have diabetic renal disease (urine ACR >3 mg/mmol and/or reduced eGFR <60) or >15% 5-year CVD risk or patients with known heart failure or CVD. Both require a special authority application for funding purposes. Although patients can use both medications together, current funding is only available for the funded use of one medication at a time. The link below is for the SA criteria for empagliflozin but the same criteria apply for dulaglutide.

https://schedule.pharmac.govt.nz/latest/SA2068.pdf

These medications are more appropriate to be started in a community setting rather than in an inpatient setting but could be considered at the time of discharge. Funding criteria notes that the patient must have been on another medication for at least 3 months prior and not yet reached Hba1c target.

Empagliflozin is also available as a combined tablet with metformin (Jardiamet®).

Vildagliptin is considered 2nd line treatment if no renal disease or heart disease is present.

Special considerations when starting and continuing medications in an inpatient setting

Metformin

- Remains the first line medication for the treatment of type 2 diabetes; to reduce the risk of adverse effects start at 250-500 mg ONCE or TWICE daily and up titrate as tolerated over days-weeks. There is little added benefit in glycaemic lowering effect and an increased risk of side-effects with doses above 2 g/day.
- Metformin can cause lactic acidosis in unwell patients, especially those with renal failure, heart failure, liver failure or tissue hypoxia. In unwell patients, metformin is stopped until the clinical situation is improved.
- The dose of metformin should be reviewed with dose reduction considered once the CrCl drops below 60 mL/min and discontinued once the CrCl drops below 15 mL/min.
- Additionally, metformin should be withheld prior to any procedure with a significant contrast load (for example angiography).

GLP1 agonists (Dulaglutide)

- If starting dulaglutide, then vildagliptin must be discontinued (limited benefit in combination and increased risk of adverse effects).
- Predictable side effects include nausea and vomiting – typically transient, improves with continued treatment. Antiemetics could be considered within the first 1-2 weeks of therapy.
- Once weekly injections can be continued as inpatient unless patient develops GI side effects, pancreatitis, severe LFT derangement or has newly diagnosed thyroid malignancy.

SGLT2 inhibitors (Empagliflozin is the only funded option in NZ)

- Empagliflozin reduces blood glucose by enhancing glycosuria. This mechanism of action explains why there is increased risk of dehydration, hypotension, genitourinary infections, and hypoglycaemia if patients are also on insulin or sulfonylureas.

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- When commencing empaglifozin, consider a 20% reduction in dose of insulin and discontinuation or dose reduction of sulfonylurea, particularly if the patient's glycaemic control is already reasonable (NZSSD website has further guidance on this). Consider if anti-hypertensive and diuretic dosing needs to be down titrated. Check renal function 2 weeks after commencing this medication.

- Empagliflozin can cause life threatening euglycaemic ketoacidosis, especially in patients who are fasting or have reduced oral intake. For these reasons, empagliflozin should be withheld in unwell hospitalised or fasting patients, as ketoacidosis can go unrecognised.

- If patients are on these medications and require emergency surgery, they will need ketone monitoring. SGLT2 inhibitor management around surgery is described in detail in the perioperative guidelines.

  https://adhb.hanz.health.nz/Policy/Diabetes%20Care%20for%20an%20Adult%20having%20Surgery.pdf#search=Diabetes%20surgical%20patient

INSULIN

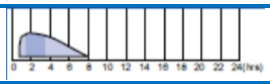
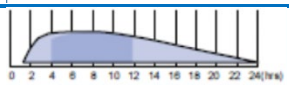
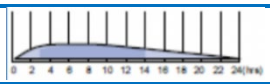
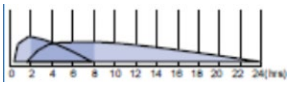
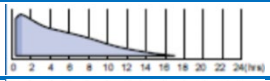
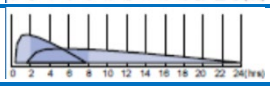
Brand Name	Insulin Type	When to Administer	Activity	Activity Profile
Humalog® Novorapid® Apidra®	Fast-acting Insulin analogues	Immediately before meals	Onset: 10-20 min Peak: 1.3 hrs Duration: 3-5 hrs	
Humulin R® Actrapid®	Short-acting Neutral (regular or solution) Insulin	20-30 minutes before meals	Onset: 30 min Peak: 1-3 hrs Duration: up to 8 hrs	
Humulin NPH® Protaphane®	Intermediate-acting Isophane (NPH) Insulin	Given with or without food	Onset: 1.5 min Peak: 4-12 hrs Duration: up to 24 hrs	
Lantus® Levemir®	Long-acting Insulin analogues	Given with or without food	Onset: 1.5 min No peak Duration: up to 24 hrs	
Humulin 30/70® Penmix 30® (Mixtard 30®) Penmix 40® or 50®	Premixed Insulin	20-30min before meals	Onset: 30 min Peak: 2-8 hrs Duration: up to 24 hrs	
Humalog Mix25® Novomix 30®		Immediately before meals	Onset: 15 min Peak: 1 hrs Duration: up to 18 hrs	
Humalog Mix50®		Immediately before meals	Onset: 30 min Peak: 2-8 hrs Duration: up to 24 hrs	

Table 2: insulin types, dosing plans and activity profile

Special considerations

- Never stop a patient's basal insulin except in severe, refractory hypoglycaemia.

- If the patient is likely to have a prolonged fast (for example, pre-surgery), consider administering 80% of the usual subcutaneous basal insulin dose along with a glucose and variable rate insulin infusion (VRIII). This is covered later in this guideline as well as in the perioperative guidelines.

Insulin pumps

Patients managed on an insulin pump are often capable of self-managing their insulin pump settings/ insulin administration rates.

If there is any problem with the pump itself, or the patient is unable to self-manage his/her insulin pump:

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- During working hours: please contact the diabetes registrar or inpatient diabetes nurse specialist urgently.

- Outside of working hours: Most patients have an insulin **Pump Failure Plan.** This plan highlights the basal insulin type (isophane or Lantus® insulin), dose and frequency (ONCE or TWICE daily) to be administered subcutaneously in the event of insulin pump failure. The patient will already be aware of his/her insulin pump failure plan, or if not, this will be highlighted in a previous clinic letter. The insulin pump failure plan takes into account the amount of insulin delivered by the pump as basal over a 24-hour period. In the event of a pump failure, a proportion of this is to be administered subcutaneously as either twice daily isophane insulin or once daily Lantus® insulin. In addition to this, rapid-acting insulin will also be needed to cover the carbohydrates in their meals.

Remember, most patients using insulin pumps have type 1 diabetes. They are at risk of developing diabetic ketoacidosis if there is any interruption to insulin delivery. Pump failure is an emergency and must be addressed immediately. If you are unable to access a plan via the above channels, either a basal-bolus insulin regimen (taking into account the total daily insulin dose needed via insulin pump) or a Variable Rate Intravenous Insulin Infusion (VRIII) are reasonable interim options. VRIII is covered in detail elsewhere in this guide.

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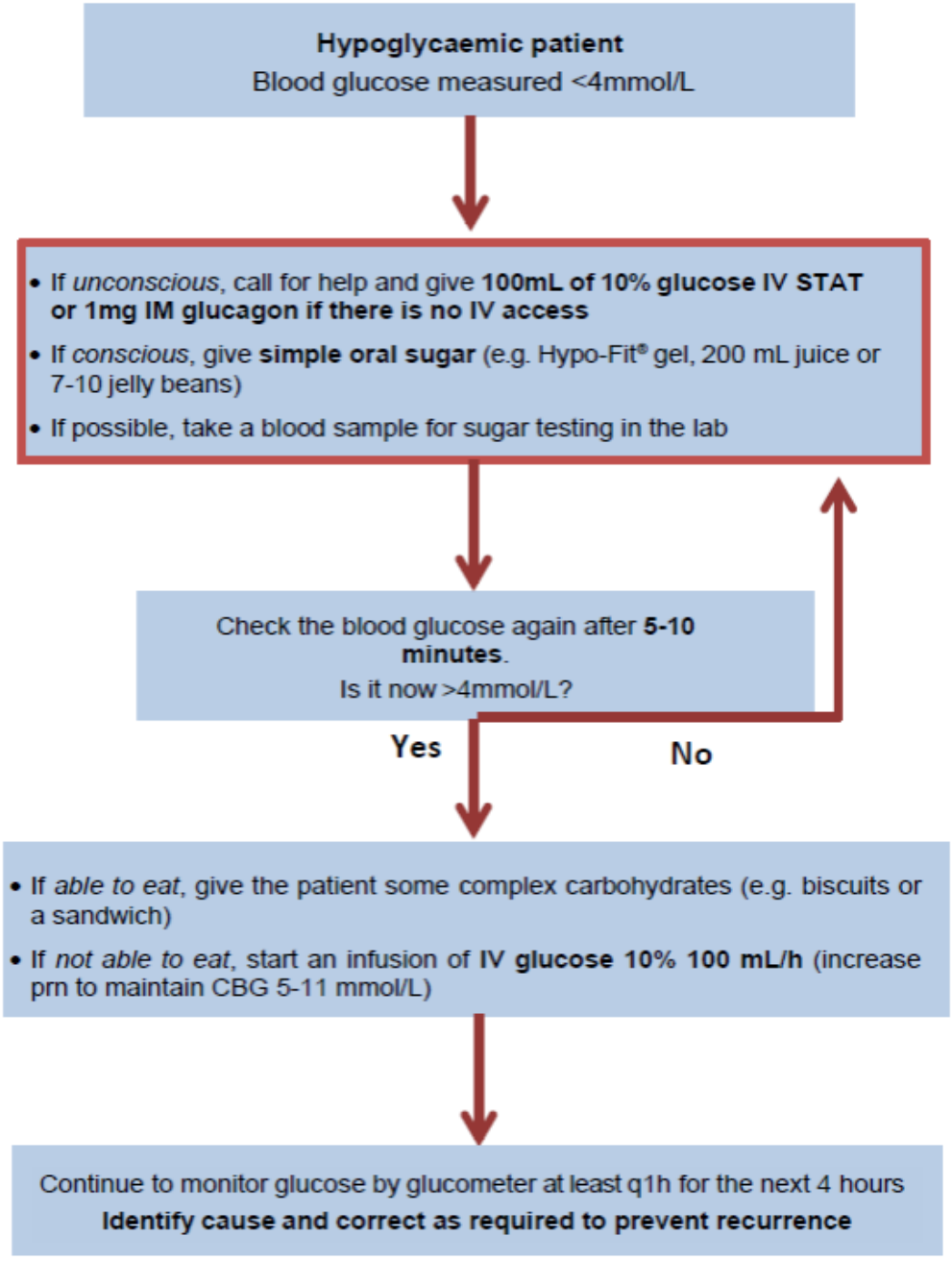
HYPOGLYCAEMIA

This is common in patients on insulin or a sulphonylurea.



Note: 50% glucose was previously used to treat hypoglycaemia but this is **no longer recommended outside of the intensive care setting** due to the potential for damage to veins and subcutaneous tissue. Please use 10% glucose as described above.

Consider octreotide in sulphonylurea induced hypoglycaemia.

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MANAGEMENT OF ACUTE HYPERGLYCAEMIA

This section does not discuss DKA or HHS (formerly HONK). These topics are specifically covered in a separate chapter of this handbook.
This section does cover:

1. **Acute hyperglycaemia in Type 1 Diabetes**
2. **Acute hyperglycaemia in Type 2 Diabetes**
3. **Insulin doses used in acute hyperglycaemia**

Patients with diabetes who are admitted to hospital for any reason often experience difficulty with their blood glucose control. Factors that elevate blood glucose may include:

- Physiological stress – e.g. infections
- Psychological stress
- Medications (especially steroids)
- Dietary change
- Immobility

There are three main considerations in managing a patient with hyperglycaemia:

1. **Acutely lowering the blood sugar to a safe level**
   - Acute blood sugar lowering is usually achieved with subcutaneous Novorapid®. Table 3 provides a guide as to reasonable insulin doses to consider in this setting. The flow charts provide guidance around extra considerations.
   - Novorapid® can last for up to 4 hours, so you should aim to avoid repeated dosing in a short time frame to prevent insulin dose stacking. The dose must always be tailored to the individual clinical setting.
   - For new hyperglycaemia in patients who do not normally need insulin, please contact the diabetes nurse specialist for advice.

STAT INSULIN DOSES FOR HYPERGLYCAEMIA IN ADULTS If hyperglycaemic, use rapid-acting insulin (e.g. Novorapid®) for correction, in addition to usual insulin			
Blood glucose	**A** Total daily insulin <40 units/day	**B** Total daily insulin 40-80 units/day	**C** Total daily insulin >80 units/day
11-13.9 mmol/L	2 units	3 units	4 units
14-16.9 mmol/L	3 units	5 units	7 units
17-19.9 mmol/L	4 units	7 units	10 units
20-22.9 mmol/L	5 units	9 units	13 units
≥23 mmol/L	6 units	11 units	16 units

Table 3: STAT insulin doses for acute hyperglycaemia in adult inpatients

Note: the above chart is for guidance only. Some people with diabetes (especially type 1 diabetes) have their own individual correction factor (ISF or insulin sensitivity factor) – please ask the patient before prescribing.

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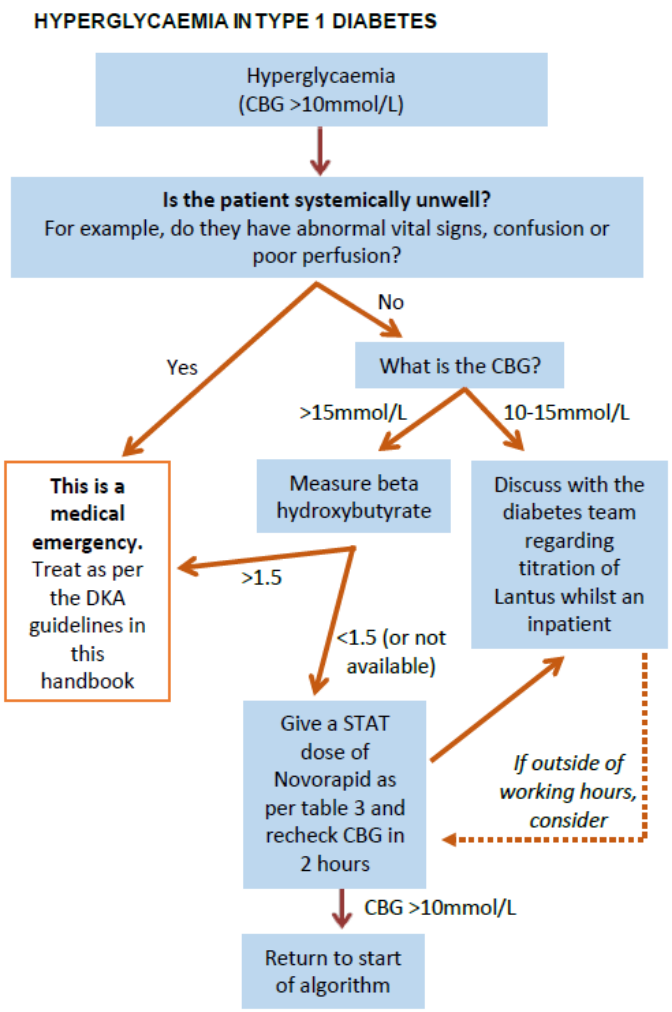
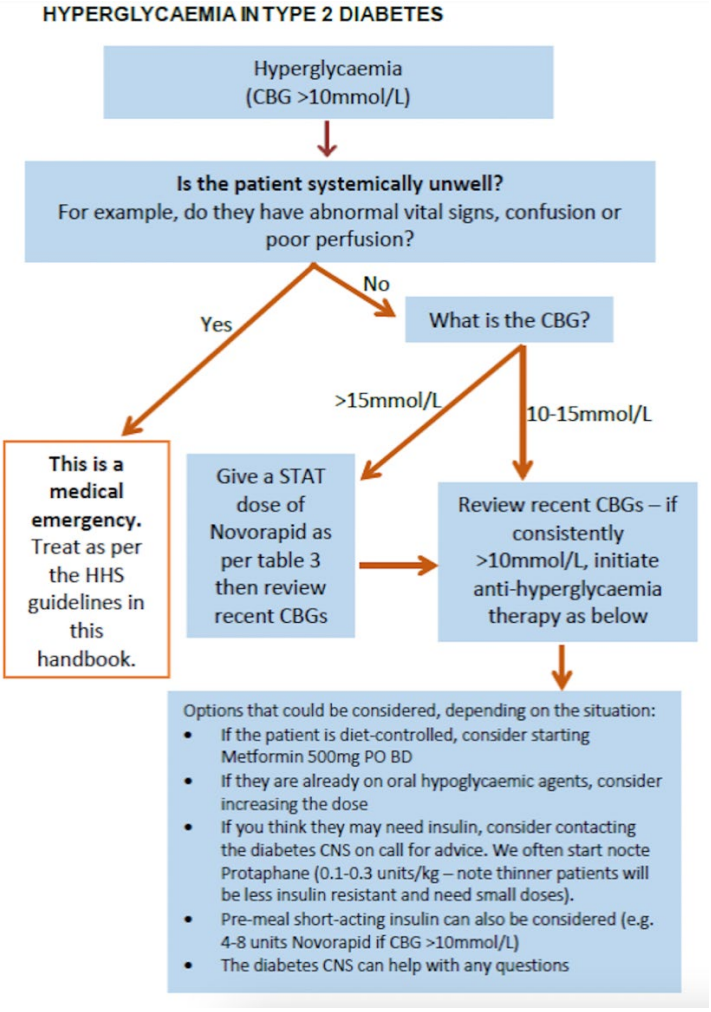
2. **Adjusting the patient's regular medication to prevent future hyperglycaemia**

   If there is a pattern of persistent hyperglycaemia over 24-48 hours, consider increasing the basal insulin by 10-20% every 2-3 days until reasonable control is attained.

3. **Having a safe plan for insulin on discharge**

   If a patient's insulin requirements have significantly changed as an inpatient, there is a risk of hypoglycaemia once they return to their normal diet and activity. Ensure there is someone who is aware of this and can monitor the patient's CBGs. It is usually worth calling their GP who is generally best placed for this follow-up management.





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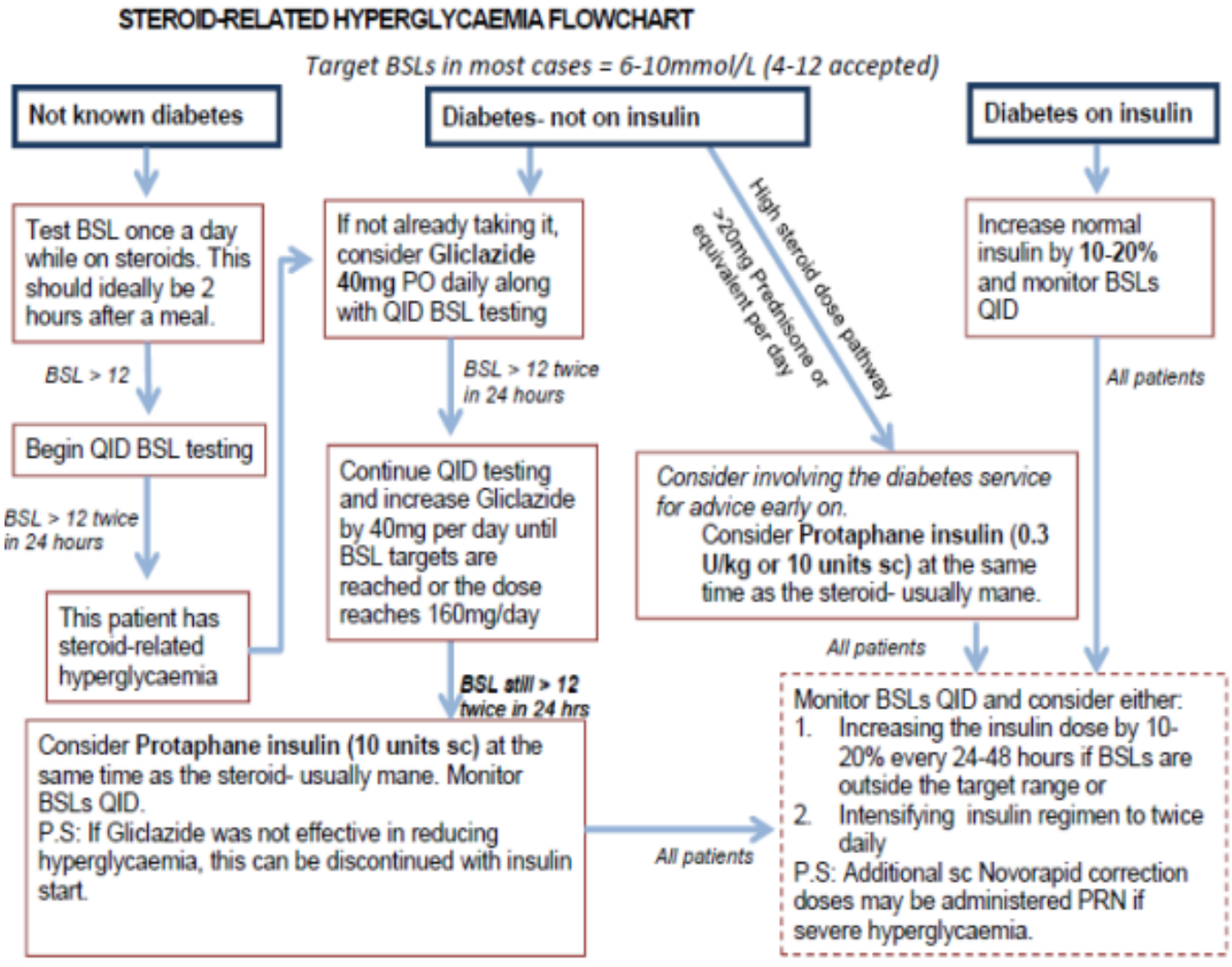
STEROID-RELATED HYPERGLYCAEMIA

- Hyperglycaemia in hospital inpatients is associated with increased mortality, length of stay, infection rate and likelihood of ICU admission.
- Steroids are recognised as a major cause of in-hospital hyperglycaemia. In fact, hyperglycaemia develops in over half of all inpatients prescribed steroids.
- Screening for hyperglycaemia should be considered in all patients receiving steroids. See below flow chart for specifics of screening and treatment.
- At a minimum, we advocate for screening in any patient with one or more of the following risk factors:

- Known diabetes or pre-diabetes
- Previous gestational diabetes
- Previous steroid-induced hyperglycaemia
- Total steroid dose >20 mg prednisone equivalent per day
- Length of steroid treatment >5 days
- Age >55
- BMI >30
- Concurrent use of medications known to raise blood sugars (e.g. calcineurin inhibitors or mycophenolate)
- Patients with multiple co-morbidities
- Post-surgical patients



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If your patient is on steroids for the treatment of either an oncological or haematological malignancy and are experiencing difficult glycaemic control either from their pre-existing diabetes or steroid-induced hyperglycaemia/diabetes (new-onset), please refer them to our Diabetes-Oncology clinic. We provide regular follow-up of such patients who are receiving treatment through Auckland Hospital regardless of their home DHB. Please note: We prefer to be contacted about these patients early, particularly if they have pre-existing poorly controlled diabetes and are commencing high dose steroids.

DIABETIC KETOACIDOSIS (DKA)

Diagnosis of DKA

The following triad must be present and documented:

- Hyperglycaemia (usually but not always >14 mmol/L)
- Evidence of ketosis (raised serum β hydroxybutyrate or at least (2+) ketonuria)
- Metabolic acidosis (bicarbonate (HCO_3) ≤18 mmol/L, pH ≤7.3)

The biochemical severity of DKA is graded as follows

- Mild: pH 7.25-7.30, HCO_3 15-18 mmol/L
- Moderate: pH 7.0-7.24, HCO_3 10-15 mmol/L
- Severe: pH <7.0, HCO_3 <10 mmol/L

Consider DCCM/ICU referral if concerns and particularly if your patient has:

- Reduced level of consciousness, GCS <12
- BP <90 mmHg systolic
- pH <7.1
- Serum bicarbonate <5 mmol/L
- Serum K <3.5 mmol/L
- Oxygen saturations <90%
- Known renal impairment

All other patients admitted acutely with DKA should be closely monitored.

Management

Patients in DKA are generally very unwell. Call for help early. There are five priorities of DKA management that *should occur simultaneously.*

1. Finding and correcting the underlying cause
2. IV fluids for rehydration
3. Potassium monitoring and replacement if required
4. Insulin therapy
5. Repeated, regular reviews of clinical state, blood gas, sugars, and fluid status

Again, these are not sequential and DKA treatment requires multiple hands. All patients should be discussed with the diabetes team prior to discharge.

1. Finding and correcting the underlying cause

Common causes for DKA

- Insulin omission, withdrawal, or reduction
- Myocardial infarction, stroke, trauma, or other medical stress
- Infection, such as pneumonia, gastroenteritis, influenza, UTI, or meningitis
- DKA as diabetes defining illness (as in a patient with newly diagnosed type 1 diabetes).
- Consider checking GAD and IA-2 antibodies.

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Investigations should include at least

- Electrolytes, creatinine, FBC, beta-hydroxybutyrate
- A venous bicarbonate is usually adequate to monitor progress unless below 10
- Culture of blood, urine if clinically indicated
- CXR
- ECG
- Record fluid balance, pH/bicarbonate, and electrolytes

2. IV fluid rehydration

Patients with DKA are profoundly dehydrated and need significant IV fluid replacement, which should be started immediately. The following table is a guide and will need to be adapted to each individual clinical situation. There **must** be regular clinical review of the patient's fluid status to avoid over- or under- hydration.

Bag	Fluid	Infuse over
1	Sodium chloride 0.9% (1000 mL)	STAT over 10-15 minutes
2	Sodium chloride 0.9% (1000 mL)	next 1 hour
3	Sodium chloride 0.9% + 40 mmoL potassium chloride* (1000 mL)	next 2 hours
4	Sodium chloride 0.9% + 40 mmoL potassium chloride* (1000 mL)	next 2 hours
5	Sodium chloride 0.9% + 40 mmoL potassium chloride* (1000 mL)	next 4 hours
6	Sodium chloride 0.9% + 40 mmoL potassium chloride* (1000 mL)	next 4 hours
7	Sodium chloride 0.9% + 40 mmoL potassium chloride* (1000 mL)	next 6 hours
only add potassium if serum potassium **<5.5 mmol/L and urine output **>30 mL/h** (otherwise use sodium chloride 0.9% only)*		

Table 4: Standard fluid replacement protocol in DKA

Note: When blood glucose is <15 mmol/L on 2 consecutive tests 1 hour apart, introduce **glucose 5%+ sodium chloride 0.45% + potassium chloride 20 mmol** (1L premixed bag) at 80 mL/hr (in addition to any other IV fluids that may be needed to correct hydration/K^+).

3. Potassium monitoring and replacement if required

Potassium level in first 24 hours	Potassium replacement in mmol/L of infusion solution
>5.5	Nil
3.5-5.5	40 mmol/L
<3.5	**Senior review** - additional potassium needed Use 10 mmoL potassium in sodium chloride 0.9% 100 mL premixed bag as necessary (isotonic solution - give over minimum 1 hour peripherally). Oral potassium replacement if tolerated.

Table 5: Recommended rates of IV Potassium replacement

Notes:

- If hypernatraemic (>146 mmol/L) consider sodium chloride 0.45%
- Pre-prepared 1 L bags of sodium chloride 0.9% + 40 mmoL potassium chloride are available at Auckland Hospital on Level 2 and General Medicine wards

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4. Insulin therapy

Variable Rate Intravenous Insulin infusions (VRIII) are the central therapy for reversing hyperglycaemia in DKA. An infusion should be started early at the rates outlined below. In general, Scale B is usually appropriate and is therefore the default scale in most settings.

Note that IV insulin can lower potassium so you should consider delaying the infusion if admission potassium is <3.5 mmol/L. In this setting, it is worth remembering that aggressive fluid resuscitation will also help to lower the blood sugar.

Scale A	Thin small individuals, especially women; some very insulin-sensitive patients (total daily dose <30 units/day); athletes; hypopituitary, hypoadrenal and hypothyroid patients; post pancreatectomy patients (surgical or functional); some well controlled non-obese diet-controlled type 2 diabetes patients
Scale B	**Individuals (type 1 or type 2) with no special circumstances; use if normal daily insulin requirements approximately 30-80 units/day**
Scale C	Seriously ill (high fever etc.); moderate steroid doses (up to 20 mg prednisone daily); very obese or insulin resistant patients (>80 units/day); uncomplicated myocardial infarction
Scale D	High steroid doses (>20 mg prednisone daily); very stressed individuals; complicated post-infarct patients

Table 6: Choice of insulin infusion scale. Scale B is usually the default

Blood Glucose	Scale A	Scale B	Scale C	Scale D
<5.0 mmol/L	Stop/consult	**0.5-1 unit/h or Scale A+**	2 units/h or Scale B+	4 units/h or Scale C+
5.0-11.0 mmol/L	1 unit/h	**3 units/h**	4 units/h	8 units/h
11.1-17.0 mmol/L	3 units/h	**6 units/h**	8 units/h	16 units/h
>17.0 mmol/L	6 units/h or Scale B*	**12 units/h or Scale C***	16 units/h or Scale D*	32 units/h

Table 7: Recommended rates of insulin infusion

+ If blood glucose persistently below 5 mmol/L, i.e. on 2 or more tests 1 hour apart, move one scale to the left and/or ask for advice.

* If blood glucose persistently high, i.e. on 2 or more tests 1 hour apart, check pump for correct rate and line for patency, then move 1 scale to the right and/or ask for advice.

Even while giving IV insulin, it is important to continue a patient's subcutaneous basal insulin (e.g. Protaphane®, Humulin- NPH® or Lantus®) wherever possible. This is safe and will allow for a smoother transition back to their regular insulin regime when the infusion stops.

Do not stop the insulin infusion just because the blood sugar is normal. The infusion should only be stopped when the patient is eating normally and is administering their own basal insulin.

In patients with newly diagnosed type 1 diabetes who need to transition to subcutaneous insulin, roughly estimate the amount of IV insulin units administered over the preceding 24 hours and give half of that dose as basal insulin at the desired time before discontinuing the insulin infusion.

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5. Guidelines for monitoring progress

- Vital signs q2h (may need q1h initially) for 8h then q4h until stable.
- Maintain a fluid intake-output chart with urine output q1h initially: be concerned if urine output less than 30 mL/h.
- CBG monitoring q1h while on IV insulin infusion.
- Monitor electrolytes (especially K^+) and HCO_3 q2h for 8h then q4h until stable – usually monitored on a VBG sample.
- Ketones are usually only tested at the time of presentation – subsequent progress is usually assessed based on resolution of hyperglycaemia and acidosis (VBG: pH and HCO_3) – glucocentric approach to DKA management.
- Consider treatment with antibiotics if infection is suspected as the trigger for DKA.
- Consider prophylactic low molecular weight heparin to reduce risk of thrombo-embolic events.
- Consider DCCM/ICU referral if: reduced level of consciousness/GCS <12, BP <90 systolic, pH <7.1 or serum bicarbonate <5 mmol/L, serum K <3.5 mmol/L, oxygen saturations <90%, renal impairment.

HYPERGLYCAEMIC HYPEROSMOLAR SYNDROME (HHS, formerly HONK)

HHS is a medical emergency with a mortality rate of around 20%. It is most often seen in older subjects with type 2 diabetes on insulin. In general, HHS occurs in the context of significant systemic stress, for example infection, myocardial infarction, or stroke. These patients are very unwell and often drowsy, confused, or comatose due to cerebral intracellular dehydration.

Characteristics of HHS

- Extremely high blood glucose (>30 mmol/L)
- Profound dehydration
- No significant ketosis (though there is often a lactic acidosis)
- Very high serum osmolality (>320 mosm/kg)

Management

The management of HHS requires multiple simultaneous interventions. Most patients may benefit from DCCM review.

There are five priorities of HHS management that **should occur simultaneously:**

1. Finding and correcting the underlying cause
2. IV fluid rehydration
3. Potassium monitoring and replacement if required
4. Insulin therapy
5. Repeated, regular reviews of clinical state, blood gas, sugars, and fluid status

During the period of treatment, it is important to do frequent assessments and measurements and document these clearly. This will allow for appropriate clinical decision-making.

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1. **Finding and correcting the underlying cause**

This process will vary depending on the clinical setting. All patients should at least have the following arranged:

- Electrolytes, creatinine, FBC, beta-hydroxybutyrate
- Serial VBG measurement (a venous bicarbonate is usually adequate to monitor progress unless below 10)
- Septic screen including blood culture, MSU, CXR as clinically appropriate – **if infection is a likely trigger for HHS, give appropriate antibiotics early**
- ECG + troponin if indicated to exclude ACS

2. **Fluid and electrolyte replacement**

IV fluid must be started immediately. Do not wait for test results.

Patients with HHS are profoundly dehydrated and may require 10L or more of fluid replacement. They are also usually comorbid and require clinical skill in assessing fluid status.

With regards to infusion rates, a common recommendation is:

Early resuscitation fluids:

- 1 L of sodium chloride 0.9% STAT
- A second litre of sodium chloride 0.9% over the first hour
- Then 50 mL/kg of fluid replacement over the next 4 hours (e.g. for 100 kg patient → 5000 mL over 4h = 1.25 L/hr).
- Choose fluid type based on electrolyte results

Remaining fluid deficit:

- Replacement after 4 hours depends on the patient's urine output, serum electrolytes and hydration status
- Euvolaemia is unlikely to be achieved in the first 24 hours. After initial resuscitation, fluid replacement can occur more slowly (e.g. 100-125 mL/hr).

3. **Potassium monitoring (and replacement if required)**

Patients may require large amounts of potassium replacement, which should be given intravenously. There is a limit to the speed at which replacement can occur. Recommended infusion rates are outlined in Table 5. Potassium needs to be given via a separate line to the one used for fluid resuscitation.

4. **Insulin therapy**

Insulin infusions are the central therapy for reversing hyperglycaemia in HHS. An infusion should be started early at the rates outlined in Table 6 and Table 7. In general, Scale B is usually appropriate and is therefore the default scale in most settings. Note that insulin can lower potassium so you should consider delaying the infusion if admission potassium is <3.5 mmol/L. In this setting, it is worth remembering that aggressive fluid resuscitation will also help to lower the CBG.

- **Even while giving IV insulin, it is important to continue a patient's subcutaneous basal insulin (e.g. Protaphane®, Humulin- NPH® or Lantus®) wherever possible**. This is safe and will allow for a smoother transition back to their regular insulin regime when the infusion stops.
- Do not stop the insulin infusion just because CBG is normal. The infusion should only be stopped after the patient is eating normally.
- When blood glucose is <15 mmol/L on 2 consecutive tests 1 hour apart, introduce **glucose 5%+ sodium chloride 0.45% + potassium chloride 20 mmol** (1 L premixed bag) at 80 mL/hr (in addition to any other IV fluids that may be needed to correct hydration/K^+).

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5. Guidelines for monitoring progress:

- Vital signs q2h (may need q1h initially) for 8h then q4h until stable.
- Maintain a fluid intake-output chart/ urine output q1h initially: be concerned if urine output is less than 30 mL/h.
- CBG monitoring q1h while on IV insulin infusion. Monitor electrolytes (especially K) and HCO_3 q2h for 8h then q4h until stable on VBG.
- Consider treatment with antibiotics if infection is suspected as the trigger for HHS.
- Strongly consider prophylactic low molecular weight heparin to reduce the risk of thromboembolic events. HHS patients are severely dehydrated and often have reduced level of consciousness, putting them at high risk of DVT and stroke.

VARIABLE RATE INTRAVENOUS INSULIN INFUSION (VRIII, formerly GIK)

A variable rate intravenous insulin infusion (VRIII) is an effective method of treating hyperglycaemia in vulnerable people with diabetes. Hypokalaemia is a common complication and all patients on IV insulin need regular K monitoring. An IV glucose infusion is often commenced once the CBG readings are <15mmol/l to allow the continuation of the VRIII without causing hypoglycaemia.

Indications for VRIII:

- Patients presenting with DKA or HHS.
- Preoperative patients with diabetes who will not be able to eat a normal meal for over 6 hours post operatively.
- If CBG >15 mmol/L and the patient is critically unwell, vomiting, or unable to eat and drink.

Prescribing VRIII:

- Continue the patient's normal subcutaneous basal insulin during their IV insulin infusion.
- The scale for the infusion rate will vary based on the clinical situation.
- CBGs should be checked hourly.
- The VRIII should be paused while **hypoglycaemia** is treated. However, IV insulin has an extremely short half-life, and the **infusion must be restarted within 20 minutes. The patient should have a medical review as to the need for continuing the VRIII, potential altering of the insulin infusion scale or restarting their usual insulin regimen as dictated by the clinical situation.**

IV fluids to be given with the VRIII:

- The most common fluid given alongside an insulin infusion is glucose 5% + sodium chloride 0.45% + potassium chloride 20 mmol/L at 80 mL/h.
- The fluid must be individualised to each situation with electrolyte abnormalities being a critical consideration. Some electrolyte abnormalities will need to be corrected via a separate line.
- Special considerations:
    - Renal failure – 10% glucose alone is often prescribed at a rate of 40 mL/hour if CBG ≤10 mmol/L (no added potassium)
    - Hypovolaemia – consider giving the standard infusion as above with fluid resuscitation given via a separate line
    - Fluid overload – consider giving the standard infusion as above but at 40 mL/hour

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- Neurosurgical patients may have specific requirements and should not be started on IV fluid without discussion with the treating team

How to stop a VRIII:

- **The infusion should only be stopped after the patient is eating normally and after ensuring that they have been administered their own basal insulin.**
- In patients on bolus insulin, this is administered subcutaneously with their usual meal and the insulin infusion is best discontinued 2 hours after the meal.

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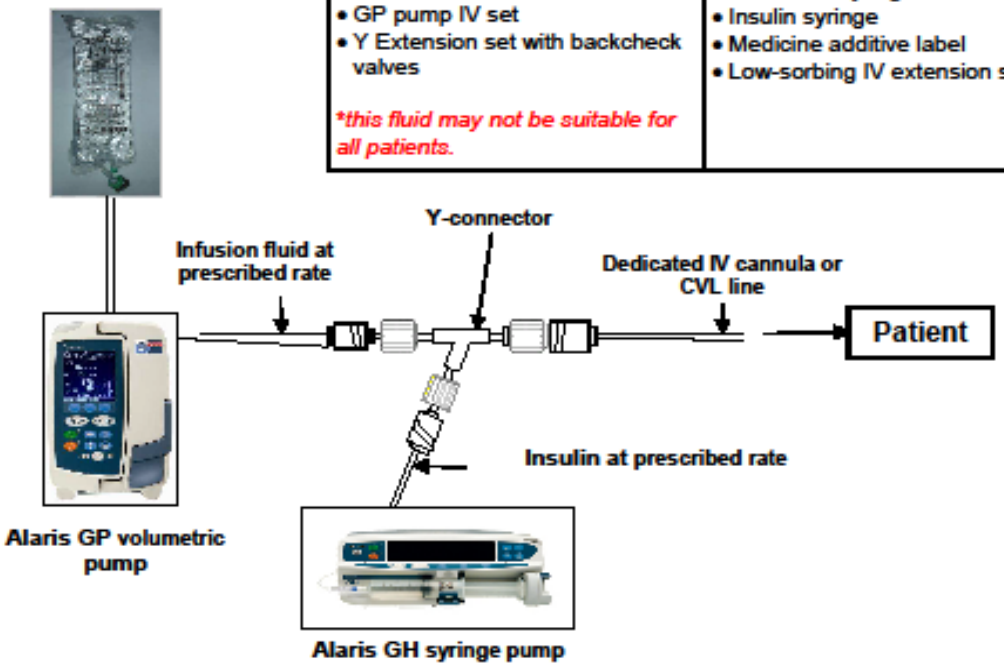
Setting up a Variable Rate Intravenous Insulin Infusion & fluid (Adult)

Equipment required	
Infusion Fluid • Glucose 5 % + NaCl 0.45% + KCl 20 mmol * (1000 mL premixed bag) • Alaris GP volumetric pump • GP pump IV set • Y Extension set with backcheck valves **this fluid may not be suitable for all patients.*	**Insulin Infusion** • 50 mL of sodium chloride 0.9% • 50 units Actrapid® • Alaris GH syringe pump • 50 mL BD syringe • Insulin syringe • Medicine additive label • Low-sorbing IV extension set



Step	Action
1	Draw up 50 units of Actrapid® insulin (0.5 mL) in an insulin syringe
2	Draw up 49.5 mL of sodium chloride 0.9% in a 50 mL BD syringe
3	Add the 0.5 mL of insulin to the sodium chloride 0.9% to give a 1 unit/mL solution (total volume = 50 mL) Label the syringe "1 unit/mL insulin in sodium chloride 0.9%"
4	Attach the low-sorbing IV extension set to the syringe. Label the insulin line.
5	Attach the insulin line to the Y-connector. The Y-connector must have backcheck valves
6	Manually prime the insulin line and the arm of the Y-connector and then clamp insulin line. Insert syringe into syringe driver.
7	Program Guardrails (*select "Insulin"*) on syringe pump and select rate of insulin infusion as per prescribed scale (default is Scale B e.g. 3 units/hr)
8	Attach the GP pump IV set to the prescribed fluid bag. Label the infusion fluid line.
9	Attach the infusion fluid line to the Y-connector
10	Prime the infusion fluid line and the arm of Y-connector. Ensure at least 3 mL of solution drains from the Y-connector before connecting to the patient. Clamp fluid line
11	Program Guardrails (*select "GIK Fluid"*) on GP pump and administer the fluid via volumetric pump at prescribed rate e.g. 80 mL/hr
12	Unclamp both lines and start infusions

Produced by Medication Safety Team, Sept 2018

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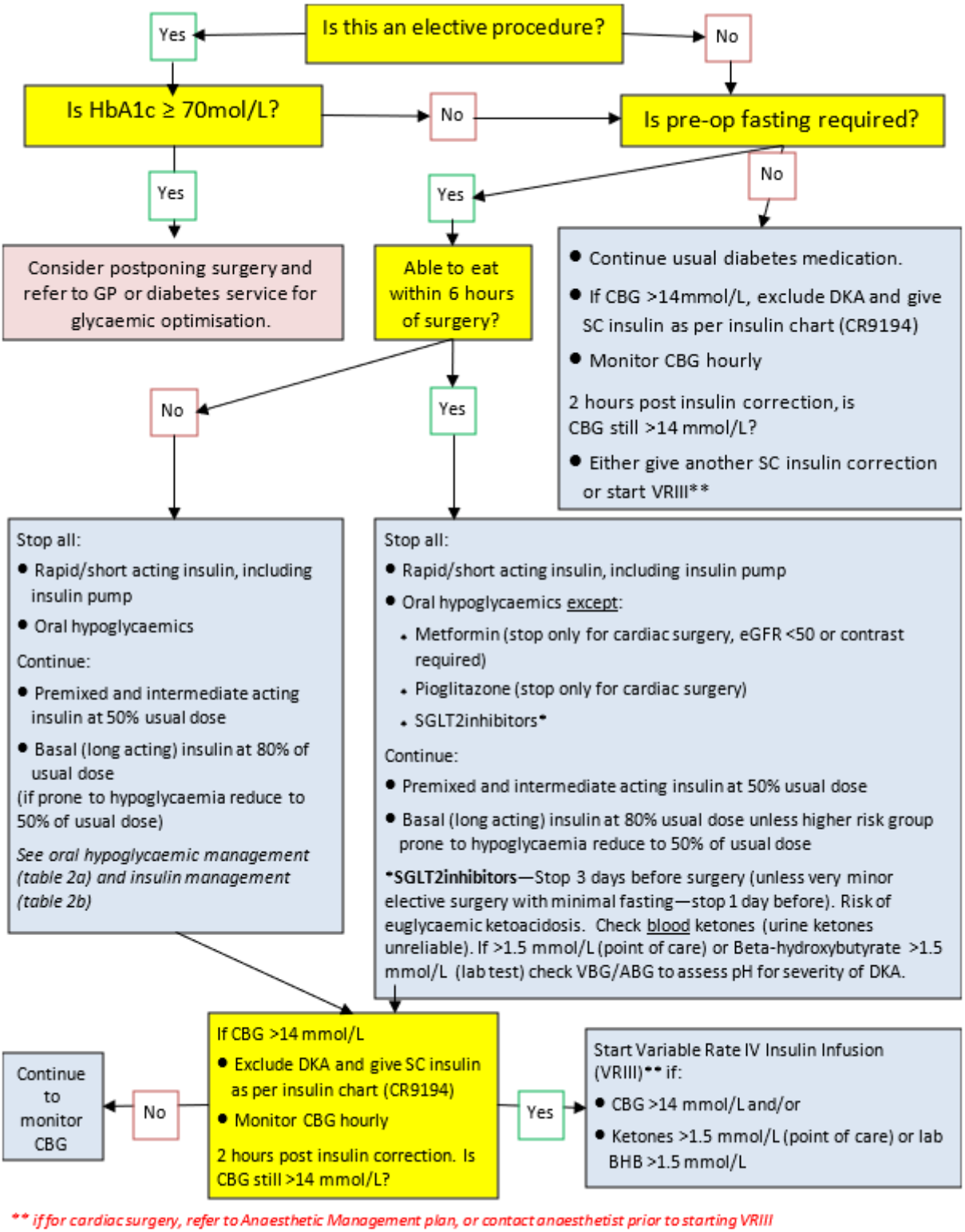
PERIOPERATIVE MANAGEMENT OF PATIENTS WITH DIABETES

For patients taking the following medications, please refer to guidelines – Diabetes Care for an Adult Having Surgery

https://adhb.hanz.health.nz/CLTC/_layouts/15/WopiFrame.aspx?sourcedoc=/CLTC/Docs/Diabetes%20Care%20for%20an%20Adult%20having%20Surgery.pdf&action=default

Pre-op Summary diagram of Diabetes management for adults



** if for cardiac surgery, refer to Anaesthetic Management plan, or contact anaesthetist prior to starting VRIII

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Notes:

- For prolonged fasting in the acute setting, treat as not able to eat within 6 hours after surgery
- If a patient has DKA—treat as per RMO handbook and inform Anaesthetist/Surgeon
- GLP-1 agonist injectable: Exenatide LAR (Bydureon) weekly—continue but be mindful prolonged fasting can cause nausea and vomiting.

EUGLYCAEMIC DKA

- SGLT-2 inhibitors carry a small but definite risk of severe diabetic ketoacidosis (DKA) in patients with diabetes. Sometimes this DKA is associated with near normal or only mildly elevated blood glucose levels (i.e. euglycaemic ketoacidosis [EuDKA]).
- The risk of EuDKA is increased in **specific patient groups**. These include those with intercurrent infection, type 2 diabetes that is poorly controlled (HbA1C >70 mmol/mol, particularly those who have had a rapid correction of their control), and patients who are younger, female, have type 1 diabetes, and lower BMI (decreased glucagon stores).
- Triggers for EuDKA include infection, decreased food intake, dehydration, and reduction of insulin use. The risk is 7-fold with SGLT-2i compared to other diabetes medications.
- If patients from these groups **have been exposed to prolonged fasting, have had a very restricted dietary intake, bowel preparation, major surgery, are dehydrated, have an intercurrent illness, or are acutely unwell, these factors increase the risk of EuDKA if taking SGLT-2 inhibitors.**
- The risk in the perioperative period is due to fasting and reduced oral intake. It is higher for those at risk of prolonged reduced oral intake post-operatively or those who have higher risk of post-operative infections.
- Patients with HbA1c >75 mmol/L are at greater risk.
- **It is advised to discontinue SGLT2 inhibitors in these patient groups:** acutely unwell inpatients, patients likely to have poor oral intake due to illness, patients kept nil by mouth for investigations or perioperatively.

Patients who require unplanned/ emergency surgery and SGLT-2 was not withheld are at higher risk of EuDKA. The decision to proceed with surgery requires a multidisciplinary discussion between anaesthetics, diabetes, surgical and critical care services. Surgery should proceed only if time is critical, or logistics dictate, and metabolic state has been thoroughly reviewed. Please refer to the document "Diabetes care for an Adult having surgery" for a detailed management approach to ketones and acid-base status.

https://adhb.hanz.health.nz/Policy/Diabetes%20Care%20for%20an%20Adult%20having%20Surgery.pdf#search=diabetes%20perioperative%20guidelines

EuDKA is a medical emergency. Suspected euDKA requires **immediate attention** – please follow advice below for diagnosis and management. **Seek senior support if unsure and/or escalate as required**.

If a patient who has been on an SGLT-2 inhibitor has POCT blood ketones >1.5 mmol/L or beta-hydroxybutyrate (BHB) >1.5 mmol/L, they must have an urgent ABG or VBG to measure base excess, if this test has not already been done.

Symptoms and signs of EuDKA

- Abdominal pain, nausea, vomiting or fatigue
- Metabolic acidosis (high anion gap metabolic acidosis)
- pH <7.3
- Base excess *worse than* -5 mmol/L
- Bicarbonate <15 mmol/L
- Anion gap >12 mmol/L (albumin corrected)
- Normal or mildly increased plasma glucose (but <14 mmol/L)
- Increased POCT ketones >1.5 mmol/L or BHB >1.5 mmol/L (lab test)
- Normal range for ketones <0.6 mmol/L and BHB <0.3 mmol/L – though these may be elevated to a variable extent due to fasting. If euglycaemic ketoacidosis is strongly suspected with ketone levels borderline positive between 0.5 to 1.5 mmol/L, consider repeating in 1-2 hours.

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Note that:

- *Normal blood glucose levels do not exclude the diagnosis.*
- *Normal urine ketones do not exclude the diagnosis. You need to check blood ketone levels when dealing with the possibility of EuDKA.*
- *Lactic acidosis is an important differential diagnosis, but may also precipitate EuDKA.*

If any of the above features are present, EuDKA is likely, so **please discuss with the diabetes team and Critical Care**. Management includes rehydration, VRIII, acidosis and electrolyte correction. Some patients may need invasive monitoring.

Management of EuDKA

1. STOP SGLT2-inhibitor.

2. Initial management involves fluid resuscitation with a balanced / isotonic crystalloid (e.g. Plasmalyte 148) 1 – 1.5 L/hr (for the first 1-2 hours).

3. Immediately commence VRIII.

4. Add glucose 5% or 10% if CBG <15 mmol/L with IV insulin titration – check CBG hourly.

5. Note: IV glucose administration is particularly important so that the blood glucose levels are kept in a range to allow continued administration of VRIII.

6. Added K replacement as highlighted under DKA management, aiming to keep K^+ (potassium) >3.5 mmol/L.

7. Aim of resuscitation is to resolve the high anion gap metabolic acidosis by addressing the ketonaemia. Regular monitoring of ketones (at least 2-hourly initially) with ward based POCT testing or BHB is required.

8. Patients with confirmed EuDKA may need review by DCCM, especially if concurrent concerns regarding sepsis or otherwise unwell. If the patient is well enough to be managed on the wards with close monitoring in place, please alert the PAR team and the General Medicine on call team. Please also alert the Diabetes Service.

9. Do not restart SGLT2 inhibitors following an episode of DKA unless a clear cause for the DKA was identified and addressed.

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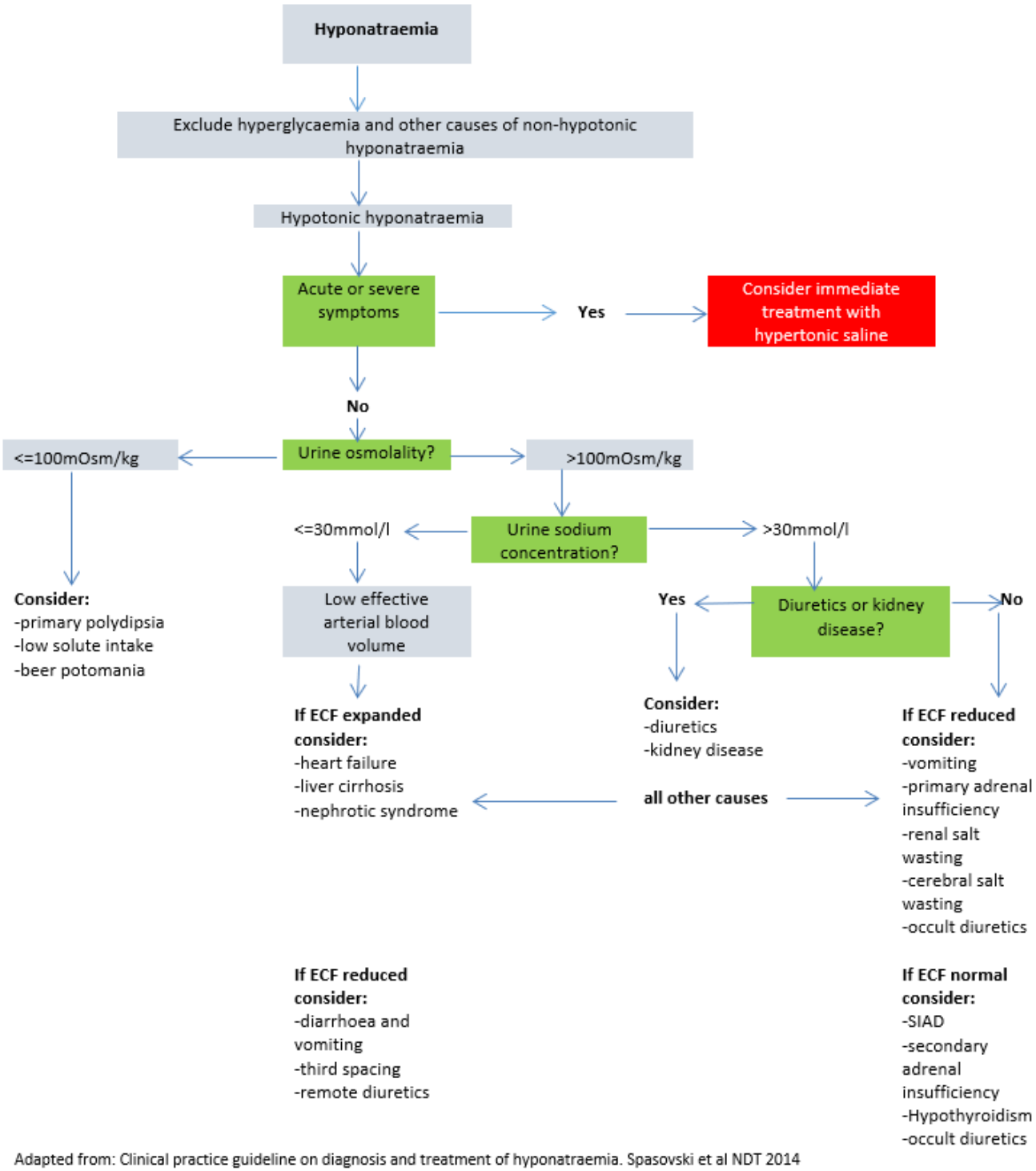
HYPONATRAEMIA

Full best practice guidelines available at [ERPB: European Renal Best Practice | ERA (era-online.org)]

Diagnosis



Adapted from: Clinical practice guideline on diagnosis and treatment of hyponatraemia. Spasovski et al NDT 2014

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- A higher urine osmolality (>100 mOsM) than is appropriate for the low serum osmolality (<275 mOsM) implies a deficit in urinary dilution, often driven by the non-osmotically regulated release of ADH due to low effective arterial blood volume, general anaesthesia, pain, nausea, stress, and a variety of medications (e.g., SSRIs and some anticonvulsants among many others).
- *True Syndrome of Inappropriate Anti-Diuresis (SIAD) is a diagnosis of exclusion.

Laboratory tests:

- Serum sodium, glucose, urea, and creatinine, T4, TSH, cortisol and serum osmolality.
- Urine sodium and urine osmolality.
- Short Synacthen® test may be required if diagnosis of cortisol deficiency is possible or if random cortisol <400 nmol/L.

NON-HYPOTONIC HYPONATRAEMIA

- Non-hypotonic hyponatraemia does not cause brain oedema and is managed differently (e.g., correction of hyperglycaemia). This guideline does not address these causes.

Table 1: Classification of Hyponatraemia by osmolality

Setting	Serum Osmolality	Examples
Presence of effective osmoles	Isotonic or hypertonic	Glucose, Mannitol, Glycine
Presence of ineffective osmoles*	Isotonic or hyperosmolar	Urea, alcohols, ethylene glycol
Presences of endogenous solutes that cause pseudohyponatraemia	Isotonic	Triglycerides/cholesterol, paraproteins

*Effective osmolality will be reduced: 2x(serum[sodium](mmol/l) + serum [potassium] (mmol/l)) + serum glucose (mmol/l)

HYPOTONIC HYPONATRAEMIA

Assessment

- Symptoms depend not only on the absolute serum sodium concentration but also on the rate of fall.
- Symptom severity generally reflects the severity of cerebral over-hydration which usually relates to the acuity of onset (<48h vs. >48h).
- In chronic hyponatraemia, symptoms tend to be milder until the serum sodium is moderately to profoundly reduced.
- Symptoms may relate to alternative diagnoses. If hyponatraemia is mild and symptoms are severe or moderately severe, alternative causes should be considered.

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Table 2: Grading of symptoms of hyponatraemia

Severity	Symptom
Moderately severe	Nausea without vomiting Confusion Headache
Severe	Vomiting Cardiorespiratory distress Abnormal and deep somnolence Seizures Coma (GCS <=8)

Table 3: Biochemical grading of hyponatraemia

Serum Sodium	Classification
130-135 mmol/L	Mild
125-129 mmol/L	Moderate
<125 mmol/l	Profound

MANAGEMENT OF HYPONATRAEMIA

- Resolution of cerebral oedema caused by hypotonic hyponatraemia must be balanced against the risk of osmotic demyelination syndrome (OSD) if correction is too rapid.

Severe or moderately severe symptoms

- In patients with severe or moderately severe symptoms the risk of brain oedema out-weighs the risk of osmotic demyelination syndrome and urgent therapy is justified irrespective of the biochemical degree or timing of the hyponatraemia.
- Urgent treatment of hyponatraemia typically requires hypertonic saline infusions (e.g., 10 mls 23.4% sodium chloride added to 90 mL of 0.9% sodium chloride over 20 min) and close clinical and biochemical monitoring. **It should be undertaken with appropriate support from the senior responsible clinician and the DCCM teams.**
- A 5 mmol/l increase in serum sodium concentration appears to be sufficient to reverse the most severe manifestations of acute hyponatraemia.
- Typically, the overall increase in serum sodium concentration should not exceed 10 mmol/l in the first 24 hours of treatment, and 8 mmol/l during every 24 hours thereafter until a serum sodium concentration of 130 mmol/l is achieved.
- Full neurological recovery may lag biochemical recovery.
- Complete diagnostic assessment and cause specific treatment.

Acute hyponatraemia without severe or moderately severe symptoms

- Stop/treat provoking factors (e.g., fluids/drugs/pain).
- Initiate prompt diagnostic assessment.
- Initiate cause specific treatment.
- Hypertonic saline may be indicated if acute drop in serum sodium exceeds 10mmol/l – discuss with senior responsible clinician.
- Typically, the overall increase in serum sodium concentration should not exceed 10 mmol/l in the first 24 hours of treatment, and 8mmol/l during every 24 hours thereafter until a serum sodium concentration of 130mmol/l is achieved.
- Lower limits of increase should be considered depending on the clinical situation.
- Close clinical and biochemical monitoring is required.

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Chronic hyponatraemia without severe or moderately severe symptoms

- Stop/treat provoking factors (e.g., fluids/drugs/pain).
- Initiate prompt diagnostic assessment.
- Initiate cause specific treatment.
- Typically, the overall increase in serum sodium concentration should not exceed10mmol/l in the first 24 hours of treatment, and 8mmol/l during every 24 hours thereafter until a serum sodium concentration of 130mmol/l is achieved.
- Lower limits of increase should be considered depending on the clinical situation.
- In moderate or profound hyponatraemia, serum sodium should be rechecked every 6 hours.
- In non-resolving cases reconsider diagnostic algorithm and considered expert advice

CAUSE SPECIFIC TREATMENT

Expanded ECF

- Fluid restriction to less than insensible losses and ongoing urine output.
- Consider loop diuretics if required for fluid overload.

Reduced ECF

- Restore ECF with 0.9% sodium chloride or a balanced crystalloid solution at
- 0.5 - 1.0 mL/kg/h.
- Treat cause of volume loss
- Haemodynamically unstable patients will require close biochemical and clinical monitoring.
- In case of haemodynamic instability, the need for fluid resuscitation overrides the risk of an overly rapid correction of serum sodium.

Normal ECF

- Fluid restriction to less than insensible losses and ongoing urine output.
- In non-resolving cases reconsider diagnostic algorithm and considered expert advice.

Too rapid correction of hyponatraemia

- Stop therapy aimed at increasing serum sodium
- Seek advice from senior responsible clinician
- Consider 5% glucose infusion

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HYPERCALCAEMIA

- This is seldom a medical emergency.
- Usually requires treatment if serum calcium is >3mmol/L and is urgent if calcium is >3.5 mmol/L.
- Common causes are primary hyperparathyroidism or malignancy but other risk factors such as immobility, chronic kidney disease or Paget's disease may co-exist.
- Check RCP for previous calcium measurements (acute vs. chronic).
- Discuss with endocrinology registrar after ordering investigations.

Causes of hypercalcaemia

- With high/normal or elevated PTH – primary hyperparathyroidism due to parathyroid adenoma [normal or high spot calcium/creatinine (Ca/Cr ratio) ratio]; very rarely due to parathyroid carcinoma (usually have very high calcium levels). If low Ca/Cr ratio, consider familial hypercalcuric hypercalcaemia (FHH).
- With suppressed PTH – malignancy including myeloma, granulomatous disease (TB, sarcoidosis), medications (thiazides, lithium), other endocrinopathies including severe hyperthyroidism, Vitamin D intoxication and excessive ingestion of antacids (milk alkali syndrome).

What tests do I order?

- PTH; Ca^{2+}; PO_4^{3-} Cr; ALP; ionised $Ca^{2+}$and urine calcium/creatinine ratio.
- If PTH is high/normal and serum calcium <3mmol/L discuss with endocrinology registrar regarding need for outpatient review or GP monitoring of calcium or refer via e-referral. This will depend on level of serum calcium, age, renal function, and evidence of complications of hypercalcaemia e.g., osteoporosis and renal calculi.
- If PTH is high/normal and serum calcium >3mmol/L, consult Endocrinology service while inpatient.
- If PTH is suppressed consider clinical history and review medications (diuretics, calcium containing supplements, lithium). Consult Endocrinology service.

How do I correct symptomatic or severe hypercalcaemia?

1. **Rehydration:**
   - With sodium chloride 0.9%, potassium chloride 20 or 40mmol per 1L of replacement fluid may be required.
2. **Stop thiazides, calcium (including OTC preparations) and vitamin D preparations**
3. **Zoledronic acid infusion:**
   - 4 mg IV in 100mL sodium chloride 0.9% over 15 minutes (if creatinine clearance <30mL/min consult an SMO).
   - Fever and flu-like symptoms may occur, transient and mild.
   - Plasma calcium falls progressively with lowest point at 3-5 days.
   - Repeat doses may be necessary, depending on the cause of the hypercalcaemia.

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4. **Prednisone:**

- If sarcoidosis or vitamin D toxicity is proven, prednisone 30mg daily may be effective.

HYPOCALCAEMIA

- Check albumin and adjusted calcium level.
- Hypomagnesaemia can cause low calcium levels by inducing PTH resistance. Note rare association with PPI use (see HYPOMAGNESAEMIA).
- Can be broadly divided into whether PTH is low or elevated.
    1. Hypocalcaemia with low PTH – surgical hypoparathyroidism e.g., post thyroidectomy, autoimmune destruction of the parathyroid glands (as seen in autoimmune polyglandular syndrome type 1), genetic disorders.
    2. Hypocalcaemia with high PTH – vitamin D deficiency, chronic kidney disease, PTH resistance and extravascular deposition – including osteoblastic metastases (breast and prostate), pancreatitis and sepsis.
- If adjusted Ca^{2+} <2.0mmol/L then further investigation is needed, provided chronic renal failure is not present. Symptoms may not be prominent if hypocalcaemia is long-standing.

What baseline investigations do I order?

- Ca^{2+}; PO_4^{3-}; PTH; Mg^{2+}; Cr; 25(OH) Vitamin D; ALP; ionised Ca^{2+}
- ECG: to check for increased QT interval

HOW DO I TREAT HYPOCALCAEMIA?

If serum magnesium <0.4mmol/L, give magnesium replacement (see HYPOMAGNESAEMIA). In this situation, the serum calcium will correct without additional treatment.

- If severely symptomatic (e.g., tetany, fits) call a Code Red and seek advice from DCCM:
- Give IV calcium gluconate e.g., 10 mL of calcium gluconate 10% solution as bolus over 5 min.
- In severe cases repeat IV calcium gluconate by continuous infusion e.g., 2-3 ampoules in 500 mL glucose 5% over 4-6 hours (each 10 mL ampoule of calcium gluconate 10% contains 89 mg elemental calcium).
- Dose and rate are monitored by repeated checks of serum calcium. Doses of 10 mg/kg of elemental calcium over 24 hours may be needed with half of this given in the first 4-6 hours.
- Start oral calcium e.g., 1-2 g elemental calcium daily (Calci-tab®2-4 tablets daily).

If not symptomatic:

- Start oral calcium
- Consider calcitriol 0.25-1 microgram daily in divided doses.
- Discuss with Endocrinology if cause of hypocalcaemia not determined/uncertain

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HYPOPHOSPHATAEMIA

Causes

- Redistribution of phosphate from the extracellular fluid into cells – diabetic ketoacidosis (DKA), refeeding in malnourished patients with underlying total body phosphate depletion e.g. anorexia nervosa or chronic alcoholism.
- Decreased intestinal absorption of phosphate – antacids, steatorrhea or chronic diarrhoea, vitamin D deficiency.
- Increased urinary phosphate excretion – hyperparathyroidism, rare phosphaturic syndromes.
- Removal by kidney replacement therapies.

Treatment

- Depends on phosphate level, symptoms and whether the patient can take oral therapy.
- Treat underlying cause – stop medications, treat diarrhoea, treat vitamin D deficiency.
- For critically ill patients with hypophosphataemia, management should be discussed with the primary team and/or DCCM.

HYPERKALAEMIA

(See Renal Medicine chapter)

HYPOKALAEMIA

- The normal plasma potassium level is 3.5-5.0 mmol/L.

Causes

1. **Tissue redistribution with fall of serum potassium by up to 1 mmol/L**
    - Metabolic alkalosis.
    - β-adrenergic agonists (intrinsic or extrinsic).
    - Insulin infusion (hypokalaemia is usually mild e.g., 3.0-3.5 mmol/L) and transient and can be treated with K+ in supplemental IV fluids.
2. GI-associated hypokalaemia
    - Upper GI gastric losses – vomiting causes volume depletion, metabolic alkalosis, and secondary hyperaldosteronism. This may cause moderate to severe hypokalaemia (<3.0 mmol/L).
    - Lower GI potassium losses – diarrhoea results in potassium loss via the gut. Patients usually have an associated metabolic acidosis.
3. **Renal potassium losses**
    - Diuretics – thiazides and frusemide.
    - Hyperaldosteronism and intrinsic renal diseases such as renal tubular acidosis and Gitelman's syndrome (a genetic disorder which affects the tubule transporter targeted by thiazides).
    - A urine potassium of >25 mmol/L during hypokalemia suggests some component of renal potassium loss.

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4. Hypertension and hypokalaemia

   - Either renal potassium wasting as seen in secondary hyperaldosteronism of renovascular hypertension or mineralocorticoid hypertension of primary hyperaldosteronism.
   - A random sitting plasma aldosterone, renin and aldosterone/renin ratio are appropriate screening tests.
   - Evaluation is usually as an outpatient, refer to Endocrinology service.

5. **Hypomagnesaemia**

   - Hypokalaemia occurs commonly in patients with hypomagnesaemia and is relatively refractory to potassium therapy. In this context hypomagnesaemia must also be corrected.
   - One vial of magnesium sulphate 2.5 g/5 mL contains 10 mmol magnesium.

Preparations

Please contact Pharmacy Medicines Information for further information or see the Pharmacy Bulletin Potassium Replacement.

Oral:

Potassium Chloride 600 mg slow-release tablet Span K® 600 mg SR	8 mmol potassium/tab
Potassium effervescent tablet Chlorvescent® effervescent	14 mmol potassium/tab (can give via NG tube)

Premixed IV solutions:

Premixed potassium bags available:
potassium chloride 20 mmol + sodium chloride 0.18% and glucose 4%, 1 Litre (isotonic)
potassium chloride 20 mmol + sodium chloride 0.9%, 1 Litre
potassium chloride 10 mmol + sodium chloride 0.29%, 100 mL (isotonic – for peripheral use)
potassium chloride 40 mmol in sodium chloride 0.9%, 1 Litre (Haematology, Level 2 & Gen Med)
potassium chloride 40 mmol in sodium chloride 0.9%, 100 mL (central line use – Ward 42 only)

Extra potassium must never be added to premixed solutions

Potassium sparing diuretics in use

Spironolactone 25-50mg daily
While these are an excellent choice in preference to regular oral potassium supplements, they add to the sum diuretic effect and may impair renal function. They are contra-indicated in patients with advanced renal failure (CKD stage 4 and 5) and used with caution in patients with stage 3 CKD (eGFR 30-60 mL/min). They must be used with caution in patients taking either ACE inhibitors or angiotensin-II receptor antagonists. In all these circumstances, more frequent potassium monitoring is required. In patients with heart failure, low dose spironolactone (25 mg daily) combined with an ACE inhibitor has a survival benefit.

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Management

Oral replacement is the preferred route if tolerated and clinically appropriate as it is easy to administer and readily absorbed from the gastrointestinal tract.

Mild asymptomatic hypokalaemia: serum potassium 3.0-3.5 mmol/L

- If otherwise well, do not need to treat.
- Transient hypokalaemia due to tissue redistribution may resolve spontaneously.
- If indicated, give Potassium Chloride 600 mg slow-release tablet – 1 tab three times daily or Potassium effervescent tablet 1 tab twice daily and monitor (chart for 2-3 days only and review).
- If on-going hypokalaemia expected e.g., loop diuretics, consider either a potassium sparing diuretic or potassium chloride 600 mg slow-release tablet 1-2 tabs three times daily.

Severe or symptomatic hypokalaemia: serum potassium <3.0 mmol/L

- Symptoms include paralysis, cardiac arrhythmias, tetany, digoxin toxicity.
- High dose oral replacement therapy with 40 mmol potassium chloride given 3-4 times over a 24-hour period can be utilised in severe hypokalaemia provided the patient is not symptomatic, can tolerate the oral medication and there is frequent potassium monitoring (at 6-12 hour intervals).
- If IV therapy is required, then infuse at a maximum rate of 10-20 mmol potassium chloride/hour. In rare circumstances the rate can be increased to >20 mmol/hour but only with appropriate monitoring in suitably equipped units in the hospital. Cardiac monitoring is mandatory if infusion ≥20 mmol/hour. Cardiac monitoring should also be considered if the infusion rate is ≥10 mmol/hour.
- The maximum recommended concentration via a peripheral line is 40 mmol potassium chloride per litre of sodium chloride 0.9%.

HYPOMAGNESAEMIA

- Reference range is 0.75-1.0 mmol/L.
- Mild to moderate magnesium deficiency (0.5-0.75 mmol/L) is usually asymptomatic and does not require supplements or testing.
- Serum magnesium <0.4 mmol/L can cause hypocalcaemia. Watch for hypocalcaemia or hypokalaemia refractory to usual potassium supplements; check magnesium level and replace.

Signs and symptoms

- Non-specific general symptoms even with moderate hypomagnesaemia. May be more susceptible to digoxin toxicity.
- Ventricular tachyarrhythmias can occur particularly after cardiopulmonary by-pass or myocardial infarction. ECG changes include progressive QRS widening, prolonged PR interval and diminution of T waves.

Causes of hypomagnesaemia

- GI losses from diarrhoea, fistula, vomiting, nasogastric suction, alcoholism.

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- Renal losses from diabetes mellitus and from medications such as frusemide, thiazides, gentamicin, cisplatin, cyclosporin and amphotericin B.
- Proton pump inhibitors – may need to stop.
- Mixed losses or redistribution in alcoholism, acute pancreatitis, and increased uptake by "hungry bones" after parathyroidectomy.

How is severe hypomagnesaemia treated?

- Severe deficiency (<0.4 mmol/L) may be symptomatic and require IV replacement therapy with 1-2 grams of magnesium sulfate (4-8 mmol) in 50-100 mL of glucose 5% given initially over 5-60 min followed by an infusion of 4-8 grams magnesium sulfate (16-32 mmol) given slowly over 12-24 hours.
- This infusion can be continued as necessary to maintain the plasma magnesium concentration above 0.4 mmol/L

Magnesium preparations

Oral

Products often change, please contact Pharmacy Medicines Information for further information or see **Pharmacy Bulletin Magnesium Replacement**

- Go Magnesium 800 capsules, each contain 14.8 mmol (360 mg) of magnesium (on HML but not funded in community).
- Mylanta® tablet contains magnesium hydroxide 3.45 mmol per 200 mg tablet (on HML but not subsidised in community).
- Magnesium hydroxide mixture 11 mmol/8 mL (subsidised: extemporaneous product).
- Magnesium sulphate 10 mmol/5 mL ampoule contents can be given orally.
- The laxative effect is caused by an intra-luminal osmotic effect and oral absorption of magnesium.
- Dosage: give 5-10 mmol Magnesium 2-4 times daily according to tolerance. Magnesium deficiency caused by loop diuretics may be better treated by a potassium (and magnesium) sparing diuretic such as amiloride (discuss with Endocrinology).

Intravenous see Medication administration guideline and Pharmacy Bulletin Magnesium Replacement for further information and guidelines

- Magnesium sulfate 49.3% injection solution available in 5 mL ampoules – 5 mL contains 2.465 g magnesium sulphate or 10 mmol Magnesium (2 mmol/mL).
- Compatible with glucose 5%, sodium chloride 0.9% and glucose + sodium chloride solutions.
- NOT compatible with calcium salts, IV fat emulsions.
- Dosage: individualise according to indication, urgency, and serum magnesium level. May give 5-10 mL magnesium sulphate (10-20 mmol Magnesium) IV over 12-24 hours in compatible fluids for maintenance doses Ensure dose adjustment for moderate renal failure: halve dose for serum creatinine 200-300 micromol/L.
- Ensure full hydration and potassium replacement therapy in patients with normal renal function.

Contraindications

- Heart block and severe renal failure

Special situations

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- Ventricular tachycardia or Torsades de Pointes (follow detailed CCU protocol).
- Pre-eclampsia or eclampsia (follow detailed NWH protocol).
- In eclampsia, careful monitoring for symptoms and signs of toxicity is required. These include respiratory depression or arrest, areflexia, hypotension, cardiac arrhythmia, or arrest.

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Endocrinology

WHO TO CALL

Endocrinology on-call Registrar (0800-1630hrs)

- Endocrinology service is not available afterhours and on the weekends
- Call General Medicine for advice after hours

OSTEOPOROSIS AND FRACTURE RISK ASSESSMENT

- If a patient >65 years is admitted with a clinical vertebral/hip/pelvic/humerus/radial fracture, it is reasonable to consider bisphosphonate treatment.
- Check Pharmac website for eligibility criteria for iv zoledronate and consider giving before discharge, renal function permitting (see below). Risedronate and Alendronate oral therapy does not require a Pharmac Special Authority application.
- Ask GP to follow-up as per Osteoporosis NZ guidelines.
- For other patients (those not admitted for treatment of a fracture), determine clinical risk factors, and fracture risk, and refer to Osteoporosis NZ guidelines.
- Consider referral to Bone Clinic as appropriate.

Check if the patient has any of the following risk factors for osteoporosis:

- Low impact fracture of the vertebrae, hip, pelvis, proximal femur, humerus or forearm
- Any fracture at a major skeletal site in an older adult should be assessed (except digits, face and skull)
- Age ≥65 years (women) and ≥75 (men)
- Smoking (current)
- Current/recent use of glucocorticoids
- Early menopause
- History of falls
- BMI ≤20 kg/m2

Use FRAX or Garvan risk assessment calculators to estimate fracture risk

- https://www.sheffield.ac.uk/FRAX/tool.aspx?country=1 (ensure Oceania: New Zealand is selected under calculation tool tab).
- Fracture Risk Calculator (garvan.org.au).
- If 10-year FRAX/Garvan hip fracture risk is ≥3% or major osteoporotic fracture risk is ≥20%, consider initiating bisphosphonate therapy.
- If eGFR or CrCL >35 mL/min, IV zoledronate is an option.
- Discuss fracture risk and side effects of zoledronate (Aclasta) infusion with patient
    - Common side effects (≥1 in 100) include mild transient flu-like symptoms, fever, headache, dizziness within 72 hours following the infusion.
    - Less common side effects include eye inflammation (about 6/1000) and osteonecrosis of the jaw (ONJ).
- Note: A bone mineral density assessment is not required if this will delay treatment.
- If CrCL <35 mL/min do not give zoledronate. Discuss with Endocrinology Registrar regarding oral bisphosphonates and potential referral to Bone Clinic.
- If zoledronate infusion was given, document this in the discharge summary and ask GP to follow-up for potential repeat infusion in 2-3 years.

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Resources

- Fracture Liaison Nurse
- Osteoporosis NZ website Clinical Guidance | Osteoporosis.

GLUCOCORTICOIDS AND ADRENAL SUPPRESSION

How to convert doses between different types of glucocorticoids

Hydrocortisone 20 mg ≈ prednisone 5 mg ≈ dexamethasone 0.5 mg

- These equivalents are for repeated dosing. Consider the 36 hour duration of action for dexamethasone which is given once daily. The duration of action for hydrocortisone is 8-12 hours and therefore hydrocortisone doses need to be given 2-3 times a day.
- The preferred adrenal replacement therapy for most patients is oral hydrocortisone 15-20 mg per day in 2-3 divided doses.
- Prednisone 5 mg daily may be preferable for long-term treatment in patients who struggle with twice daily dosing.
- Dexamethasone is not used for adrenal replacement therapy.

When do I suspect adrenal suppression in a patient taking steroids?

- This is dose and duration dependent.
- Expected in patients taking prednisone 5 mg daily (or more) long term (>6 months).
- Short-course steroids (e.g. for acute asthma for <3 weeks in tapering doses) do not cause adrenal suppression.

How do I taper down from chronic steroid treatment (in a patient not known to have long-term corticosteroid deficiency)?

- Reduction from higher doses of prednisone down to 5 mg/day is determined by the requirement for an anti-inflammatory effect (e.g. for PMR) and should be discussed with the relevant specialty or GP.
- If a decision is made to taper from prednisone 5 mg daily, reduce the daily dose by 1 mg every 1 month (4, 3, 2, then 1 mg per day) and stop 1 month after reaching 1 mg/day.
- No need for cortisol testing unless clinical features of concern. If there are any concerns, request a morning cortisol (recommend time of 0900) and if level >300 nmol/L, this rules out adrenal insufficiency.

When do patients require bone protection therapy during glucocorticoid therapy?

- Should be considered for patients whose projected prednisone therapy will exceed 5 mg daily for 6 months or more, especially if postmenopausal woman or >65years.
- Check Pharmac website http://www.pharmac.govt.nz/ for eligibility criteria for alendronate or zoledronate therapy.

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- Oral bisphosphonate therapy does not require a PHARMAC Special Authority application.
- Alendronate is currently less expensive than risedronate.

In what situations do I need to increase the steroid dose for patients on long-term adrenal replacement therapy?

Inter-current illness scenario

- Dose and formulation depends on the severity of illness
- Mild illness – double dose of glucocorticoid until symptoms resolve (e.g. increase prednisone from 5 mg daily to 10 mg daily). Once symptoms resolve, return to usual replacement dose.
- Severe illness – Influenza or pneumonia, systemic infections or immune reactions, significant trauma, surgery, may require higher doses (e.g. prednisone 40 mg daily, or hydrocortisone 100-150 mg daily, often given parenterally).
- If severe illness and unable to tolerate/absorb oral medications (e.g. vomiting, gastroenteritis), use hydrocortisone 50 mg IV 2-3 times a day.
- Switching from IV to oral therapy after resolution of the acute GI upset, infection or post-op usually coincides with reduced illness severity.
    - Hydrocortisone 40 mg am, 20 mg pm – oral OR
    - Prednisone 10-15 mg mane – oral

      These are equivalent schedules and can be reduced by one-third to half over the next 2-4 days, according to clinical progress, to baseline dose.

Peri-operative scenario

- Give hydrocortisone 50-100 mg IM with pre-med or IV at induction and a further 100 mg on day 1, then 50 mg BD on day 2 and then consider switching to oral hydrocortisone

  60 mg/day on day 3 and proceed with dose reduction as per the pathway above.
- Consider the clinical situation and reduce speed of reduction if post-operative complications occur.

ADRENAL INSUFFICIENCY

When is it appropriate to do a morning cortisol?

Only when there is clinical suspicion of adrenal insufficiency, including dilutional hyponatremia, suspected or known pituitary disease.

A morning (0900) cortisol is the first test to evaluate adrenal function – a value above 300 nmol/L excludes glucocorticoid deficiency.

When not to order a morning cortisol

Patients that have had steroid medications in the last 48 hours – make sure you check the medication and anaesthetic chart for IV dexamethasone.

Patients taking long-term steroids at doses >5 mg prednisone equivalent for more than 3 months. These patients will have low morning cortisol levels but will have adequate replacement (depending on clinical state).

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When and how do I do a short synacthen test (SST)?

- Check a morning (0900) cortisol – if >300 nmol/l do not do a short synacthen test.
- If morning cortisol <170 nmol/l and the patient has not had glucocorticoids recently (check the medication chart), then an SST is appropriate.
- If unsure, discuss with LabPlus how to chart synacthen and request a short synacthen test on the ward.
- The normal peak response is >400 nmol/l and is valid at any time of day or night.

ADRENAL LESIONS

How do I work up a patient with an adrenal lesion discovered incidentally on CT or MRI?

The vast majority of incidentally discovered adrenal lesions are benign and non-functional

1. **Determine if the lesion is benign or malignant:**

Review the images and radiology report and/or in x-ray conference (if applicable).

Features suggestive of a benign lesion:

- Size <4cm.
- Absence of imaging characteristics associated with malignancy – these include irregular margins and heterogeneous appearance.
- Low density on non-contrast CT imaging (<10HU).
- High washout rate of contrast on CT imaging (>50% at 10 min).
- Loss of signal on “out of phase” MR imaging.

Note: If an adrenal lesion has the typical benign radiological appearance, no follow-up imaging is required. If indeterminate, then follow-up imaging after 3-12 months is usually recommended.

2. **Determine if the lesion is hormonally active:**

- If history suggests phaeochromocytoma – check plasma metanephrines.
- If history/exam suggests Cushing’s syndrome – request either a 24h urine free cortisol level, or do a 1 mg dexamethasone suppression test.
- If there is a history of long-standing, difficult to control hypertension, particularly in association with hypokalaemia, request plasma aldosterone/renin ratio.

Note: new onset or well-controlled mild hypertension does not usually require aldosterone/renin ratio testing.

3. **Refer the patient if they meet the following criteria**

- Refer to surgical service when lesion is indeterminate or malignant. Any patient being considered for surgery should have plasma metanephrines measured.
- Refer to Endocrinology service if lesion is hormonally active, or there is clinical concern about hormonal activity.

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THYROID DYSFUNCTION

- The investigation and management of most goitres or thyroid nodules is elective and best handled in the primary sector or by referral to Endocrinology Outpatient Clinic.
- Exceptions include inpatients with symptomatic obstruction by goitre or those who have clinical thyroid cancer. These patients should be seen urgently by Endocrinology and/or ORL services.

Thyroid test guide

- Serum TSH − to screen for primary thyroid dysfunction.
- Serum T4 and TSH − if secondary hypothyroidism considered (pituitary or hypothalamic disease).
- Thyroid antibodies − TPO Ab is not recommended (non-specific). TSH-receptor antibody (TSH-Rab) is specific for Graves' Disease.

HYPERTHYROIDISM

- Usually first detected and managed in primary care but occasionally patients present to hospital with severe or complicated hyperthyroidism (e.g. atrial fibrillation or in the context of past or on-going amiodarone therapy).
- Differentials include Graves' Disease, sub-acute thyroiditis, toxic nodular goitre (TNG).

How do I work-up a patient with hyperthyroidism?

- Take a history and examine the patient
  - Symptoms include weight loss, palpitations, sweating and dry eyes
  - Check for tachycardia, tremor, proximal myopathy, thyroid eye disease
  - Palpate the neck feeling for tenderness, a goitre or nodule
  - Listen for a thyroid bruit
- Check TFTS (TSH, T3 and T4) and order a TSH-Rab if clinical uncertainty about cause.
- Check if recent or current amiodarone therapy, on lithium or iodine supplements.
- Review radiology imaging within past 3 months, as radio-contrast agents contain iodine.

If my patient has Graves' Disease, what dose of carbimazole should I use?

- Mild (FT4 or FT3 < twice the upper limit of normal): 10-15 mg daily.
- Moderate (FT4 or FT3 > twice the upper limit of normal): 15 mg twice daily.
- Severe (FT4 or FT3 > 3 times the upper limit of normal) or with marked symptoms (tachycardia, rapid weight loss): 15-20 mg three times a day, plus a beta blocker. Higher doses may be required. These patients should be discussed with the on-call Endocrinology team.
- Warn all patients about the sudden, serious complication of agranulocytosis (about 1/1000 risk) with carbimazole and take a baseline FBC and LFTs before starting carbimazole. Document this in the notes.
- For patients with thyro-cardiac disease, start metoprolol CR 47.5-95 mg daily, aiming for HR <90/min and BP >100 systolic.

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When do I refer to Endocrinology?

- Any patient whose management you are uncertain about.
- If you are unsure about what dose of carbimazole to use.
- If the diagnosis is uncertain.
- Female patient wishing to conceive in the next year.

Further reading

Hyperthyroidism - Community HealthPathways Auckland Region | Te rohe o Tāmaki Makaurau

HYPOTHYROIDISM

- Replacement treatment with levothyroxine is appropriate for patients with TSH >10 mIU/L.
- Most adults will achieve euthyroidism with a dose of approximately1.6 mcg/kg/day.
- For adults >60 years of age and those with ischaemic heart disease, it is recommended that low initial doses are used, i.e. start on 25-50 mcg daily with dose increases approximately every six weeks, as guided by TSH results.

Further reading

Hypothyroidism - Community HealthPathways Auckland Region | Te rohe o Tāmaki Makaurau

Management of thyroid dysfunction in adults - BPJ Issue 33 (bpac.org.nz)

HYPOGLYCAEMIA (in a patient not known to be on diabetes medications)

- If the patient has diabetes and is on medications known to cause hypoglycaemia (insulin or insulin secretagogues) refer to DIABETES section on MANAGEMENT OF HYPOGLYCAEMIA.
- Insulin secretagogues include sulphonylureas (e.g. glipizide, gliclazide).
- Spontaneous hypoglycaemia always requires investigation. Suggest early referral to Endocrinology service.
- Note that capillary blood glucose tests are unreliable in the hypoglycaemic range and should not be used for diagnostic purposes.
- If a patient with hypoglycaemia (plasma glucose <3.0 mmol/l) demonstrates Whipple's Triad, they should have further investigations
- Whipple's Triad consists of:
    - Symptoms, signs, or both consistent with hypoglycaemia
    - A low plasma glucose concentration (<3.0 mmol/L)
    - Rapid resolution of those symptoms or signs after the plasma glucose concentration is increased.
- If Whipple's Triad is present, take a history regarding timing of symptoms in relationship to meals, drugs/medications, critical illnesses, recent gastric bypass surgery, hormone deficiencies (e.g. cortisol), and non-islet pancreatic cell tumours.

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What tests do I order?

Measure plasma glucose, insulin, c-peptide, β-hydroxybutyrate, and order a sulfonylurea screen **during an episode of hypoglycaemia,** before administering treatment Remember to document this clinical information on the lab form.

How do I interpret these tests?

	Exogenous	Insulin secretagogues	Insulinoma	Non-insulin causes
C-peptide	↓	↑	↑	↓
Insulin	↑	↑	↑	↓
Glucose	↓	↓	↓	↓
Sulphonylurea screen	NEG	POS	NEG	NEG

When do I refer to Endocrinology?

- At any time if you are uncertain how to proceed.
- If you have documented a plasma glucose <2.5 mmol/L.
- After you have done baseline testing and wish to discuss diagnosis and management including need for further testing – e.g. imaging.
- **Please DO NOT** discharge a patient with Whipple's Triad and unexplained hypoglycaemia or testing suggestive of endogenous insulin production without a definitive endocrinology management plan.

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Gastroenterology

Gastroenterology INTRANET SITE

If a patient who has been under the care of Gastroenterology as an outpatient is admitted under another service for a gastro-related problem they MUST be discussed with the Gastroenterology Department.

WHO TO CALL

Gastroenterology on-call Registrar

Hepatology on-call Registrar

After hours Gastroenterology/Hepatology Registrar

Fax for inpatient endoscopy procedures/referrals

Gastroenterology endoscopy booking clerk

Inpatient endoscopy referrals are now online via RCP. Please ensure that you have selected the drop box for Inpatient Endoscopy (see below).

All urgent and after-hours requests must still be discussed with the on-call Gastroenterology Registrar or Consultant.

Outpatient Gastroenterology referrals are made online via RCP.

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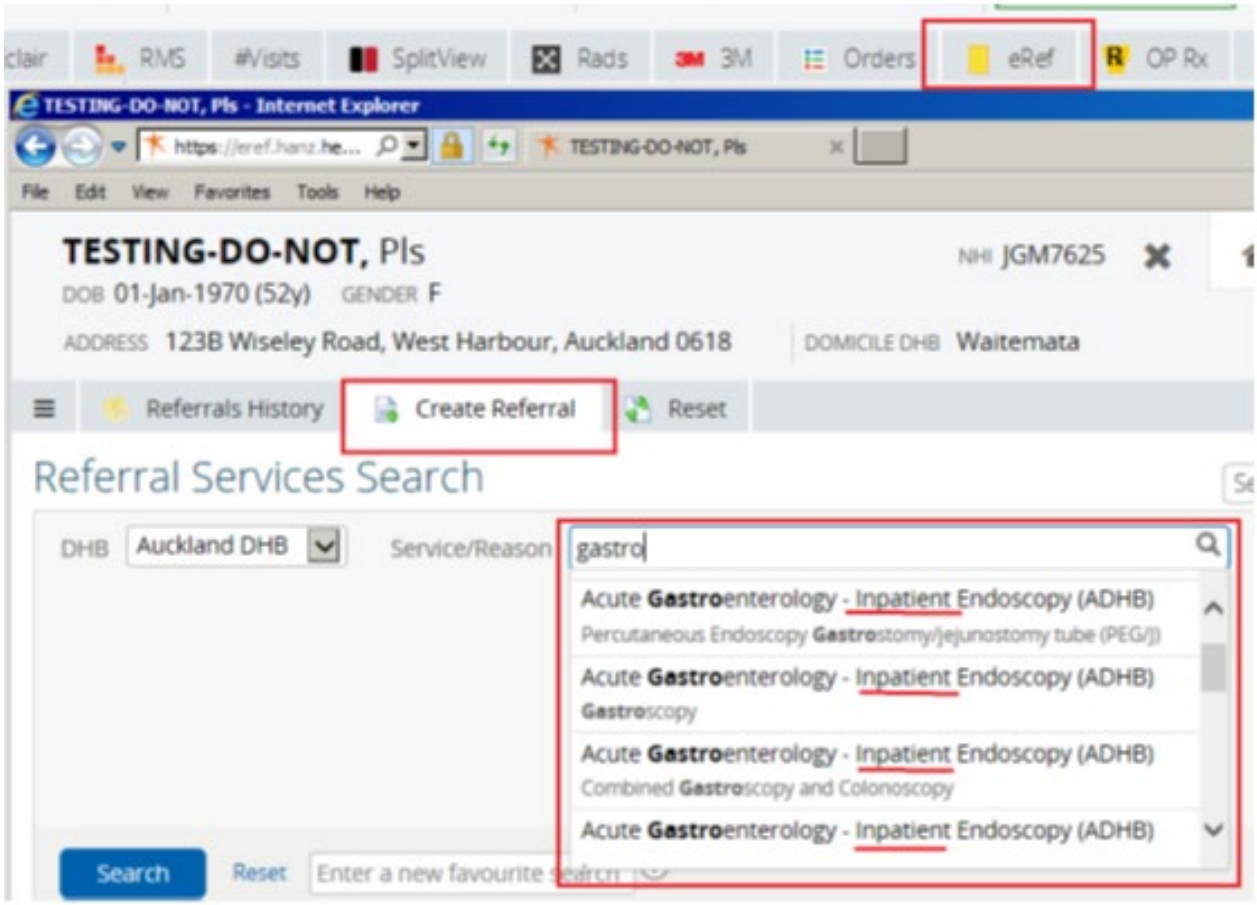
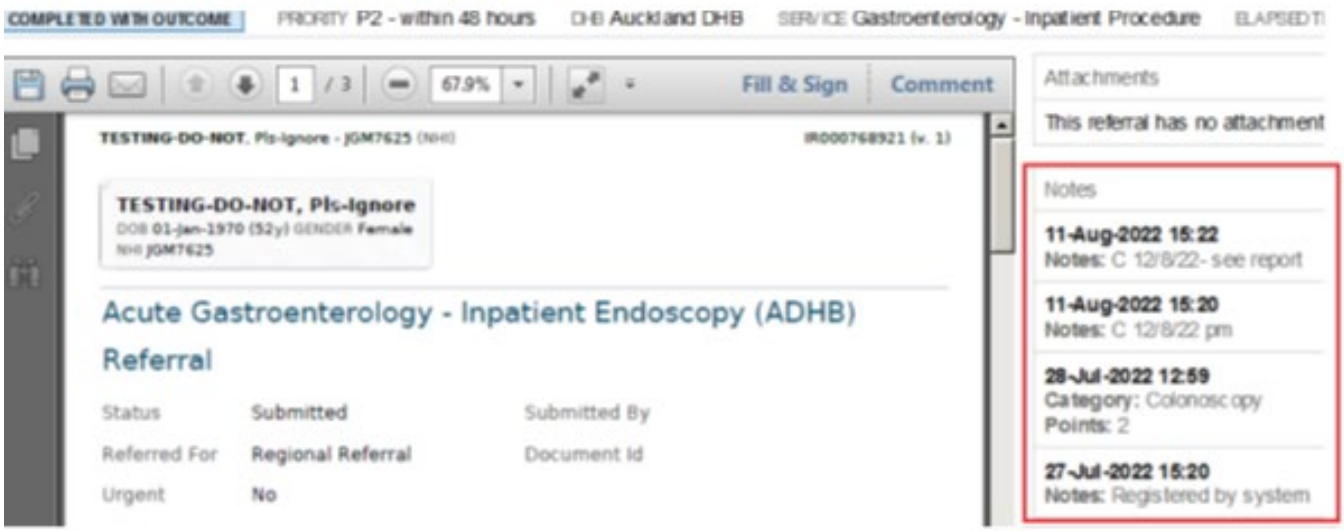


You can check on the progress of each referral and the scheduled procedure time on the intranet without having to call the endoscopy unit.



UPPER GI HAEMORRHAGE

(See Emergency Medicine: **Upper GI Haemorrhage** chapter)

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NAUSEA AND VOMITING

(See also Palliative Care chapter)

Causes to consider

Cause	Examples
Gastrointestinal infections	Gastroenteritis, epidemic vomiting, food poisoning
Gastrointestinal disorders	Peptic ulcer disease, gastroparesis, bowel obstruction, gastric outlet obstruction, cholecystitis, hepatitis, pancreatitis, appendicitis
Drugs	Chemotherapy agents, antibiotics, digoxin, theophylline, alcohol
Endocrine disorders	Diabetes, adrenal insufficiency
Central nervous system	Motion sickness, increased intracranial pressure, head trauma, epilepsy, vestibular disorders, stroke, meningitis, migraine
Systemic illness	Myocardial infarction, renal failure, sepsis, electrolyte imbalance
Psychogenic causes	Psychogenic vomiting and related disorders
Specific syndromes	Cyclic vomiting syndrome, post-operative vomiting
Miscellaneous	Pregnancy

Other Considerations:

- Complications
- Haematemesis (Mallory Weiss tear)
- Oesophageal perforation (pain prominent)
- Electrolyte disturbances
- Dehydration
- Malnutrition
- Aspiration

Treatment:

(See Palliative Care chapter)

HELICOBACTER PYLORI

Diagnosis

- Serum serology remains positive for a long time after eradication, so cannot and should not be used to distinguish current from past infection.

- Faecal antigen testing is the simplest test to confirm current active infection; however, antibiotics within 4 weeks and PPI use within 2 weeks can give false negative results.

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- Gastric biopsy with rapid urease testing or histology with immunohistochemistry are also reliable (although similar issues with false negative as above) but are clearly the most invasive and expensive.

Eradication Therapy

Success of eradication is around 80% with 1st line therapy, however is reduced if the course is not taken completely, after recent antibiotic use, and if an active smoker.

1st line therapy is 14 days of:

- Amoxicillin 1g po bd (if penicillin allergic, substitute metronidazole 400 mg po bd), and
- Clarithromycin 500 mg po bd, and
- Omeprazole 40 mg po bd

2nd line therapy is generally 14 days of:

- Amoxicillin 1g po bd, and
- Tetracycline 250-500 mg po qid, and
- Omeprazole 40 mg po bd, and
- Bismuth (De-Nol®) 120 mg po qid (Section 29 medicine. Stock is carried in limited pharmacies)

3rd line therapy should be specifically targeted. Refer to Gastroenterology or ID

ACUTE DIARRHOEA

History

- History: pain and contacts:
    - Include frequency, presence of blood and/or mucus, fever, any nausea or vomiting, drugs (especially recent antibiotics), surgery and radiotherapy
    - Overseas travel
    - Any suspect foodstuffs
    - Occupation

Examination

- Signs of dehydration, abdominal tenderness, peritonism and sepsis
- Always do PR

Investigations

- FBC, differential electrolytes and creatinine
- Blood cultures if febrile
- Supine AXR may be useful
- Stool samples (give full clinical details to ensure appropriate testing)

You must write date of admission and appropriate history on laboratory request, or specimen will be discarded.

1. **Microscopy:**
    a. Leucocytes: inflammatory process suggestive of large bowel invasive pathogens or inflammatory bowel disease
    b. Parasites: consider if foreign travel, unexplained diarrhoea for >7days, at risk groups (e.g. infants, HIV infection)

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2. **Culture**:

   Salmonella, Shigella, Campylobacter, Yersinia and Aeromonas are routinely sought by the laboratory. Clinical details/specific request will determine if other pathogens sought (e.g. Vibrio, toxin-producing E. coli)

3. **Antigen/toxin**:
   a. Rotavirus routinely tested in young children, otherwise by request
   b. C. difficile toxin assay on liquid stool (culture not performed) with history of prior antibiotic use or acid suppression (PPI or H2 receptor antagonists). If toxin assays are positive, the lab will automatically perform PCR testing for confirmation

4. **Parasites:**
   3 faecal samples on separate days in PVA fixative for parasites. Giardia antigen if requested (fresh specimen needed)

Management

- If suspect infection: isolation and strict hand hygiene.
- Rehydration with oral fluids + IV fluids.
- Remember faecal losses of electrolytes may be as high as 100 mmol/L Na+ and 5-15 mmol/L K+ per litre of stool.
- Antibiotics are not necessary for most cases of infective diarrhoea.

Specific infections

- *Salmonella/Shigella/Campylobacter*: usually self-limiting. Antibiotics should only be used when illness is severe with systemic inflammatory response syndrome (SIRS) or in the immunocompromised patient; discuss with ID team.

- *C. difficile*: associated diarrhoea must be suspected when antibiotics have been taken within the last few weeks, or if the patient is taking acid suppression (PPI or H receptor antagonist). Sigmoidoscopy may sometimes be diagnostic, but is often not necessary. One test for *C. difficile* toxin on liquid stool is adequate with current assays. Treat with metronidazole 400 mg po q8h (preferred) or 500 mg IV q12h (use IV only if oral route is contraindicated), aiming for total of 14 days. An alternative treatment option is vancomycin 125 mg po qid (also 14 days duration) – requires ID/Microbiology approval. Failure rates can be minimised by reducing concomitant use of anti-secretory medication (PPI or H2 receptor antagonists). Discuss patients with recurrent disease with Gastro.

- Patients with HIV infection often have diarrhoea, most commonly due to drugs or irritable bowel syndrome. Usual gut pathogens are most likely but these patients are more likely to have GI tract infections with less common organisms, e.g. *Cryptosporidium parvum*, and if CD4 <100 cells/mm3, CMV and *Mycobacterium avium intracellulare* are possible. Call ID team.

CHRONIC DIARRHOEA

History

- Bowel habit: stool frequency (?nocturnal), consistency (?steatorrhoea), blood, mucus
- Abdominal pain
- Upper GI symptoms, weight loss, appetite
- Relevant surgery, past medical history, alcohol, drugs (including laxatives)
- Family history

Examination

- Evidence of systemic upset e.g. cachexia, dehydration, abdominal masses/tenderness
- Must do PR

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Investigations

- FBC, CRP, Fe, B_{12}, folate, Coeliac antibodies, thyroid function, albumin/total protein
- 3x stool samples (see **ACUTE DIARRHOEA** chapter)
- AXR
- +/- sigmoidoscopy/colonoscopy, CT abdomen (selected cases)
- Rarer causes include constipation (AXR), hyperthyroidism (TSH), pancreatic exocrine deficiency (faecal elastase)

Management

- Unlikely to be infectious so don't need to isolate
- Main differentiation is between functional and organic symptoms
- Ensure hydration/nutrition is maintained
- Avoid anti-diarrhoeals until a diagnosis is achieved

INFLAMMATORY BOWEL DISEASE (IBD)

History

- Known IBD presenting with diarrhoea, blood/mucus, constipation or increased abdominal pain should alert you to possible flare-up of the disease
- Ask for any relevant recent history: drugs/travel/surgery

Examination

- General: dehydration/sepsis
- Specific: abdominal pain/peritonism/bowel sounds
- Must do PR

Remember

- Steroids will suppress inflammatory response, so signs may be reassuringly normal (possibly falsely so)
- Normal inflammatory markers do not exclude significant IBD flare
- IBD patients have increased rates of enteric infections including *C.difficile*
- Seek Gastroenterology advice if concerned

Investigations

- FBC, electrolytes, creatinine, albumin, LFTs, blood cultures (if febrile), CRP
- Stool cultures
- AXR: toxic mega-colon (diameter >5.5cm) is a medical/surgical emergency

Management

- IV fluids (consider antibiotics if temp >38°C).
- Early Gastroenterology referral. If IBD is the primary reason for admission, patient should be transferred to Gastroenterology inpatient team.
- Surgical referral if signs of peritonism.
- Corticosteroids are the initial medication of choice: IV hydrocortisone 100 mg qid then oral prednisone 40 mg daily with cholecalciferol for bone protection.
- Relapse prevention: consider 5-aminosalicylic acid compounds (Asacol®/Pentasa®)
- Prescribe VTE prophylaxis for all patients. Please note that PR bleeding is not a contra-indication for prophylactic enoxaparin.

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CONSTIPATION

General measures

- PR examination
- Exclude: pregnancy, cancer, hypothyroidism, and hypercalcaemia
- AXR: not usually needed

Specific measures

- Bulking agents should be the first line treatment e.g. psyllium (Konsyl-D®). Caution in patients with diabetes (high sugar content in some products) and avoid if patient is immobile or on constipating drugs.
- Avoid constipating drugs e.g. opiates, tricyclics, anticholinergics, calcium channel blockers, aluminium hydroxide, ondansetron.
- Dietary control e.g. fibre, fruit.
- Lifestyle: regular exercise.

If no response then consider

- Faecal softeners e.g. docusate (Coloxyl®) 50-100 mg bd.
- Lactulose 10-20mL bd (osmotic effect but may cause excess flatulence).
- Colonic stimulants: e.g. bisacodyl, docusate and senna (Laxsol®) 2 tablets bd (useful in acute constipation; side effects include cramps, electrolyte imbalance, melanosis coli; short term use is advised).
- Rectal therapy: stimulant (bisocodyl suppositories), osmotic citrate (Micolette® enemas) and phosphate enemas may be helpful.
- Polyethylene glycol (Macrogol 3350, Molaxole® sachets) 1-3 sachets daily, (up to 8 for faecal impaction)
- Glycerol suppositories/manual evacuation for faecal impaction (See also Palliative Care chapter).

JAUNDICE

Painless obstructive jaundice is NOT an indication for admission. Patients should be referred to Gastroenterology Services for urgent outpatient assessment.

Indications for admission are:

Acute viral hepatitis with

- Intractable nausea/vomiting
- INR >2.0; any hypoglycaemia
- **Acute Liver Failure** – see later section

Cholestasis with

- Pain
- Cholangitis – refer Gastroenterology
- Pancreatitis – refer General Surgery

Chronic liver disease with

- Complications (other than jaundice) – see later section

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INTERPRETING LIVER TESTS

Isolated hyperbilirubinaemia

- Haemolysis (FBC, reticulocyte count, haptoglobins, Coomb's test)
- Gilbert's syndrome (no evidence of haemolysis)

Obstructive jaundice (cholestasis; ALP >4x normal + GGT elevation or AST÷ALP <2)

- Ultrasound scan (USS) is the investigation of choice to exclude duct dilatation.
- If normal calibre bile duct on USS, consider drug toxicity, primary biliary cirrhosis, primary sclerosing cholangitis, cholestatic hepatitis.
- Consider MRCP(diagnostic)/ERCP (therapeutic) if dilated biliary system (consult with Gastroenterology Department).
- Give IV vitamin K 10mg if INR increased.

Hepatitic jaundice (AST or ALT >10x normal or AST÷ALP >5)

- Infectious causes: hepatitis A, B, C, Delta, E, EBV, CMV
- Acute alcoholic hepatitis
- Decompensated chronic liver disease
- Drugs, toxins

Mixed jaundice (does not meet above criteria)

- Will need consideration of all the above tests/diagnosis

Hepatitis B serology

- HB surface antigen – indicates acute or chronic infection.
- HB surface antibody – indicates immunity to HBV after vaccination or infection.
- HB core antibody IgG – indicates immunity to HBV after previous infection.
- HB core antibody IgM – indicates acute infection.
- HB e antigen – tends to mirror DNA levels and indicates high level viraemia and potential infectivity.
- HB e antibody – develops after clearance of HB e antigen and implies low level viraemia in the Immune. Control phase of chronic infection.

SPECIFIC MANAGEMENT OF LIVER FAILURE

ACUTE LIVER FAILURE

Acute liver failure is a medical emergency. Early diagnosis and management is crucial to ensure recovery or survival to liver transplantation. Where this is suspected, commence treatment and involve the Liver Unit early.

Clinical and biochemical features of acute liver failure

- Jaundice
- Hepatic encephalopathy, acute confusion, drowsiness (cerebral oedema)
- Hypoalbuminaemia (late feature)
- Coagulation defects: check prothrombin time/INR
- Hypoglycaemia
- Oliguric renal failure, hyponatraemia
- Fever, hypotension from sepsis
- Hypoxia from acute lung injury

Causes of acute liver failure/acute severe hepatic necrosis

- Acute hepatitis B
- Acute hepatitis flare in chronic hepatitis B carrier (usually Asian, Maori, Pacific Islander)
- Acute hepatitis A or E
- Idiopathic (presumed non-A, non-B viral hepatitis)
- Drugs: paracetamol/others

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- Autoimmune
- Fatty liver of pregnancy
- Wilson's disease

Investigations of acute liver failure

- Electrolytes, creatinine, glucose, albumin, bilirubin, ALP, ALT, AST, GGT, FBC + differential
- INR (if >5 request Factor V level)
- Drug screen (30 mL urine to toxicology: alcohol and other drugs as indicated)
- Hepatitis testing: HBsAg, anti HBcore-IgM and HAV IgM
- ANA, SMA, immunoglobulins, 24h urinary copper
- ABG, pH

Treatment of acute liver failure

- Correct hypokalaemia, hypotension, hypoglycaemia – start glucose 10% at 50 mL/hour.
- If paracetamol overdose, start N-acetylcysteine (NAC calculator), request urgent Consultant psychiatric review (prior to onset of confusion).
- Give IV vitamin K (phytomenadione)10 mg slowly; do not give FFP unless needed to control active life-threatening bleeding.
- Consult Liver Unit immediately (24 hour SMO contact number 021-LIVER-1 or 021-LIVER-2).
- If patient confused, drowsy, or severely coagulopathic (INR >8), contact DCCM directly.

CHRONIC LIVER FAILURE

Always arises on the background of cirrhosis, which may be previously undiagnosed. Acute deterioration usually has an identifiable precipitant.

Clinical and biochemical features of chronic liver failure

- Jaundice
- Encephalopathy
- Ascites
- Hypoalbuminaemia
- Coagulation defects: check prothrombin time/INR

Causes / precipitants of acute decompensation of chronic liver failure

- GI haemorrhage.
- Sepsis (chest, UTI, skin, spontaneous bacterial peritonitis if ascites).
- Alcohol excess, alcohol withdrawal in chronic alcoholism.
- Drugs (especially alcohol, benzodiazepines, narcotics).
- Electrolyte disturbance and volume depletion (over-diuresis, hyponatraemia, hypokalaemia, hypomagnesaemia).

Investigations of chronic liver failure

- Electrolytes, creatinine (urea usually unhelpful and creatinine underestimates degree of renal failure in patients with protein-calorie malnutrition from liver failure), glucose, albumin, bilirubin, ALP, AST, GGT, FBC + differential, coag screen.
- Drug screen (30 mL urine to toxicology: alcohol and other drugs as indicated).
- HBsAg and anti-HCV testing (assume infectious until result available).
- ANA, SMA, AMA, SLA (soluble liver antigen), immunoglobulins.
- Serum AFP.
- Blood cultures.
- Abdominal ultrasound (determine ascites, hepatoma, portal vein thrombosis).
- Ascitic tap if ascites present (Inoculate into blood culture bottles at the bedside to increase diagnostic yield. Send cell count and albumin separately).

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Treatment of chronic liver failure

- Treat any underlying cause (e.g. bleeding varices, sepsis).
- Give full nutrition support (dietician assessment).
- Treat hypovolaemia with albumin 4% or 20%, not sodium chloride 0.9%
- Stop any sedatives, opioids.
- Correct hypokalaemia, hypotension, hypoglycaemia.
- If INR/PR elevated, give IV vitamin K 10 mg once daily for 3 days; FFP for significant bleeding complications only.
- Involve Liver Unit early.
- Watch for alcohol withdrawal (see Recreational Drug Problems chapter).

If GI bleed suspected

- Contact Gastroenterology Registrar on call immediately.
- Cross-match and transfuse as required, target Hb 80-90 g/L if no signs of hypoperfusion.
- Urgent upper GI endoscopy (prophylaxis with cefuroxime).
- If delayed, consider IV terlipressin 1 mg q6h. Watch for signs of cardiac or mesenteric ischaemia.
- If unstable, discuss with DCCM.
- Gastroenterology will take over care of all patients with variceal bleeding.

If hepatic encephalopathy suspected

- If patient unconscious or haemodynamically unstable (from GI bleed or sepsis) or in oliguric renal failure (hepatorenal syndrome), contact DCCM directly. Give full nutrition support (dietician assessment).
- Purge with lactulose 10-30 mL tds (adjust to produce 3 loose stools/day).
- If drowsy use bd enemas, insert NG tube and give lactulose.
- Watch for alcohol withdrawal.
- Treat/remove precipitating cause.

Contact Gastroenterology/Liver Unit for advice

For further detailed protocols on management of all complications of acute and chronic liver disease consult the NZLTU Protocol - look under "T" (transplant section) on the ADHB intranet homepage.

ASCITES

Ascites, like other body effusions, can be a transudate (low protein content with albumin <30 g/L) or an exudate (high protein content with albumin >30 g/L).

- Transudate = portal hypertension, heart failure (RVF, cor pulmonale), nephrotic syndrome
- Exudate = infection or malignancy

In general ascitic fluid should be tested for the following:

- WCC + differential and RCC, albumin, glucose, amylase
- Cytology
- Culture: fluid placed directly into blood culture bottles (>50 mL fluid)
- Request TB culture if this infection is suspected
- Concurrently check serum albumin and total protein

Management

- If the serum albumin/ascitic gradient (serum albumin-ascitic albumin) is >11 g/L, portal hypertension is the likely cause
- Low salt diet
- Spironolactone 100 mg daily +/- furosemide (40 mg per 100mg spironolactone to a maximum of 80 mg).
- Monitor creatinine and electrolytes 48-72 hourly

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- Large volume paracentesis (discuss with Gastroenterology/Hepatology)
    - Reduces hospital stay.
    - Involves removal of a large volume of ascitic fluid by peritoneal tap over 2-6 hours.
    - After completing paracentesis of more than 5 Litres, give IV albumin 8 g per every 1 L of ascites that was drained. Albumin comes as Albumex® 20 bottles where each 100 mL bottle contains 20 g of albumin.
    - Avoid if renal failure or SBP.
    - Paracentesis catheter to be removed after no more than 6 hours (even if still draining) to decrease infection rate.

- Spontaneous bacterial peritonitis (SBP) (discuss with Gastroenterology/Hepatology)
    - Suspected if the ascites neutrophil count is >250 x 106/L.
    - SBP is unlikely in non-cirrhotic ascites.
    - The initial treatment for proven or suspected bacterial peritonitis is IV cefuroxime 750 mg IV q6h.
    - Aminoglycosides should be avoided.

ENDOSCOPY CONSENT

The elements that must be covered within the consent process include

1. Why the procedure is being requested.
2. What is involved in routine examination.
3. The common therapeutic interventions that may be needed.
4. Potential complications (while emphasising that serious complications are rare).

The patient / consenter interaction

You may like to use phrases similar to ones below while talking to your patient. Usually, the patient will have already received a copy of the information sheet. We suggest you give it to them again and then come back a few minutes later to go over it.

1. Explain what the procedure involves

Gastroscopy

- Initially, a spray of anaesthetic at the back of the mouth is given to make the throat numb and help stop gagging. Some find the taste a little unpleasant. It may make you feel like you can't swallow even though you still can.
- Gastroscopy can be performed safely with no sedation but, if you wish, a sedative can be given into the vein which will allow you to relax but will not put you completely to sleep. It is not a general anaesthetic. Occasionally, because of this medication, people might be unable to remember the procedure.
- The endoscope (a flexible black tube about the diameter of your little finger that has a video camera and a light in its tip) is passed over the tongue, down the gullet and into the stomach. This allows the doctor doing the procedure to view the inside of the stomach and first part of the gut. It will not go down your breathing tube or block your breathing.
- Gastroscopy is not painful but minor nausea/retching is common and usually settles quickly.
- The examination typically takes only 4-5 mins.

Colonoscopy

- You will need to drink some preparation fluid before the examination. This is a large volume of fluid (3 litres). It is very important you drink this all because if your bowel is not clear your examination may be inadequate, important abnormalities may be missed, and the whole test may need to be repeated. When you have drunk all the prep fluid you will have done the hardest part of colonoscopy!
- Most of the time a sedative is then given into the vein which will allow you to relax, but will not put you completely to sleep as it is not a general anaesthetic. You can choose not to have the sedative

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and be fully awake for your procedure. Occasionally, because of this medication, people might be unable to remember the procedure.
- The doctor will then examine the rectum (back passage) with a finger to lubricate the area and to make sure there are no problems in the rectum. The colonoscope (a flexible black tube about the diameter of your finger that has a video camera and a light in its tip) is then inserted, which will then be guided through the bowel.
- The examination may be uncomfortable at times due to stretching of the bowel wall, a bit like wind pains. If this is bothering you, tell the staff.
- One of the staff may have to press on your stomach to help guide the tube through the bowel. You may be asked to roll over to help the tube slide around the bowel.

2. Explain what might happen during the procedure

- Sometimes, a biopsy, which is a small tissue sample of an area of interest, may be required. A small instrument is passed down the endoscope and pieces of tissue about the size of a pinhead are taken.
- At other times, an area of bleeding may be found. This may require injection of adrenaline or heat therapy or clips to stop it.
- If polyps are found, the endoscopist may remove them with a snare.
- Biopsies and polyp removal should not cause any discomfort (except occasionally the feeling of a small tug).

3. Explain potential complications

- Endoscopy is a very safe procedure, performed by highly trained endoscopists.
- Most people tend to feel a little bit "woozy" after having some sedation – this is quite common. Sedation may cause respiratory depression but this is monitored constantly throughout the examination.
- Occasionally people may have a sore throat for a day or so after gastroscopy – this is usually very mild and self-limiting.
- Sometimes, if a biopsy is taken or a polyp is removed, there may be a small amount of bleeding at the site that this is taken from – again, this usually resolves on its own.
- There are some very rare but potentially serious complications.

For gastroscopy, rare complications include bleeding, especially from biopsy sites (about 1:10,000); and perforation, for example of oesophagus (about 1:10,000 in diagnostic examination). The only infection of any significance is aspiration pneumonia, which usually occurs in patients with active upper GI bleeding or gastric outlet obstruction (in that circumstance risk is about 1:100).

For colonoscopy, there is a small risk of colon perforation (about 1:3000) and a higher risk if a polyp is removed (about 1:1000) and, like gastroscopy, there is a risk of bleeding from polypectomy sites which can occur up to 14 days after the procedure.

Although the Gastroenterology Service delegates this task to you, we take full responsibility for the process and the consent. ERCP consents should be done by the Gastroenterology Registrar.

MANAGMENT OF ENDOSCOPY COMPLICATIONS

Complications can often be managed conservatively, however at times urgent action is required.

Contact the Gastroenterology Registrar if you have any concerns about a post-procedural complication; both for management advice and so we have a record of the complication.

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Complications

- Bleeding – clinically significant bleeding is a rare complication in diagnostic procedures. Bleeding is more likely in patients with thrombopenia and /or coagulopathy. Bleeding is more likely if a therapeutic procedure was undertaken.
- Perforation
- Post ERCP Pancreatitis – the incidence of pancreatitis after ERCP is approximately 5-10% but can exceed 30% in high-risk groups. Gastroenterology team might give diclofenac PR and IV Hartmann's (lactated ringer's) solution to reduce this risk in identified high-risk patients.

Investigations of complications

- Electrolytes, creatinine, glucose, albumin, bilirubin, ALP, AST, GGT, FBC + differential, coag screen
- If concerns of pancreatitis post ERCP – Lipase (Note: Amylase and lipase elevation often occur after an ERCP thus should be completed in conjunction with new abdominal pain, and with persistent elevation at 24-48 hours post procedure)
- Erect Chest Xray and Abdominal X-ray
- Urine output

Management

- IV fluids (consider antibiotics if febrile temp >38°C)
- If concerns of pancreatitis post ERCP – Please give Hartmann's (lactated ringer's) solution (available on Wards 61, 76, 78)
- NBM

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Haematology

WHO TO CALL

- On-call Haematology Registrar: (0800-1600h)
- After hours Haematology Registrar: (1600-2200h and weekends)
- At night, please contact the Medical Specialties Registrar
- Queries on FBC morphological abnormalities/comments – LabPlus Haematology Laboratory Registrars (0800-1600h Mon-Fri)
- Useful intranet site: https://adhb.hanz.health.nz/cancer-and-blood/Haematology/Pages/default.aspx

WHEN TO CALL

- Concern regarding any Haematology inpatients
- Require advice regarding investigations for potential haematological disorders
- All after-hours Haematology admissions

NEUTROPENIC FEVER/SEPSIS

This is a medical emergency.

Definition

Absolute neutrophil count (ANC) <0.5 x 109/L or ANC <1 x 109/L and expected to fall with a temperature of >38ºC on two occasions within 2 hours or >38.5ºC on one occasion

DO NOT WAIT FOR THE FBC RESULT. If the patient has a fever or a history of a fever and has had chemotherapy within 4 weeks and/or they have a chemotherapy alert card, assume this is neutropenic fever and proceed with work-up as noted below.

Common causes:

Chemotherapy, leukaemias, myelodysplastic syndrome, severe sepsis, and radiotherapy.

What to do

- Urgent clinical assessment to look for evidence of shock. If shock present, consider contacting the DCCM Registrar immediately.
- Contact the Haematology Registrar immediately for review.
- FBC, creatinine and electrolytes, LFTs, coagulation profile, venous blood gas (for lactate and pH).
- Basic septic screen (full clinical assessment, peripheral blood cultures (at least 2), catheter line culture (all lumens), chest x-ray, and MSU).
- Consider extended septic screen as indicated (e.g. wound swab, respiratory panel PCR, sputum specimen).

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Treatment

- High risk patients (e.g. acute leukaemia, post intensive chemotherapy patients, clinically unstable, rapidly dropping neutrophil count)
    - Piperacillin-tazobactam 4.5 g IV q6h + gentamicin 5 mg/kg IV q24h **IMMEDIATELY: the target for administration of antibiotics from presentation is <60 minutes.**
    - Check if the patient has a history of ESBL – meropenem 1 g IV q6h + gentamicin 5 mg/kg IV if cardiovascular instability.
    - Check the yellow sticker on the front of medication chart and bone marrow transplant (BMT) protocol – an antibiotic will be suggested if the patient has a history of resistant organisms, or if one is contraindicated e.g. gentamicin.
    - There is a standing order for piperacillin-tazobactam on Motutapu ward and in the Emergency Department to allow immediate administration for high-risk patients by nursing staff. The RMO must assess the patient and prescribe the gentamicin in a timely fashion (due to increasing piperacillin-tazobactam resistance amongst haematology patients).
    - See SCRIPT App or the full Neutropenic Fever protocol for further options.

- Low-medium risk patients (e.g. CLL or myeloma who are not profoundly neutropaenic or those with neutropaenia of expected short duration e.g. RCHOP that are haemodynamically stable). *Please discuss with the Haematology Registrar first before deciding to use the low-medium risk protocol.
    - Piperacillin-tazobactam 4.5 g IV q8h

    OR

    - Ceftriaxone 2 g IV daily
    - **Low threshold for escalating to the high-risk protocol**

Ongoing fever despite broad spectrum antibiotics

- Consider resistant organism, invasive fungal infection, malignancy related fever and viral infection.
- Other rarer causes include graft versus host disease, thrombotic thrombocytopenic purpura, antibiotic related fever.

Seek early input from the Infectious Diseases team.

In septic shock:

- Give a 500 mL bolus of IV plasmalyte over 30 minutes.
- Consider repeating up to 30 mL/kg with close monitoring of RR/ saturations/ BP and JVP.
- If persistent hypotension discuss with Haematology SMO, measure the urine output, FBC, Creatinine, LFTs and a venous gas lactate.
- The criteria for admission to DCCM are persistent hypotension (systolic BP <100/ >40 mmHg drop from baseline) despite 30 mL/kg fluid OR >4 L fluid over 24 hours. Keep Hb>70 g/l and platelets >20.

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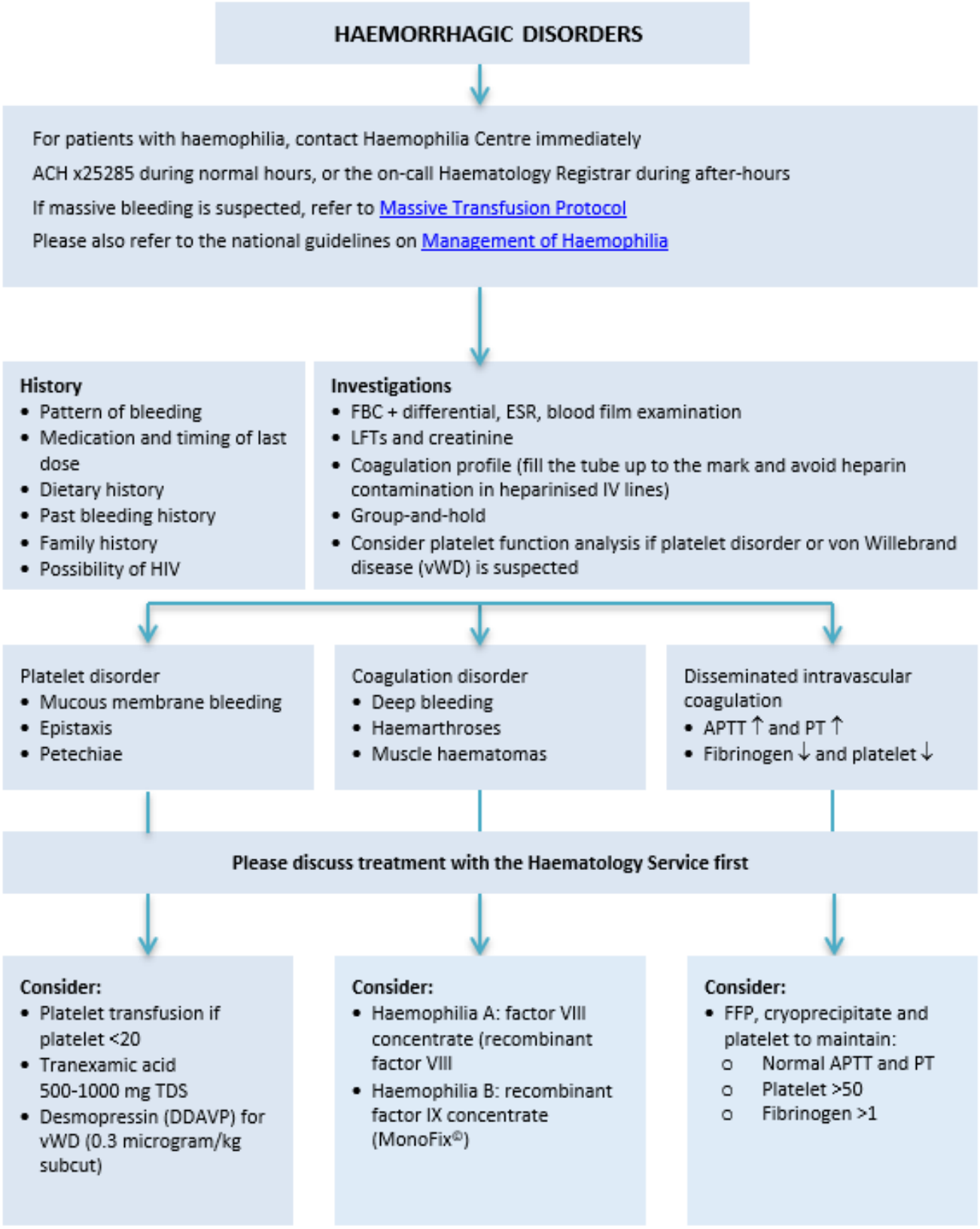
HAEMORRHAGIC DISORDERS



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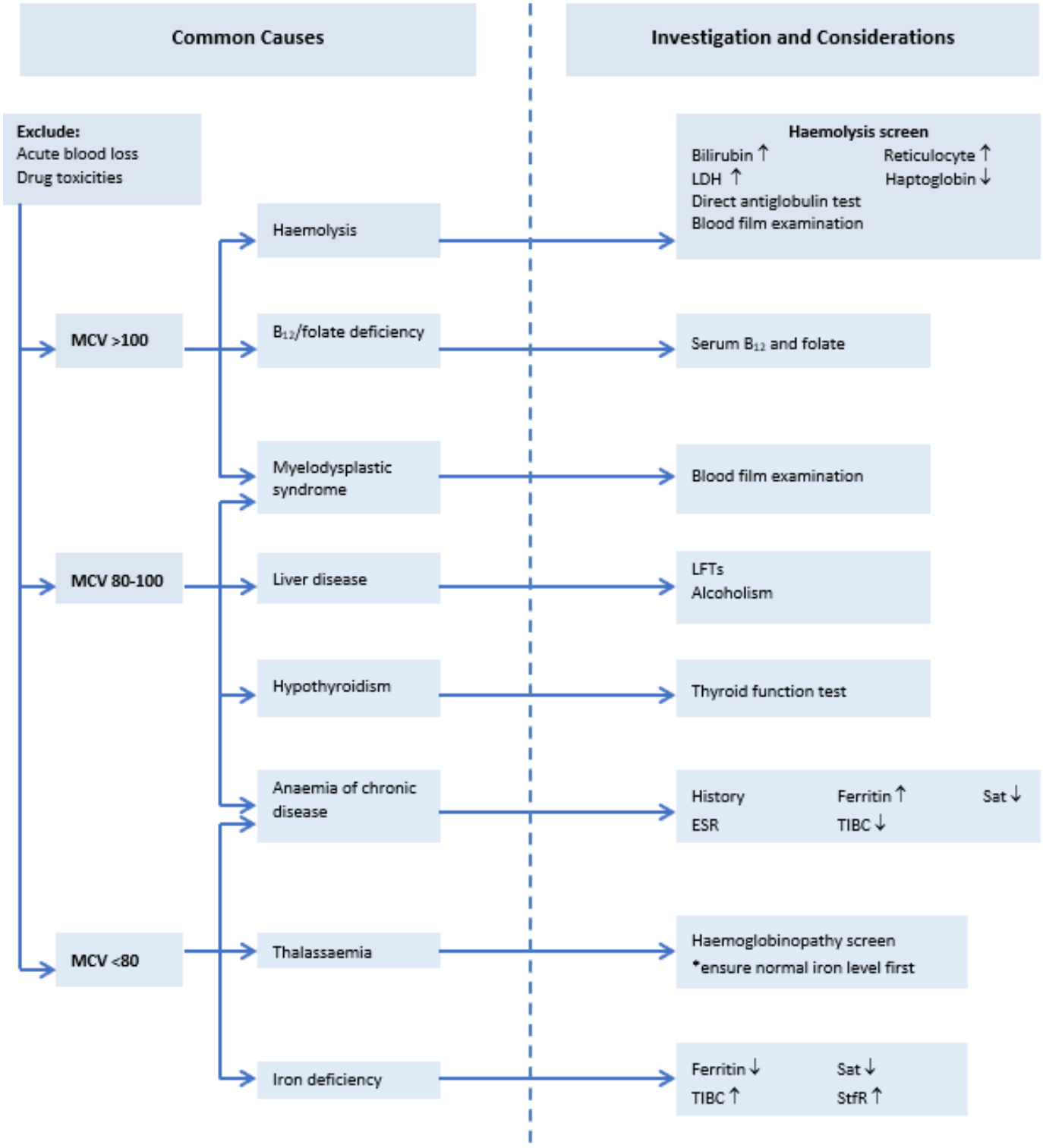
SEVERE ANAEMIA

If possible, initiate investigations before commencing blood transfusion.



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TREATMENT

Iron deficiency:

- Find and treat underlying cause
- Oral iron – start at 100-200 mg elemental iron daily or alternate daily. Empty stomach and Vit C increases absorption
    - Reticulocytes will increase in 7-10 days. Expected rise of Hb of 10 g/L in one month
    - Adverse effects: Constipation, diarrhoea, epigastric discomfort, and nausea (reduce dose if possible)
    - Alternate daily oral iron is better tolerated and absorbed more effectively
- IV iron infusion – ferinject (ferric carboxymaltose)* (see Reference Viewer and medicine administration guideline for dosing)
    - Pre-medication may not be necessary
    - Potential reactions usually occur during the first 15 minutes
    - Alternative iron products (ferrum H, iron polymaltose) are used in patients with a history of reaction to ferinject (which is relatively rare)
    - The following blood tests may be unreliable or unmeasurable for 1-2 days following an iron infusion – ALT, AST, TIBC and plasma free haemoglobin. Additionally serum iron and ferritin will increase
    - Ensure protocol followed and patient given information sheet and signs consent form

Vitamin B_{12} / folate deficiency:

- If megaloblastosis is suspected give both vitamin B_{12} (hydroxocobalamin) and folate until laboratory measurements of B_{12} /folate available. Expect rise in reticulocytes in 3 days.
- Consider causes – dietary, pernicious anaemia (especially in those >60 years and women>men, and with autoimmune disease), other causes for malabsorption.
- Hydroxocobalamin (vitamin B_{12}) 1000 micrograms IM (or subcut if platelets <50) on alternate days for 1 week, THEN weekly for 1 month or until blood count is normal, THEN 3-monthly ongoing maintenance.
- Folic acid 5 mg po daily.
- **NEVER replace folic acid without ensuring patient has normal B_{12} level**. This can potentially exacerbate neurological complications. If in doubt, give B_{12} replacement first THEN replace folate.

TRANSFUSION

(See Blood Products and Transfusion chapter)

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LYMPHADENOPATHY

Common causes

Infection, lymphoproliferative disorder (e.g. lymphoma), metastatic disease, connective tissue disorders.

What to do

- History to look for: recent infection, travel, symptoms of cytopenia (lethargy from anaemia and bleeding from thrombocytopenia), previous history of malignancy, and other musculoskeletal symptoms (e.g. rash and arthritis).
- Nature of the lymphadenopathy: location, size, areas involved, rate of enlargement, tenderness, firmness, presence of B symptoms and any associated symptoms.
- B symptoms are:
    - Recurrent night sweats requiring change of clothing or bed linen Unexplained fever of >38ºC

      OR

    - Unintentional weight loss of >10% of body weight in <6 months
- Examine all lymphatic regions (cervical, axillary, and inguinal), including tonsils and spleen

Investigations

- If suspected to have reactive lymphadenopathy, then investigate accordingly (e.g. CMV and EBV serology).
- If suspected to have lymphoma, consider checking hepatitis B, C and HIV serology, LDH, β-2 microglobulin, protein electrophoresis and immunoglobulins.
- Attempt FNA if node is palpable. This can be arranged via the Cytology Department (x22076).
- If the FNA is positive or lymphoma seems the most likely diagnosis a lymph node biopsy is mandatory.
    - Discuss with Interventional Radiology regarding image guided biopsy for abdominal or mediastinal nodes.
    - Contact ORL or genera surgery if neck or peripheral lymphadenopathy.
- Once a diagnosis of lymphoma is made a staging CT or PET Ct depending on lymphoma subtype +/- bone marrow biopsy. Contact the Haematology Registrar for advice.

General advice

Contact Haematology Registrar early to streamline investigations. Once diagnosis is confirmed, we prefer to see the patient before discharge.

MONOCLONAL BAND

Common causes

- Plasma cell disorders (e.g. myeloma)
- Lymphoproliferative disorders (e.g. Waldenstrom macroglobulinaemia)
- Infection (e.g. hepatitis C and HIV)
- Connective tissue disorder (e.g. SLE)

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- Monoclonal Gammopathy of Uncertain Significance (MGUS)

Note: Not all M bands are malignant

What to do

- History to rule out infection and connective tissue disorder
- History of bony tenderness, pathological fractures, symptoms of anaemia and lymphadenopathy

Investigations

- If suspected to have plasma cell disorder, check FBC, immunoglobulins (IgG, IgM, and IgA), serum electrophoresis, urine for Bence Jones protein, serum creatinine, serum calcium, LDH, β-2 microglobulin, serum free light chains.
- Please discuss with the Haematology Registrar regarding the need for bone marrow biopsy, skeletal survey, STIR MRI.

General advice

- Check for CRAB symptoms (hyperCalcaemia, renal impairment, anaemia, and bony lytic lesions).
- The use of a bisphosphonate is useful for hypercalcaemia and to reduce fractures and is generally given to patients with myeloma. However, it can potentially lead to osteonecrosis of the jaw; therefore, all non-urgent cases should seek proper dental review prior to receiving bisphosphonate if clinically possible.

THROMBOCYTOPENIA

Common causes

- Infection, liver disease, immune-related (ITP), marrow infiltration, drug/medication induced, disseminated coagulopathy (DIC), Pregnancy induced HELLP/fatty liver/acute liver failure.
- Urgent Haematology consult: Heparin induced thrombocytopenia (HIT), Thrombotic Thrombocytopenic Purpura (TTP).

What to do

- History to look for: recent infection, liver specific history including alcohol intake, previous history of malignancy
- Medication history: antibiotic, anticoagulation (heparin/enoxaparin)
- Bleeding manifestation: bruises, purpura, clinical or occult blood loss

Investigations

- Full blood count, blood film examination, B12, foliate, U&Es, liver tests, coagulation screen, viral serology, ANA +/- ENA, protein electrophoresis, immunoglobulins, ADAMTS-13 level (if TTP suspected)
- Consider switching to other anticoagulation if suspicious of HIT
- Consider malignancy screening if history suggestive

General advice

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- Read blood film report which may provide clues to potential causes or guide next step of investigation
- Check coagulation test especially if bleeding
- Consider 1-2 units of platelet if bleeding and TTP and HIT excluded

Contact Haematology Registrar early to streamline investigations

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Immunology

WHO TO CALL / WHEN TO CALL

On-call Immunology Registrar (via switchboard at Auckland City Hospital)

- Known immunology patient presenting with immunological condition requiring input (e.g. C1 inhibitor deficient patient with angioedema, common variable immune deficiency patient with pneumonia).
- Drug allergy where the allergy is interfering with current treatment.
- Suspected immunodeficiency (in-patient).
- Urticaria/angioedema that is difficult to control, prolonged (>6 weeks), or has atypical features (e.g. bruising).
- Other acutely unwell patients where immunology input may be helpful, e.g. autoinflammatory syndromes, hypereosinophilia, IgG4 disease.

When to refer as outpatient

- Anaphylaxis – ideally all, but particularly first episode, unknown trigger, recurrent anaphylaxis, anaphylaxis where immunotherapy is available (e.g. venom desensitization).
- Drug allergy not affecting inpatient treatment that requires further assessment (e.g. patient with history of penicillin allergy who is to start chemotherapy or on waiting list for organ or bone marrow transplant).
- Suspected immunodeficiency (outpatient).

ANAPHYLAXIS

For acute management, see Emergency Medicine **Anaphylaxis** section.

Consider:

Is this anaphylaxis?

- History (provoking factors, previous reactions, timing, cofactors such as NSAIDs or alcohol)
- Clinical findings (hypotension, bronchospasm, airway angioedema)
- Investigations
    - Serum tryptase – a measure of mast cell degranulation, elevated in most episodes of anaphylaxis
        - Ideally measure 1-2 hours after onset of symptoms; a sample taken after 2 hours may still be helpful. Can add on to bloods if done promptly
        - Tryptase is unaffected by the use of adrenaline
        - A second sample should be taken 24 hours or more after symptom onset to confirm a return to baseline (this can be done in the community)
    - C1 inhibitor – only if isolated angioedema (no urticaria)
    - Specific IgE testing (EAST/RAST) or skin prick testing – consider discussing with on-call Immunology before ordering. Unreliable if done within 4 weeks of anaphylaxis

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- Exclusion of other causes (e.g. cardiac events, vasovagal, panic attacks)

If trigger known/identified

- Avoidance
- Identification of safe alternatives
- Need for treatment? (e.g. desensitisation to venom, penicillins and some other antibiotics) – refer to Immunology
- Management plan and emergency treatment where trigger difficult to avoid (food, venom) – adrenaline autoinjector and anti-histamines (see below)

If trigger unknown

- Refer to immunology outpatients for assessment
- Management plan and emergency treatment (see below)

Management plan

Before discharge, all patients with anaphylaxis due to food, venom or unknown causes should be advised to obtain an adrenaline auto-injector. These are not funded as yet and can be purchased from a pharmacy without a prescription. Prices and expiry dates will vary between pharmacies. ACC may reimburse patients after an injector has been used – please provide patients presenting with anaphylaxis who have used their adrenaline pen with an ACC number on discharge. The online pharmacy allergypharmacy.co.nz and Chemist Warehouse currently provide low-cost adrenaline pens.

Anaphylaxis management plans including details of when and how to use auto-injectors can be downloaded from ASCIA.

URTICARIA / ANGIOEDEMA

- Urticaria or "hives" are common. They result from histamine release from mast cells. Approximately 20% of people will experience urticaria, and most episodes will spontaneously resolve. Single episodes with no obvious allergic trigger do not need investigation.
- Acute urticaria may be IgE or non-IgE mediated.
- IgE-mediated (allergic) urticaria usually occurs within 30-60 minutes of a trigger (e.g. food, venom, drug).
- Non-allergic causes include infections, medications (NSAIDs, opiates), and physical stimuli (heat). Many cases are idiopathic. Infectious urticaria is often difficult to control with antihistamines and may not settle until a number of days after the underlying infection has resolved.
- Chronic spontaneous urticaria (CSU) lasts more than 6 weeks and is usually autoimmune or idiopathic, rather than allergic. Angioedema is also present in around 40% of cases. Allergy investigations such as skin prick testing are usually not helpful – please do not organise allergy testing in CSU without discussing with Clinical Immunology. Food exclusion is also unhelpful and can cause significant morbidity.
- Angioedema is non-pitting subdermal oedema that typically affects the face and lips, although any part of the skin can be affected. Mucous membranes may also be involved. If angioedema affects the tongue or larynx life-threatening airway obstruction can occur.
- Angioedema can occur due to histamine release (where it is typically seen with urticaria) or due to the effects of bradykinin (as in hereditary angioedema (HAE) or ACE inhibitor-induced angioedema)

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where urticaria does not occur. Causes of histamine-mediated angioedema are similar to those for urticaria listed above. Patients experiencing angioedema alone, however, should be considered for investigation of HAE and/or acquired angioedema. C4 levels can be used as a screening test. If C4 is low, C1 inhibitor should be tested.

- Consider ACE inhibitor-induced angioedema in all patients with angioedema on ACEI, regardless of length of treatment with an ACE inhibitor. These patients are often poorly responsive to adrenaline and securing the airway is essential in acute management.

Hereditary angioedema

- Autosomal dominant (family history) deficiency of C1 (esterase) inhibitor
- Recurrent attacks of angioedema that can affect any part of the body
- Usually presents in childhood

Acquired angioedema

- Usually due to autoantibody to C1 (esterase) inhibitor
- Commonly have underlying haematological malignancy or autoimmune disease – consider serum protein electrophoresis, ANA/ENA

ACE-inhibitor induced angioedema

- Occurs in 0.1% of patients per year of treatment
- Not IgE-mediated
- Attacks tend to become more severe if drug is continued Attacks can occur up to 3 months after stopping ACE-inhibitor
- Angiotensin Receptor Blockers (ARBs) do not carry the same risk of causing angioedema

MANAGEMENT OF PATIENTS WITH URTICARIA AND/OR ANGIOEDEMA

Treatment depends on symptoms. If there is airway involvement, treat as acute anaphylaxis:

- Non-sedating antihistamines – e.g. cetirizine or loratadine (up to a dose of 20 mg BD) are the mainstay of treatment. Treatment of CSU often requires 20 mg BD for weeks to months. Useful advice can be found on HealthPathways.
- A short history of urticaria, for instance following an infection, often only needs anti-histamines for days to a week or so.
- Corticosteroids may be used if there is severe or persistent angioedema, or if urticaria has not responded to maximal antihistamines; usual dose of prednisone is 20-40 mg daily for 2-5 days. Steroids should not be used for long-term maintenance.
- Patients with CSU may require immunosuppression or monoclonal antibody therapy in addition to antihistamine blockade. This should be discussed with the Immunology team.

If hereditary angioedema is suspected for patients with tongue/laryngeal angioedema, discuss with immunology regarding investigations (serum C4 and C1 inhibitor) and treatment with C1 esterase inhibitor concentrate.

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IMMUNODEFICIENCY

Primary immunodeficiencies (PID) are rare, but patients with them are often seen multiple times by health practitioners before being diagnosed. Consider investigation and/or referral in the following cases:

- Two or more severe bacterial infections
- Two or more radiologically proven pneumonias within 3 years
- Recurrent infections or infections requiring prolonged antibiotics to clear
- Infection in unusual location or with an unusual pathogen
- A family history of PID
- Co-existing autoimmunity with a history of recurrent infections
- Reduced IgG (<5g/L) without obvious cause (e.g. nephrotic syndrome, GI loss, myeloma)

Secondary causes should be considered and excluded. Common secondary causes include medications (steroids, chemotherapy – especially agents like rituximab), diabetes, haematological malignancy, S. aureus colonisation and protein loss states (e.g. nephrotic syndrome).

Baseline investigations

- FBC
- Serum immunoglobulins and serum protein electrophoresis
- Lymphocyte subsets
- Urine protein:creatinine ratio (if hypogammaglobulinaemia present)
- HIV serology

Specialised investigations such as tests of neutrophil function and vaccine studies should be discussed with Immunology.

DRUG ALLERGY

Patients commonly report histories of "drug allergies". In many cases these are not reproducible or significant, and patients can safely be given the suspected drug or related agents. However, drug reactions can be severe and the clinical history is crucial in deciding how to manage these patients. Drug allergy testing (blood and skin testing) is available for only a limited range of agents, including IV penicillins and cephalosporins and general anaesthetics.

Given the importance of the history in diagnosing drug allergy, it is essential that the nature of the symptoms/rashes etc. and the timing of their onset in relation to drug dosing (e.g. delay between dose and symptom onset; whether symptoms occurred after the first dose or after several doses of a course) is documented accurately in the medical notes and in referrals to the Immunology Clinic.

Ensure an Alert Notification is completed (see Pharmacy chapter).

Inpatient referrals

For patients with a history of allergy to a drug that is required for their current care (e.g. antibiotics for current pneumonia) or expected future care (e.g. listed for a bone marrow or organ transplant) please provide details of the reaction history, including all relevant drug exposures, timeframes, reaction signs and symptoms,

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subsequent exposure to same/related agents, results of additional investigations (e.g. skin biopsy) and details of the current need for treatment (which agent(s), how soon).

Desensitisation to some antibiotics may be possible as an inpatient but should follow ID input as to the best antibiotic choice.

For advice on drug challenges in patients giving a history of mild or very distant drug reactions, the on-call immunology registrar can be called for advice. Likewise, if there is uncertainty over whether a patient's drug allergy warning can be amended (e.g. many patients report historical rash with an antibiotic but have subsequently tolerated a further course – generally this would lead to removal of the allergy warning from the medical record) the on-call immunology registrar can be contacted for advice.

Outpatient referrals

Referrals for anaesthetic allergy should be sent to the Anaesthetic Allergy Service (we run a joint clinic with them). We also run a Beta Lactam Allergy Clinic; referrals to this should be sent to Immunology Outpatients.

Patients reporting penicillin allergy that is >10 years ago and/or is non-anaphylactic in nature may be best to proceed directly to a test dose, either in the community or in the day unit. Those with more recent and/or severe reactions may need to be seen for penicillin skin testing first. Before sending a referral, please check with the patient that they would be prepared to take these drugs if we recommend them, and then refer as above.

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Infectious Diseases

The antimicrobial prescribing guidance in the following chapter is intended to be generic advice.

ESSENTIAL RESOURCES

Antibiotic guidelines for management of sepsis, meningitis, pneumonia and many other infections can be found in the SCRIPT app. Download the Script App from the Play Store or iTunes App Store:

https://play.google.com/store/apps/details?id=nz.co.uniservices.script&hl=en

https://apps.apple.com/nz/app/script/id1113276600

Auckland DHB Antimicrobial Stewardship Guidelines – under A on the intranet or Health Professionals on the internet site: https://www.adhb.health.nz/health-professionals/resources/ams/

WHO TO CALL

You can contact ID in a number of ways depending on what you need:

1. ID referrals (see below) are best made through email
2. **Urgent** clinical advice or antibiotic approvals
3. OPIVA team (see below)
4. HIV team

There is an ID RMO on-call until 10pm Monday to Friday and a SMO on-call at all times.

GENERAL PRINCIPLES

- Where feasible, collect appropriate specimens, ideally at least two sets of blood cultures before starting antimicrobial agents.
- If an organism which fits the clinical picture has been isolated from an appropriate specimen, adjust the patient's therapy accordingly.
- Try to prescribe the most narrow spectrum regimen e.g. penicillin rather than amoxicillin for a penicillin-sensitive organism.
- Document the indication for an antimicrobial on the drug chart. If you're unsure – why are you prescribing something?
- Prescribe short courses of antimicrobial agents and always specify the duration – in most cases 5 days will be enough.
- Always review allergies when prescribing antimicrobials. Many are actually side effects or expected symptoms of illness and should not stop you using first line therapies.
- All fever is not infection. Resolution of fever with antimicrobial treatment does not necessarily imply a microbial diagnosis; likewise, a persistent fever does not necessarily mean that the antimicrobial regimen is wrong.

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ID REFERRALS

The ID Service is available to provide advice on patients with known or suspected infection. There are 3 different services provided so please follow up with the team or clinician who has reviewed your patient.

Referrals (like the following conditions) are split between the 2 inpatient referral teams (General and Bone/Renal/Urology):

- Septic shock
- Infections due to multi-resistant organisms e.g. ESBL, MRSA, VRE
- Invasive fungal infections
- Infections of implanted prosthetic devices e.g. central lines, pacemakers, CSF shunts
- Meningitis, encephalitis or brain abscess
- Meningococcal disease
- Infective endocarditis
- Tuberculosis other than those patients under the care of the Respiratory team
- Diabetic foot infections
- Prosthetic joint infections
- Septic arthritis or osteomyelitis

The Bacteraemia Service will automatically see patients with positive blood cultures every day; you do not need to refer unless the blood culture was taken in a different hospital (please refer these patients).

Information to have when referring to Infectious Diseases

1. It is expected that you will have assessed your patient and discussed management with your team first
2. Name, NHI and location of your patient
3. Knowledge of your patient's problems
4. Relevant microbiology results, including colonisation with multi-resistant organisms
5. Current and/or recent antimicrobial therapy, including a clear understanding of antibiotic allergies

OPIVA – Outpatient IV Antibiotic Service

All patients being considered for OPIVA first require referral to Adult Infectious Diseases.

More information about OPIVA and the referral process can be found on HIPPO
https://adhb.hanz.health.nz/Pages/OPIVA.aspx

ANTIMICROBIAL PRESCRIBING

Antimicrobials requiring pre-approval

- Prescribing of some broad spectrum and specialist antimicrobials is restricted to certain indications or prescribers to encourage prudent use.

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- Pre-approval must be obtained from Infectious Diseases or Clinical Microbiology before prescribing these agents unless the prescriber or indication is exempt.
- When prescribing these antimicrobials, the drug chart must be annotated with the exemption or approver's name.
- Supply will not be made until this is completed.
- The complete and up-to-date list of restricted antimicrobials is available here: https://www.adhb.health.nz/assets/Documents/Health-Professionals/Antimicrobial-stewardship/AMSC-Adult-Restricted.pdf

Vancomycin

- Initial prescribing is guided by the Vanculator® tool in the clinical portal.
- In the Éclair tab, select the "New" button to access the Vanculator.
- Request a random vancomycin concentration within 24-48 hours and Clinical Pharmacy will assist with interpretation and subsequent dosing using Next Dose – an AUC guided dosing approach.

Gentamicin

- Gentamicin may be used safely in most patients for 1 or 2 days.
- Dose adjustment and concentration monitoring is required for longer courses, for patients with abnormal renal function (e.g. AKI, CKD or are elderly) and for patients who are prescribed other nephrotoxins.
- Advice on dosing or monitoring is available here and from Clinical Pharmacy https://www.adhb.health.nz/assets/Documents/Health-Professionals/Antimicrobial-stewardship/aminoglycoside-guide.pdf

Switching from intravenous to oral antibiotic

Most infections are treated with oral antibiotics. You should review prescriptions for IV antibiotics at least daily and whenever you are asked to replace an IV line. Does the patient need an antibiotic? If not, stop it. If yes, could they be changed to oral antibiotic?

In general, oral antibiotics are suitable when all of the following criteria are satisfied:

1. Resolution of sepsis and clinical improvement.
2. Availability of an appropriate oral antibiotic.
3. Patient will absorb enteral medication i.e. can swallow or has a feeding tube, and can absorb medication e.g. no ileus.
4. The patient does not have a condition (such as *S.aureus* bacteremia, endocarditis, neutropenic sepsis, osteomyelitis, some forms of meningitis) for which prolonged IV antibiotic is recommended.

"BEST GUESS" ANTIBIOTIC THERAPY

- Antibiotic guidelines for most common infections are presented on the SCRIPT app and the AMS website (as above).
- Suggestions for empiric management of positive blood cultures, before Bacteraemia service review, are provided below.

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POSITIVE BLOOD CULTURE RESULTS

Gram-positive coccus	True versus contaminant bacteraemia (approx 50:50). Review patient. If well and no signs of infection consider observing off antibiotics. Take further cultures before starting antibiotics. If unwell start **flucloxacillin 2g IV q6h**
Gram-positive bacillus	Almost always a contaminant. Review patient. Observe off antibiotics. Take further cultures before starting antibiotics. If unwell start **benzylpenicillin 1.2g IV q4h**
Gram-negative bacillus	Almost always a true bacteraemia Review patient. Start **gentamicin 5mg/kg (IBW) IV q24h** If potential abdominal source add anaerobic cover with **metronidazole**
Gram-negative coccus	Likely meningococcal bacteraemia. Review patient. Start **ceftriaxone 2g IV q12h**
Yeast	Discuss with bacteraemia service or on-call ID Consultant

MANAGEMENT OF SUSPECTED INTRAVENOUS LINE INFECTION (IV CANNULAE, PICC, CENTRAL LINE, PORT-A-CATH® etc.)

- Collect blood cultures from peripheral vein and if possible simultaneously from the line.
- Swab IV line exit site if purulent.
- Remove line and send distal tip of central lines in a sterile container to Microbiology for culture (tips of peripheral IV cannulae or urinary catheters are NOT cultured).
- Look for evidence of metastatic infection e.g. septic pulmonary emboli, endocarditis, septic arthritis, osteomyelitis.
- Commence treatment with flucloxacillin 2g IV q6h if there is infection present or sepsis. If not, consider empiric treatment if the patient is at high risk of complications.
- If MRO colonised or very unwell add gentamicin and discuss with ID.
- The ID Service can provide advice if required.

HIV TESTING

1. HIV testing must be done for patients with suspected acute HIV infection (seroconversion illness), symptoms of HIV infection (e.g. lymphadenopathy, wasting, chronic diarrhoea, neuropathy, dementia), opportunistic infections (e.g. TB, PCP, oesophageal candidiasis, toxoplasmosis, cryptococcosis, CMV retinitis, recurrent non-typhoidal salmonellosis or pneumonia), clinical immunodeficiency or malignancy.
2. All pregnant women should be screened for HIV infection.

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3. All patients aged between 15 and 65 years presenting to hospital should be screened for HIV infection at least once every five years or more frequently for high risk groups.

4. HIV testing requires consent similar to other laboratory tests. There is no requirement for pre-test counseling or written consent.

HIV infection

- The Community HIV team https://adhb.hanz.health.nz/Pages/Infectious-Diseases-Service.aspx#chivt should be informed of all patients with HIV infection admitted to hospital (Menu 1, then Option 1). Acute HIV Infection (acute retroviral syndrome or seroconversion illness) should be suspected in patients with malaise, fever, sweating, pharyngitis, lymphadenopathy, rash, diarrhoea or meningitis especially after a risk exposure.

- Modern HIV screening tests usually detect symptomatic acute HIV infection but may miss some cases during "the window" period so any negative tests should be repeated after 4-6 weeks if the likelihood of HIV infection is high.

- Patients should be informed of positive results in a timely fashion and referred to the Community HIV Team for counseling and coordination of ongoing care.

- People exposed to HIV infection through occupational (usually blood or body fluid accidents) or non-occupational (usually sexual) routes may benefit from post exposure prophylaxis with anti-retroviral therapy. The PEPsie electronic decision support tool https://adhb.hanz.health.nz/Toolkit/PEPsie%20guide%20for%20HIV.pdf?Web=1 can be accessed via **the PEPsie tab in the clinical portal** to guide assessment. Discuss with Infectious Diseases.

- Read more about HIV infection https://adhb.hanz.health.nz/Pages/Infectious-Diseases-Service.aspx

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Neurology

WHO TO CALL

- A Neurologist or Neurology Registrar is available 0800-2200h (**call via switchboard**)
- After 2200h ask for the Medical Specialties on-call Registrar via switchboard

When to refer

The following disorders should be referred to the Neurology Department:

- Stroke
- First seizure (most patients)
- Status epilepticus
- Progressive weakness
- Undiagnosed decreased level of consciousness

This chapter will address specific conditions classified by presentation.

STROKE

See Stroke Chapter

SEIZURE

Diagnosis

Diagnosis is clinical and is established on the basis of the patient's account and on any eyewitness description. A detailed neurological examination is required.

Features suggestive of a seizure include:

- Absence of syncopal prodrome (nausea, pallor, sweating, dimmed vision)
- Period of post-ictal drowsiness and/or confusion
- Tongue biting, urinary/faecal incontinence (tongue biting is more specific for seizure, incontinence is not and can occur with syncope)

Note: Syncope can provoke a seizure or seizure like activity if cerebral hypo-perfusion is prolonged (convulsive syncope)

Investigations

- FBC, glucose, electrolytes, calcium, magnesium, creatinine, LFT
- Consider urine toxicology screen
- CXR
- CT head: particularly if fever, focal neurological symptoms or signs, or slow recovery
- EEG/MRI: selected patients, usually performed as an outpatient

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Management

- Will vary according to the underlying aetiology.
- Most patients who have recovered and are well following a single seizure do not require hospital admission
- Admit most patients who have:
  i. a prior history of status epilepticus
  ii. prolonged recovery
  iii. signs of a systemic illness
  iv. new focal neurological signs; or
  v. occurrence of more than one seizure in 24 hours
- Generally, do not start anticonvulsant therapy following a first seizure, unless a structural brain abnormality is demonstrated.
- All patients must be told they cannot drive a motor vehicle for 12 months after a seizure (see NZ Transport Agency website). This is your responsibility – do not leave it until the Neurology clinic appointment. Shortening of this restriction can occur in only very specific circumstances (e.g. a provoked seizure) and a visit to the Neurology clinic usually does not change this. Patients should also be advised of potential risks of swimming alone, scuba diving, working at heights and other high-risk activities. Document in the notes that this advice has been given.
- After a first seizure, if the patient has recovered, they can be seen in the Neurology outpatient clinic – send electronic referral to the first seizure clinic.

Status epilepticus

- Defined as a prolonged seizure (>5 minutes) or failure to regain consciousness between seizures
- Causes include: anticonvulsant withdrawal or non-compliance in a patient with epilepsy
- Stroke (old or new)
- Metabolic (e.g. hypoglycaemia, hypocalcaemia)
- CNS infection
- Alcohol intoxication or withdrawal
- Remote CNS insult (e.g. perinatal asphyxia)
- Drug toxicity (e.g. theophylline, cocaine) or withdrawal (e.g. benzodiazepine)
- Post-cardiac arrest
- CNS tumours

Investigations

- FBC, electrolytes, glucose, creatinine, LFT, calcium, magnesium, toxicology
- Anticonvulsant blood levels (where relevant)
- ABG
- ECG

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Management

1. ABC. Ensure adequate airway and oxygenation: Nurse in recovery position with an oral airway. Monitor oxygen saturation, BP and ECG. If status is not stopped promptly (i.e. within 15-20min) patient should be discussed with DCCM.

2. Insert IV line and take bloods (see above). If patient has had seizures for >5 minutes and no IV line established, give intramuscular midazolam STAT.

3. If blood glucose <5 mmol/L give IV glucose.

4. If known to have alcoholism or possibly malnourished, consider IV thiamine as per alcohol withdrawal guideline (see Recreational Drug Problems chapter / **2. ALCOHOL WITHDRAWAL** guidelines). Give this before IV glucose containing fluids.

5. Give Benzodiazepine:
    a. Lorazepam 4 mg by IV push over 2min. If seizure continues or recurs after 10-15min, administer an additional dose to a cumulative total of 0.1 mg/kg or 8 mg/24 hour total (whichever is the lowest). Most authorities regard lorazepam as the drug of choice for acute status epilepticus. It has a longer anti-epileptic effect since it is not redistributed to adipose tissue (unlike diazepam).
    b. If lorazepam is not immediately available do not delay but proceed with midazolam 10 mg IV or IM.
    c. IM midazolam is the treatment of choice if no IV access is available. Dose is 10 mg via INTRAMUSCULAR (IM) injection. The dose may be repeated if required after 10 minutes. Maximum midazolam dose is 20 mg IM over 24 hours.

6. Benzodiazepines are usually effective in stopping seizures, but seizures may recur as the drug is redistributed/metabolised. Therefore further treatment is usually required.

Initial options for management of ongoing seizures despite benzodiazepine use:

Sodium valproate

30 mg/kg (maximum dose 3000 mg) IV in 100 mL sodium chloride 0.9% infused over 15min (administration rate not exceeding 10 mg/kg/min)

Maintenance sodium valproate will usually be required thereafter (750 mg PO/NG BD)

Sodium valproate is contraindicated in mitochondrial disorders

OR

Levetiracetam

Dose: 60 mg/kg (maximum dose 4500 mg) IV for most adult patients. If patient weight is <50 kg give 3g IV. This is the dose for status epilepticus (not for loading in other situations).

Dilute dose in 100 mL of sodium chloride 0.9% or glucose 5% and infuse over 15 minutes

- High doses of levetiracetam are required when used for management of status epilepticus. Do not under-dose.
- Maintenance levetiracetam will usually be required thereafter (1 g PO/NG BD).

If seizures continue after a benzodiazepine and either levetiracetam or sodium valproate, then the second of these drugs (sodium valproate or levetiracetam) should be used.

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If the above medications are contraindicated consider:

Phenytoin

- Loading dose of 18 mg/kg (1g is a commonly used adult loading dose) IV infused over minimum 30min (max 50 mg/min). Rapid administration and extravasation can result in tissue necrosis.
- Should be infused undiluted using a syringe driver. If dilution is desired, only use sodium chloride 0.9% and ensure an in-line filter is used.
- Monitor cardiac rhythm, blood pressure and respiratory rate.
- Loading doses can be given IV or orally. Peak concentrations and therapeutic effect may not be observed for some hours following an oral loading dose.
- Loading doses should be used with extreme caution in patients already taking phenytoin.
- Maintenance phenytoin is usually required thereafter (300 mg IV/PO/NG q24h).
- It can take one week or more to reach steady state after a dose change. Care should be taken when interpreting a serum concentration taken before this time.
- If a patient is deemed to be at steady state and a dosage increase is required, it should be done slowly, usually in increments of no more than 30 mg every two weeks according to clinical response and phenytoin concentration. Phenytoin has saturable zero order kinetics so even a small dose increase can result in toxic concentrations.
- Phenytoin concentrations should be measured immediately prior to a dose. The concentration represents the total phenytoin amount (i.e. the combination of free and bound drug). The usual therapeutic range is 40-80 micromol/L; however, in patients with decreased albumin levels (e.g. renal patients) the total phenytoin concentration may be less than this but the free phenytoin concentration may still be in the therapeutic range. In these situations, a lower therapeutic level (20-60 micromol/L) may be more appropriate with titration of the dose according to clinical response.
- A number of factors can affect phenytoin serum concentrations. A calculated adjustment may also need to be made to accurately reflect the free concentration. Contact your Clinical Pharmacist or Medicines Information to help with interpretation of the result.

Notes:

- Do not use the IM route for diazepam or phenytoin. Absorption is slow and erratic, and phenytoin precipitates in tissues.
- As noted above, if status is not stopped promptly (i.e. within 15-20min) patient should be discussed with DCCM.
- Not all oral and IV phenytoin preparations are bioequivalent. The capsules are bioequivalent to the injection, but the chewable tablets and suspension are not.

Video monitoring

Patients who are undergoing video monitoring on Ward 51 comprise a special group. They are in hospital specifically to record seizures and their medications are often reduced to increase the likelihood of seizures. This does entail some risk. Specific instructions for emergency treatment are usually written in each patient's chart.

See: Video EEG Monitoring (VEM) Rescue Medication Guideline

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ACUTE HEADACHE

The most common problem is to distinguish between migraine and other intracranial pathology: meningitis, intracranial haemorrhage, tumour, encephalitis, cortical vein thrombosis etc. In the absence of a clear past history of headaches similar to the presenting symptoms, the diagnosis of migraine should only be made after the exclusion of intracranial pathology.

Red flags for possible intracranial pathology include:

- Thunderclap onset
- Worse with coughing, bending or Valsalva
- Headache wakes patient from sleep
- Fever
- Neck stiffness
- Altered level of consciousness
- Abnormalities on neurological examination
- Papilloedema

Thunderclap headache

Abrupt onset of severe headache may be due to subarachnoid haemorrhage. CT scanning is the appropriate initial investigation, followed by CSF examination (12 hours after headache onset) if CT is negative for SAH and shows no other contraindication. Remember to test for CSF xanthochromia. The Emergency Department is better equipped to rule out subarachnoid haemorrhage than Neurology.

Temporal arteritis

In patients >50 years check ESR and CRP and consider a temporal artery biopsy if ESR elevated.

Cluster headache

Patients with cluster headache should be referred to Neurology. Features include recurrent episodes of very severe non-throbbing pain, usually lasting 15-60 minutes, located behind or around one eye. May have accompanying ipsilateral ptosis, lacrimation, conjunctival injection, rhinorrhoea. Treatment is with high flow oxygen in the acute setting.

Management options for migraine

General measures

- Dark, quiet room
- IV fluids (many patients are mildly dehydrated)

Medication

- 1st line: naproxen 500 mg or paracetamol 1g + metoclopramide 10 mg po (even if not nauseated metoclopramide can be helpful) **if no contraindications** (Caution: use of naproxen in renal impairment and metoclopramide in women <20 years old).

- 2nd line: naproxen 500 mg or paracetamol 1 g + metoclopramide 10 mg po, whichever has not been trialed.

- 3rd line: chlorpromazine 2 mg IV (this must be given as an infusion ONLY). Rare dystonic reactions can be treated with benztropine – usually 2 mg po or IM.

- 4th line: sumatriptan 6 mg subcut (repeat dose in 1 hour if initially effective but headache recurs) or 50-100 mg po (repeat dose after at least 2 hours if initially effective but headache recurs). Maximum dose in 24 hours is 12 mg subcut or 300 mg po. Contraindications include: ergotamine in preceding 24h, ischaemic heart disease, cerebrovascular disease or hemiplegic migraine, within 14 days of MAOI use, severe hepatic impairment, un-controlled hypertension.

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- If no response, contact the Neurology Service.

Consider prophylaxis

- 1st line is to avoid precipitants e.g. chocolate, red wine, oral contraceptive pill.
- Pharmacologic prophylaxis may be appropriate if more than 2 attacks per month.
- 1st line: amitriptyline or nortriptyline 30-50 mg po nocte (start at 10 mg, increase by 10 mg every week), propranolol 40-160 mg po BD or metoprolol or nadolol (avoid in asthma).

Further points

- Analgesic overuse can perpetuate chronic headache. Patients should not take analgesia on more than 2 days per week. Opiates should be avoided.
- Migraineurs may have transient positive focal neurologic symptoms with their headache (typically visual scintillation or tingling paraesthesia or speech disturbance).

ACUTE OR PROGRESSIVE BILATERAL WEAKNESS

Causes

- Myelopathy (cord compression, infarction or demyelination, infection)
- Neuropathy (Guillain-Barre syndrome)
- Central (brainstem infarction)
- Rarely: parasagittal brain lesion, myasthenia gravis, myopathy

Clinical approach

Consider the following clinical features:

- Upper or lower motor neuron-pattern (including reflexes, plantars, rapid movements hands + feet)
- Bilateral vs. unilateral vs. asymmetric vs. focal
- Proximal vs. distal vs. both
- Sensory deficit
- Time course
- Associated features – involvement of cranial nerves or arms or sphincter dysfunction

Spinal cord compression

Presentation

- Back pain/tenderness
- Upper motor neuron-pattern weakness
- Bladder and/or bowel dysfunction
- Sensory level

Causes

- Trauma
- Tumour: extrinsic/intrinsic
- Haemorrhage
- Extradural abscess
- Disc prolapse

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Investigations and management

- Remember that quick action may avoid irreversible paraplegia. The duration, rate of progression, and degree of the neurologic deficit dictate the urgency.
- If recent onset, rapid progression, and/or significant neurological deficit, obtain immediate neurological or neurosurgical consultations and MRI spine.
- Catheterise if urinary retention.
- If suspect malignancy, order CXR.
- FBC, ESR, electrolytes, glucose, calcium, creatinine, LFT, albumin.
- Do not delay MRI by ordering x-rays of spine.
- Depending on MRI, serum protein electrophoresis and PSA may be indicated.
- In patients with acute spinal cord compression due to malignancy, consider IV steroid and urgent radiotherapy.

Remember that in some tumours (e.g. myeloma, metastases) radiotherapy and/or chemotherapy may be the treatment of choice. Urgent consultation with a Haematologist or Oncologist is recommended

If a patient with a known malignancy develops spinal cord compression, inform the doctors who have been supervising care. Generally patients with spinal cord compression are cared for by Orthopaedics (if bony lesion causing compression) or appropriate medical service (e.g. Oncology if caused by metastasis).

STUPOR AND COMA

(See also Emergency Medicine chapter)

Causes:

Consider the following possibilities:

Anatomic

- Brain infarction, haemorrhage (including subarachnoid), tumour, abscess
- Extra- or subdural haematoma or subdural empyema
- Venous occlusion
- Hydrocephalus
- Posterior fossa lesions (e.g. large vertebrobasilar aneurysm)

Metabolic

- Drugs/toxins
- Cerebral hypo-perfusion (syncope/cardiac arrest)
- Hypoxia/hypercapnia
- Hypothermia/hyperthermia
- Hypoglycaemia
- Electrolyte abnormality (especially hyponatraemia, hypercalcaemia)
- Hyperosmolality (usually >350 mmol/L)
- Acidosis/alkalosis
- Severe endocrine abnormality
- Organ failure
- Thiamine deficiency

Other

- Head trauma
- Epilepsy or pseudoseizures
- Meningitis/encephalitis
- Severe hypertension
- Acute delirium (e.g. delirium tremens, post-operative)
- Demyelination (e.g. central pontine myelinolysis)

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- Fat embolism syndrome
- Locked-in syndrome (mimics coma)
- Psychogenic unresponsiveness (mimics coma)
- Remember that more than one process may be contributing

Early management

1. **ABC+**

- Establish a safe airway – early intubation may be required
- Oxygen if needed
- BP and HR – check heart rhythm and treat hypotension
- Check temperature and **blood glucose**
- Control seizures

Note: may need DCCM input.

2. **Insert line and draw blood**

- Routine: FBC, electrolytes, glucose, calcium, creatinine, LFT
- Consider: ABG, TFT, blood cultures, drug levels, ESR
- Urinary catheter: send urine for toxicology +/- ketones

3. **Obtain history (ambulance staff, eye witnesses, patient notes)**

- Event: overdose, head injury, seizure
- History: diabetes, epilepsy, previous episodes, medications

4. **Examination**

- GCS
- Signs of head/neck trauma
- Examine pupils, eye movements, fundi, corneal reflexes
- Motor responses in limbs
- Respiratory pattern
- Perform as much of the rest of the neurological exam as possible
- Meningism: may indicate meningitis, subarachnoid haemorrhage, downwards herniation of cerebellar tonsils
- **Petechial rash: may indicate meningococcal or systemic sepsis. This is an emergency.**

5. **Consider treatment with:**

- Thiamine (100 mg IV) or Pabrinex® 1 pair of vials (IV).
- Glucose IV (with thiamine if patient could be thiamine-deficient, give thiamine before glucose)
- Naloxone (100 microgram IV for possible narcotic overdose. Dose can be repeated at 2-3min intervals up to maximum of 10 mg in total).
- Flumazenil (300 microgram IV for possible benzodiazepine overdose. Then a 100 microgram dose can be repeated at 60 second intervals up to a maximum of 2 mg in total).
- Antibiotics/ antiviral therapy (if suspect meningitis and LP delayed).

6. **Consider urgent head CT scan**

7. **Consider lumbar puncture (wait till after CT if focal signs – see Note c.)**

Notes:

a. History of evolution of coma is important.
b. Repeat examinations are important to check for progression of focal signs and evolution of level of consciousness.

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c. Lumbar puncture should be obtained urgently in cases of suspected meningitis. If focal neurological signs are present obtain a head CT first, as cerebral herniation can occur when lumbar CSF is drained in the presence of an intracranial mass lesion. **Antibiotics should not be delayed if the patient is systemically unwell.**

d. Important questions are: whether the patient has a reversible process, the presence or absence of a structural lesion and whether a Neurosurgeon should be involved.

Differential diagnosis of coma

1. **Psychogenic unresponsiveness**

   Patients may be relatively unresponsive to noxious stimuli, including the gag reflex. There is often flickering of the closed eyelids with resistance to eyelid opening. When the patient's eyes are held open, they will avoid the examiner's gaze.

2. **Locked-in syndrome**

   Usually due to an infarct in the ventral pons producing:

   - Complete paralysis of facial and bulbar muscles and quadriplegia (although patient continues to breathe spontaneously).
   - Paralysis of horizontal eye movements but ability to look up.
   - Retained hearing and limb sensation.
   - Check for this state by attempting to establish communication with the patient using upward eye movements (e.g. "Look up once for Yes, look up twice for No").

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Older People's Health

This chapter is intended to help you manage common ward calls on your long days and weekends.

Older People's Health: more than rehabilitation

Older people with multidimensional needs may have these needs best met by Older People's Health:

- Multiple, unstable medical problems which may be slow to stabilise
- Unstable psychological/psychiatric problems
- Impaired ability to manage personal or instrumental activities of daily living
- A social support system that is stressed or absent

WHO TO CALL

Monday to Friday 0800-1600 – team OPH Registrar or Consultant

Monday to Friday 1600-2200 AND Saturday-Sunday 0800-2200:
On-call OPH Registrar or OPH Consultant

Night shift: contact Night Gen Med Registrar Medical Subspecialty

Weekends: as a HO you will be expected to cover the OPH wards OR to join a Gen Med team ward round.

Handover is by email before each weekend and Public Holiday and is coordinated by one of the Geriatricians

OPH Weekend

Monday to Friday 1600-2200 AND Saturday-Sunday 0800-2200 – you will be carrying phone. At 2200 you are expected to attend Handover at Robin Mitchell Training room next to ED Radiology on Level 2 and give the phone to the Night House Officer. You will be covering ward calls for OPH patients and Ward 51 Rehab patients and from 1600-2200 every day General Medicine outliers.

Ward 51

The OPH House Officers cover the HO jobs for the rehab patients (both under and over 65 years) on ward 51. Problems are escalated to the Neurology Registrar not the OPH Registrar

General Medicine weekend – attend Gen Med Handover at 0800 at Davis Room in CEC (Clinical Education Centre) on Level 5. You will be doing a post-acute ward round with the Consultant +/- the Registrar.

If at any time you feel you need additional support or cannot contact a registrar, please call the on-call Geriatrician through the switchboard

In-patient OPH referrals

These are made by internal e-referral on RCP. Referrals are seen by a Geriatrician or a senior therapist. If a patient is accepted for inpatient rehabilitation/OPH stay they will go onto a waitlist and the ward will be notified when a bed is available.

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PRESENTATION OF ILLNESS IN OLDER PEOPLE

Illness can present differently in older people:

- Loss of independence in simple activities of daily living, falls, immobility, confusion, incontinence, weakness, failure to manage at home
- Atypical symptoms/signs are common: painless myocardial infarction, systemic infection with normal temperature and white cell count, syncope without recollection
- Often older patients are on multiple medications
- Medication-induced symptoms/illness are common
- Careful work-up will usually reveal treatable conditions
- Optimising medical conditions and reducing polypharmacy usually improves independence

History

- Case history should follow the usual format of the medical history.
- History from family or caregiver is usually helpful and essential if patient is unable to give history.
- Document function before this illness and now: mobility, transfers, dressing, washing, feeding, continence, toileting assistance.
- Document social supports: family and friends, services, paid and unpaid help with housework, shopping, personal cares, personal alarm, respite care, Enduring Power of Attorney (EPOA).
- Accurate medication history is essential. Non-prescribed medications are common. The patient is often the best source of information but check with family or caregiver.
- GP or community pharmacy dispensing record on Concerto (Testsafe). Ask for medications to be brought in. Complete medicines reconciliation if in-patient.

Investigations

- FBC, U&Es, LFTs, Calcium
- Iron studies, B12, folate, TSH - if these have not been done in the last 3 months by the GP
- Chest x-ray if indicated – check with team if unsure
- ECG if indicated – check with team if unsure
- Other investigations depend on clinical situation e.g., PSA/HbA1C
- Admissions directly from the community need blood tests **on the day of admission**

Examination

- As well as the standard examination, the following checklist should be considered: not all of these will be able to be done for an acute admission – select according to clinical scenario

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CHECK LIST

BP	• Lying and standing BP and pulse
Eyes	• Visual acuity • Have the correct spectacles been brought in to hospital?
Ears	• Is there hearing loss? Impacted wax? • Is there a hearing aid? Does it work?
Mouth	• Tongue • Dentition and fitting of dentures
Cognition	• Check the standard, 4AT, Mini-ACE or RUDAS as appropriate
Bladder and bowels	• Is there urinary or faecal incontinence? • Bladder palpable/percussible? Faecal masses palpable? • Rectal examination • Bedside ultrasound post-void residual • IDC in situ?
Temperature	• Infection may be present with a normal temperature
Feet	• Are there any painful lesions, corns, calluses, pressure sores, ulceration that needs attention? • Is the vascular supply impaired? • Is there a peripheral neuropathy? • Is there adequate, safe footwear?
Nutrition	• Evidence of malnutrition? • Recent weight loss? Changing sizes of clothes? • Obtain BMI if possible
Gait	• Normal? Unsteady? Antalgic? Apraxic? • Is there a suitable walking aid
Skin	• Skin tear, pressure sore • IV leur in situ?

Problem list

- Always end admission clerking with a diagnosis or problem list, including social problems
- Consider medication side effects (or withdrawal) as potential causes for symptoms
- Stop unnecessary medications. Review doses and frequency of other medications
- Terms such as "acopia" and "social admission" are unacceptable

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COMMON WARD CALLS

If you are unsure ALWAYS discuss with the OPH Registrar. If the patient is deteriorating, the Registrar should inform the family and the on-call Consultant. If a patient has a code the on-call Registrar must be informed.

Also see Common Ward Calls **chapter.**

FALLS – the term mechanical fall is meaningless. A description of how the person fell is essential.

- Also see Falls/Collapse in Common Ward Calls chapter
- Inpatient falls are common and are likely to be due to delirium, acute medical illness and age-associated physiological changes. Falls often occur when a patient is trying to get to the toilet.
- Distinguish from a syncopal event – if has had syncope, refer to Common Ward Calls section.
- If the fall was witnessed, try and get a description of the fall and record in the notes e.g., getting out of bed, didn't take walking frame; this is useful information for the usual team.
- Low impact falls from standing height in frail older people can result in significant injury including C-spine fractures and intracranial injury.
- Examine for injury including evidence of fractures, external evidence of a head injury and mid-line C-spine tenderness.
- Establish whether taking anticoagulation or antiplatelet medication.
- Consider whether the patient is becoming medically unwell – observations (EWS)/clinical examination and proceed.
- Discuss with registrar as to need for CT head/C-spine/Neuro obs – consider especially if there has been head strike or the patient is on anticoagulation or antiplatelet medication.
- Ask the nurses to arrange a watch or an ESR room.
- Simple analgesia.

CONFUSION AND AGITATION

- See Common Ward Calls and Psychiatry chapters
- Discuss with Registrar
- Code Orange can be called for support

URINARY RETENTION

- Confirm with bladder scan to get an accurate volume
- If the patient is symptomatic and there is 500mL or more in their bladder – insert an IDUC
- If the patient has no symptoms but a high bladder volume, discuss the need for an IDUC with your Registrar
- Check bowel chart as constipation can trigger retention
- Should prompt a review of the medications
- The usual team will determine when the IDUC should be removed

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REQUEST FOR NIGHT SEDATION

- Avoid if possible as all sedatives/anxiolytics increase the risk of falling. If you need to, then Zopiclone 3.75 mg STAT dose (equivalent to 10 mg Temazepam) is the preferred option. Please don't chart this on the regular or PRN section. Leave a note for the usual team to review.

CONSTIPATION

- See Palliative Care chapters for flow chart
- Extremely common in our patients
- Should prompt a review of the medications (e.g., look out for opioids and medicines with anti-muscarinic side effects)

RENAL IMPAIRMENT

- Very common in older people despite normal serum creatinine
- In frail older people in hospital, using eGFR is inappropriate to estimate renal function
- Use Cockcroft & Gault CrCl to adjust doses of renally-excreted drugs (see Pharmacy chapter)
- There is a Cockcroft & Gault calculator in RCP (page icon upper left corner RCP results page)
- Before prescribing check the reference viewer to see if the dose and /or interval needs adjusting for older people
- If renal function is deteriorating check for nephrotoxic medications and a PVR for obstruction/retention

ASYMPTOMATIC BACTERIURIA

- Very common in frail older people in hospital, particularly women – often treated needlessly
- Asymptomatic pyuria, smelly urine and cloudy urine are not an indication for treatment
- Do not check MSU unless you suspect a symptomatic UTI (e.g. fever, new symptoms) or patient is delirious
- Treatment of asymptomatic UTI is not helpful in improving continence

DEMENTIA AND DELIRIUM

- A significant proportion of our patients have dementia which puts them at risk for delirium.
- Delirium can be missed as it does not always manifest as agitation, rather apathy and withdrawal.
- Hallmark features are a fluctuating course, inattention, disorganised thinking and altered levels of consciousness – either sleepy or hyperactive. Useful screening tests include the 4AT test and the months of year backwards.
- Delirium is often an indication that the patient is significantly unwell and if occurs de novo on the ward requires a full clinical assessment and septic screen (FBC, U&Es, LFTS, Calcium, blood cultures, CXR, urine spec) to try and identify a specific underlying cause.
- Delirium can be triggered by illness, injury, constipation, urinary retention and change in environment. In one third of cases a specific cause cannot be identified.
- Unrecognised pain should always be considered, and it is reasonable to prescribe empirical regular paracetamol.

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- Don't forget alcohol or benzodiazepine withdrawal. Routine night sedation with benzodiazepines should be continued at least until medically stable. **See 2. ALCOHOL WITHDRAWAL in Recreational Drug Problems chapter and 3. DELIRIUM section in Psychiatry for Benzodiazepine Withdrawal.**

- Refer to Psychiatry chapter for investigation and management of delirium.

PAIN MANAGEMENT

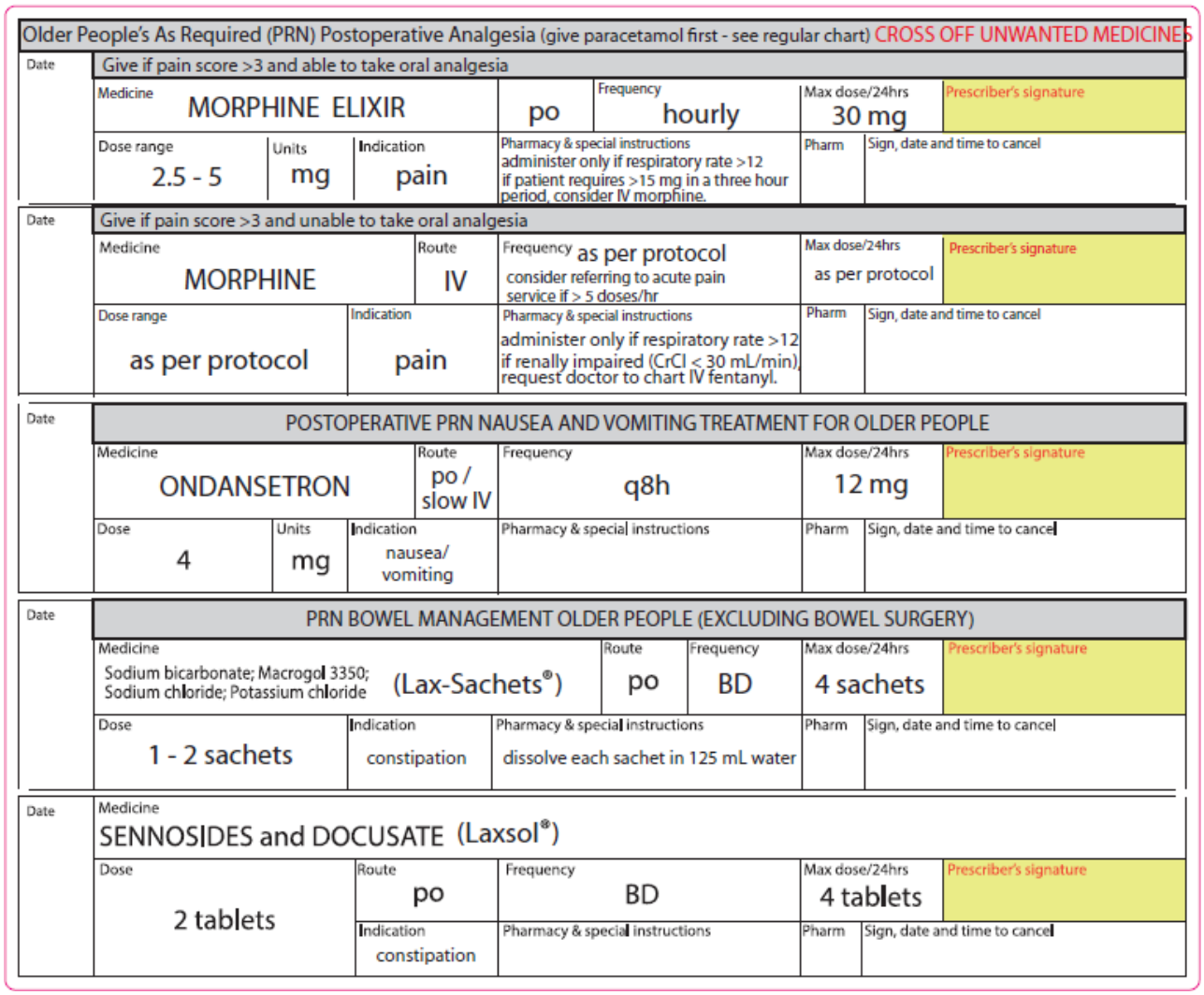
For full details see the Pain Services chapter. The following chart provides a template for appropriate pain management for older people: stepwise increase in analgesia, initially modest doses, side-effect management and frequent review.

Use low doses of morphine elixir e.g., 1-2 mg to start if the patient is frail or of low body weight. This can be prescribed regularly if needed. Please do not start long-acting opiates without discussing this with your team

Always chart a concurrent laxative (e.g., Laxsol +/- molaxole) when an opioid is prescribed.

Please avoid Tramadol and NSAIDS unless specifically discussed with the team.

Post-operative pain and nausea management for older people



Older People's As Required (PRN) Postoperative Analgesia (give paracetamol first - see regular chart) CROSS OFF UNWANTED MEDICINES

Date | Give if pain score >3 and able to take oral analgesia

Medicine			Frequency	Max dose/24hrs	Prescriber's signature
MORPHINE ELIXIR		po	hourly	30 mg	
Dose range	**Units**	**Indication**	**Pharmacy & special instructions**	**Pharm**	**Sign, date and time to cancel**
2.5 - 5	mg	pain	administer only if respiratory rate >12 if patient requires >15 mg in a three hour period, consider IV morphine.		

Date | Give if pain score >3 and unable to take oral analgesia

Medicine	Route	Frequency	Max dose/24hrs	Prescriber's signature
MORPHINE	IV	as per protocol consider referring to acute pain service if > 5 doses/hr	as per protocol	
Dose range	**Indication**	**Pharmacy & special instructions**	**Pharm**	**Sign, date and time to cancel**
as per protocol	pain	administer only if respiratory rate >12 if renally impaired (CrCl < 30 mL/min), request doctor to chart IV fentanyl.		

Date | POSTOPERATIVE PRN NAUSEA AND VOMITING TREATMENT FOR OLDER PEOPLE

Medicine	Route	Frequency	Max dose/24hrs	Prescriber's signature
ONDANSETRON	po / slow IV	q8h	12 mg	
Dose	**Units**	**Indication**	**Pharmacy & special instructions**	**Pharm**	**Sign, date and time to cancel**
4	mg	nausea/ vomiting			

Date | PRN BOWEL MANAGEMENT OLDER PEOPLE (EXCLUDING BOWEL SURGERY)

Medicine	Route	Frequency	Max dose/24hrs	Prescriber's signature
Sodium bicarbonate; Macrogol 3350; Sodium chloride; Potassium chloride (Lax-Sachets®)	po	BD	4 sachets	
Dose	**Indication**	**Pharmacy & special instructions**	**Pharm**	**Sign, date and time to cancel**
1 - 2 sachets	constipation	dissolve each sachet in 125 mL water		

Date | Medicine: SENNOSIDES and DOCUSATE (Laxsol®)

Dose	Route	Frequency	Max dose/24hrs	Prescriber's signature
2 tablets	po	BD	4 tablets	
	Indication	**Pharmacy & special instructions**	**Pharm**	**Sign, date and time to cancel**
	constipation			

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ELDER ABUSE

Be mindful of this when admitting patients – often patients will talk to someone they feel comfortable with, and that might be the admitting RMO. Watch the dynamic between the patient and family or carer – sometimes this will give you a clue that all may not be well. If you have any concerns about this, please discuss with your consultant before taking any action.

POLYPHARMACY

- Polypharmacy is not just the absolute number of medications but being on more than is clinically indicated
- The more medications someone is on, the higher the chance of adverse drug events, side effects and compliance difficulties
- Anticholinergics and sedatives can contribute to cognitive and physical dysfunction
- Review medications regularly and stop any that are no longer of any net benefit

DEPRESSION IN OLDER PEOPLE

Depression is relatively common in older people. Occasionally an older person who is depressed may be mistaken for having dementia – it is therefore important to consider this in the evaluation of cognitive function. A collateral history from family can be very helpful.

Check FBC, thyroid function tests, renal function, and calcium. In screening, the NICE two question interview has a very high sensitivity and good specificity in the detection of depression. These questions are:

During the last month, have you often been bothered by:

- Feeling down, depressed, or hopeless?
- Having little interest or pleasure in doing things?

More detailed evaluation can be done by using the Geriatric Depression Scale.

Before any referrals are made to MHSOP you need to talk to your consultant who will guide you.

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Oncology

ONCOLOGY INTRANET SITE

WHO TO CALL

On-call Registrars

0800-2200h Radiation Oncology Registrar

0800-2200h Medical Oncology Registrar

2200-0800h Medical Specialties Registrar

On weekends: 0800-1600: there is both an on call Medical Oncology and Radiation Oncology registrar available for advice. But 1600-2200, both Oncology specialties are covered by only one of these registrars.

1. REFERRALS

WRITTEN REFERRALS FOR OUTPATIENT CONSULTATION

eReferrals via RCP

Information to have available when making an initial referral to the Oncology Service:

- Established diagnosis of malignant disease
- Histology (operative histology or FNA/core biopsy results)
- Staging information (operation findings, CXR, CT, bone scan or other imaging)
- Information about current symptoms and co-morbidities and functional status

A written referral is not appropriate in the following circumstances – please call the on-call Registrar directly regarding:

1. Patient is suspected to have a malignancy that is curable by chemotherapy or radiotherapy (see below).
2. Urgent chemotherapy or radiotherapy is indicated (see below).

IF IN DOUBT, PRELIMINARY ADVICE REGARDING THE GENERAL APPROACH TO INVESTIGATION AND STAGING OF A PATIENT WITH SUSPECTED CANCER, OR QUESTIONS ABOUT WHEN AND HOW TO REFER, CAN BE PROVIDED BY TELEPHONE CONSULTATION.

2. MULTIDISCIPLINARY MEETINGS

Patients need to be presented at MDM. Please refer to the appropriate team. Please ensure that you know any comorbidities and the functional status of the patient.

Cancer	Team	Day
Lung	Respiratory (ACH)	Monday
Colorectal	General surgery	Monday

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Breast	General surgery (MMH)	Tuesday
Breast	General surgery (ACH)	Tuesday
Gynaecology	Gynaecology	Wednesday
Upper GI	Upper GI (ACH & MMH)	Wednesday
Lung	Respiratory (MMH)	Wednesday
Genitourinary	Urology	Wednesday
Breast	General surgery (NSH)	Thursday
Sarcoma	Sarcoma team at MMH	Thursday
Melanoma	Melanoma	Friday
Upper GI	Upper GI (NSH)	Friday
Head and Neck	ORL	Friday
Neurosurgery	Neurosurgery	Friday

3. MALIGNANCIES CURABLE WITH CHEMOTHERAPY OR RADIOTHERAPY

Early discussion and referral to specialist is recommended for any patient with a potentially curable malignancy. This facilitates investigations, staging and initiation of treatment. Please do not wait until all investigations or histology reports are complete. All require specialist consultation for staging and treatment. These include:

- Testicular cancer
- Germ cell tumours: ovary, extra-gonadal, retroperitoneal and mediastinal
- Gestational trophoblastic malignancy including choriocarcinoma
- Small cell cancer (usually lung)
- Undifferentiated cancers, especially in younger patients
- Any malignancy in children or teenagers (discuss with Paediatrics if less than 15 years old)
- Osteosarcoma, Ewing's sarcoma and rhabdomyosarcoma
- Lymphomas: Hodgkin’s and non-Hodgkin’s (Haematology)
- Early stage head and neck cancer
- Cervical cancer
- Leukaemias (seen by Haematology)

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4. INDICATIONS FOR URGENT CHEMOTHERAPY/RADIOTHERAPY

There are a few situations in which inpatient chemotherapy is indicated to reverse complications of chemo-sensitive cancers, even though the aim of treatment is not cure.

- Respiratory distress due to chemosensitive mediastinal or lung malignancy e.g. germ cell tumour, choriocarcinoma, small cell lung carcinoma
- Occasionally spinal cord compression due to chemosensitive malignancies, as above
- Ascites or bowel obstruction due to gynaecological malignancies
- For lymphoma-related complications please call Haematology

Indications for urgent radiotherapy

- Spinal cord compression (see section below)
- Bleeding e.g. gynaecological, lung or GI
- Superior vena cava obstruction (see section below)

5. ONCOLOGY EMERGENCIES

Below is a list of common oncology emergencies, which are further described in the sections that follow.

- Febrile neutropenia
- Spinal cord compression
- Bowel obstruction
- Diarrhoea
- Ureteric obstruction
- Superior Vena Cava Obstruction (SVCO)
- Biliary obstruction
- Hypercalcaemia
- Cardiac Tamponade

The following issues are also important oncology emergencies but are not further described in the following section:

- Raised intracranial pressure: increasing tumour oedema after starting radiotherapy for brain tumours. Closely monitor GCS, consider CT scan (to exclude hydrocephalus or acute haemorrhage) and call Radiation Oncology Registrar. Usual initial treatment is with high dose corticosteroids and proton pump inhibitor cover, but may be amenable to surgical intervention so discuss with Neurosurgery.

- Respiratory distress due to pneumonitis or lymphangitis carcinomatosis: pneumonitis may be caused by certain chemotherapy drugs (e.g. gemcitabine) or radiotherapy to the chest. Stop offending drug and start high dose steroids.

  *Remember oncology patients are also at increased risk of pulmonary embolism

- Anaphylaxis: caused by many chemotherapy drugs; call the Oncology Registrar immediately and start resuscitation measures.

- Chest pain: in patients receiving 5FU (fluorouracil) or capecitabine any chest pain (however atypical) should be treated as serious – these patients are at risk of coronary artery spasm and fatal myocardial infarction. If serial ECGs and Troponins are negative, patient may be considered for further investigations such as exercise tolerance test or CTCA or angiography before re-trialling 5FU or capecitabine. Please discuss with Cardiology team.

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FEBRILE NEUTROPENIA

If a patient who is receiving chemotherapy and/or radiation treatment becomes febrile and neutropenic, this constitutes a medical emergency.

Acute management

- Febrile neutropenia is a common life-threatening complication of chemotherapy
- In Auckland we consider any temperature over 38.0°C and ANC <1.0 (absolute neutrophil count) as significant
- SPEED is of the essence
    - 73% of patients with sepsis respond if treated on the day they become febrile. 45% respond if treatment is delayed 1-2 days, and only 22% respond if the delay is 3-4 days
- Please note that first-line antibiotics are different for Oncology and Haematology patients

Empiric treatment

- Rapid instigation of treatment is more important than identification of a source of infection
- However, at least one blood culture should be obtained at the time of IV access

    - Cefuroxime 1.5 g IV q8h
    - Add gentamicin 5 mg/kg IV q24h if any high risk features (see below)

High risk features

- Hypotension (SBP ≤90 mmHg) or needing inotropic support
- Respiratory failure (pO2<60 mmHg) or oxygen sats <90% or needing ventilatory support
- Confusion or CNS infection at presentation
- Suspected typhlitis (neutropenic enterocolitis)
- Febrile despite being on prophylactic antibiotics
- DIC

If the patient has a relative contraindication to aminoglycosides e.g. in patients on cisplatin or high-dose methotrexate as they can potentiate renal and oto-toxicity:

Replace cefuroxime and gentamicin with ceftriaxone 2 g IV q24h

Note:

- Bacteraemia is present in approximately 10-20% of cases – related to depth and duration of neutrophil nadir; also depends on whether ANC is heading down or up
- Most mortality is due to Gram negative sepsis – empiric treatment mostly directed at this

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Examination

- Meticulous examination is required – important signs of infection may be blunted because of immuno-suppression.
- Don't forget perineum, but do not do PR exam (can introduce infection in neutropenic patients).

Any patient with

- Febrile neutropenia
- HR >100/min **HAS SEPTIC SHOCK**
- BP sys <100 mmHg

Septic shock is a medical emergency. DCCM should be contacted immediately – even if the patient looks "well".

Investigations

Do not wait for any of these results before starting antibiotics!

- Bloods, BLOOD CULTURES x2 including from central line / Port-A-Cath / PICC line
- CXR, urine, stool culture, sputum, swabs (throat, lines, skin etc)

SPINAL CORD COMPRESSION

- There should be a high index of suspicion in patients with back pain and neurological symptoms (even if subtle) who have known metastatic cancer.
- Repeated, thorough neurological examination of these patients is essential. Eventual outcome is related to neurological status at start of treatment, and late diagnosis can lead to permanent paralysis and/or loss of bowel and bladder function.
- Ensure anal sphincter tone and peri-anal sensation is recorded on repeat examinations.
- Spinal cord compression is commonly associated with multiple myeloma, metastatic breast and prostate cancer.
- Early liaison with a Radiation Oncologist is important and there is frequently the need for joint consultation with an Orthopaedic Surgeon or Neurosurgeon.
- Investigation: urgent MRI of whole spine, as multiple levels may be involved.

Immediate management

- **Commence steroids** – dexamethasone 16 mg IV STAT followed by 8 mg po BD (mane and midi)
- **Start omeprazole at 40 mg once daily**
- **Consider whether log rolling is necessary**

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- **Urgent referral for radiotherapy**

- A biopsy (CT guided) or surgical decompression with biopsy may need to be considered where there is no known history of cancer and the lesion is apparently solitary

- A surgical opinion is necessary if the spinal cord compression is at a site of previous radiotherapy and should also be considered when the spinal cord compression is caused by retropulsion of bone fragments into the spinal canal from vertebral fracture

BOWEL OBSTRUCTION

- Common in oncology patients, usually secondary to mechanical obstruction from malignancy, faecal impaction or from bowel ischaemia.
- Symptoms – abdominal pain, vomiting, constipation.
- Signs – abdominal distension, hyper- or hypo-active bowel sounds. On rectal examination, look for bleeding.

Investigations

- Abdominal x-ray
  - Normal diameters: small bowel (3cm); caecum (8-10cm); rest of large bowel (6cm)
  - Look for air fluid levels on erect CXR or decubitus film
- Blood tests
  - Electrolyte abnormalities, renal impairment, inflammatory markers
- Arterial blood gas
  - Lactate, acidosis
- CT abdomen and pelvis -to look for transition point

Management

- Urgent surgical review (although the preference is often for conservative management).
- Keep nil-by-mouth.
- Start maintenance IV fluids (please correct abnormal electrolytes).
- Pain relief and antiemetics (avoid prokinetic agents, e.g. metoclopramide, if patient has colicky abdominal pain, otherwise these are often indicated). Syringe driver may be required for symptom control - please see Palliative Care chapter.
- Consider nasogastric tube insertion (omitted in palliative situations).
- If isolated transition point is found, discuss with general surgeons as to whether surgery is appropriate.

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DIARRHOEA

- Common in Oncology patients and potentially life-threatening in some
- Causes: infection, chemotherapy-induced (especially capecitabine and irinotecan), radiotherapy-induced, antibiotic-related
- Symptoms: bowel frequency >3-4 stools above normal, abdominal pain, vomiting, dehydration, anorexia

Investigations

- Bloods: check electrolytes (incl. Mg), FBC (watch for neutropenia)
- AXR: may have air-fluid levels despite no bowel obstruction, air in the bowel wall suggests severe typhlitis
- Stool sample: check C. difficile toxin
- Accurate fluid balance

Management

- STOP capecitabine (if patient is receiving this)
- IV fluid rehydration: may need up to 8 L/day
- NBM for the first 24 hours + bowel chart
- If febrile or neutropenia – IV cefuroxime ± gentamicin
- Start regular loperamide 2 mg q2h (4 mg q4h overnight)
    - If diarrhoea continues add codeine phosphate 60 mg QID
    - If no improvement after 24 hours, then give subcutaneous octreotide 100 micrograms q8h (or 300 micrograms over 24h as a continuous infusion using a syringe driver)
- Early referral to dietician for TPN discussion
- Team will review this treatment regimen daily

URETERIC OBSTRUCTION

- First sign can be new renal impairment or incidental radiological finding.
- Investigations: urgent ultrasound or CT scan to diagnose and identify the cause of obstruction.
- Can be life-threatening if it is bilateral or if it involves the only functioning kidney.
- Acute obstruction is best relieved by a nephrostomy or ureteric stent followed by appropriate treatment of a known malignancy with chemotherapy, radiotherapy or hormone therapy.
- The option of no treatment should be considered if the underlying malignancy is untreatable.

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SUPERIOR VENA CAVA OBSTRUCTION (SVCO)

- May be difficult to diagnose, and present late.
- In more than 95% of cases, superior vena cava obstruction is due to an underlying malignancy, frequently carcinoma of the bronchus or lymphoma.
- Symptoms – dyspnoea, facial swelling, cough, orthopnoea, headache.
- Signs – facial oedema, jugular venous distension, Horner's syndrome, paralysis of vocal cords.
- Thrombosis may be present, and will often require anticoagulation.
- Urgent Oncology referral is recommended, even before diagnosis is obtained (if this will result in a significant delay). See Palliative Care chapter.
- Radiotherapy is often the treatment of choice, but very occasionally radiologically-guided stenting is indicated (this will be arranged by the team responsible for the patient's care).

BILIARY OBSTRUCTION

- Jaundice is common in oncology. Potential causes include (but are not limited to):
  - Biliary obstruction (benign or malignant)
  - Direct liver infiltration by cancer
  - Reactivation of hepatitis viruses (especially hepatitis B)
  - Novel infection (EBV, CMV)
  - Medication (especially antibiotics or chemotherapy)
  - Haemolysis

Symptoms

- Jaundice (often painless), pale stools, dark urine, pruritus, possible fever (if ascending cholangitis or cholecystitis)
- Right upper quadrant pain

Signs

- Jaundice, palpable liver, palpable abdominal mass, bruising

Investigations

- Bloods: FBC, creatinine and electrolytes, proteins, liver enzymes, liver synthetic function (glucose, bilirubin, coags, albumin), viral serology
- Blood cultures (if febrile or neutropenic)
- USS: to look for biliary duct dilatation ± obvious point of obstruction
- May need ERCP/MRCP if has dilated biliary tree (may need CT abdo in appropriate situations)

Management

- Give IV vitamin K 10 mg if raised PR
- Antibiotics if signs of infection/neutropenia (as per ID empiric guidelines)
- Discuss with Gastroenterology early
- Biliary drainage – either ERCP or percutaneous (arranged after appropriate work-up)

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HYPERCALCAEMIA

A high proportion of hypercalcaemic patients will have an associated underlying malignancy, the commonest being

- Breast cancer
- Lung cancer
- Myeloma
- Prostate
- Renal cell carcinoma

Initial treatment

- IV fluids, as the patient is often significantly dehydrated
- Patients may need aggressive rehydration and repeated clinical examination to ensure euvolaemia
    - Patients may need 3-4 litres sodium chloride 0.9% over the first 24 hours
- Accurate fluid balance
- Often it is necessary to add a bisphosphonate for hypercalcaemia e.g. zoledronic acid 4 mg IV over 15 minutes. Doses are reduced in renal impairment, see NZ Datasheet for details. Often renal impairment is secondary to hypercalcaemia
- Stop contributing medications e.g. thiazide diuretics, lithium, calcium supplements, vitamin D

CARDIAC TAMPONADE

- This can be a difficult diagnosis, as patients often present with non-specific breathlessness and chest pain.
- Signs: high JVP, distended neck veins and pulsus paradoxus (felt in the pulse, and measured in the blood pressure) are important signs to look for. ECG may show low voltage QRS complexes or QRS electrical alternans.
- A high index of suspicion is required especially in patients with breast cancer, lung cancer or lymphoma (the malignancies most commonly associated with pericardial effusions).
- A coexisting pleural effusion can mask the clinical symptoms and signs.
- Refer to Cardiology for urgent echocardiogram and clinical review.

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6. NAUSEA AND VOMITING

Causes to screen for include:

- Hypercalcaemia
- Opiate use
- Electrolyte imbalance
- Increased intracranial pressure
- Bowel obstruction
- Urinary tract infections

Check that calcium, creatinine and electrolytes have been measured recently
Give IV fluids if dehydrated
Use specific treatment if cause identified e.g. dexamethasone for cerebral metastases, hydration ± bisphosphonates for hypercalcaemia
Exclude bowel obstruction as a cause for nausea/vomiting

Antiemetics for oncology patients

Metoclopramide	10 mg po **OR** IV q4-6h
Haloperidol	0.5-1.5 mg po **OR** subcut q8-12h
Cyclizine	25-50 mg po **OR** IV q8h
Dexamethasone	2-4 mg po mane and midi
Domperidone	10 mg po q6h
Ondansetron	4-8 mg po **OR** IV q12h (This should be used very cautiously in oncology patients as it commonly causes constipation and headache and is not particularly effective in delayed nausea)
Levomepromazine	3.125-6.25 mg po **OR** subcut q8h

Avoid ondansetron in bowel obstruction: haloperidol or cyclizine preferred. Metoclopramide may cause intolerable cramping in patients with bowel obstruction.

- Treatment varies based on underlying cause.
- Haloperidol is often helpful for opiate-induced nausea.
- Dexamethasone is useful for liver metastases and raised intracranial pressure due to cerebral oedema and intractable nausea from chemotherapy (cisplatin, anthracycline or cyclophosphamide).
- Lorazepam 1 mg q6-8h orally or sublingually can be useful for anticipatory or anxiety-related nausea (especially before chemotherapy).

(Refer to Palliative Care chapter for additional information on antiemetic treatment)

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7. MUCOSITIS PATHWAY

	Oral Mucositis In Cancer and Blood	
Palliative		**Curative Intent / Treatment induced**
↓		↓
Refer to Palliative Care		Refer to Acute Pain Service

8. IMMUNOTHERAPY-RELATED ADVERSE EVENTS

Immune check point inhibitors (CTLA-4 inhibitors, PD1 inhibitors and PDL1 inhibitors) are increasingly being used in medical oncology. These are monoclonal antibodies that inhibit signalling pathways that down-regulate the T-cell response to tumour cells. This can lead to uncontrolled immune activity and immune-related adverse events.

Common immune-mediated adverse events include:

- Pneumonitis
- Colitis
- Hepatitis
- Adrenal insufficiency
- Rash
- Hyper/Hypothyroidism
- Hypophysitis
- Renal insufficiency

Management is with corticosteroids. Dose of steroid is dependent on grade of adverse event (e.g. Grade 3-4 requires high dose steroids and admission). Seek urgent guidance from medical oncology. Note that these can present even after having completed immunotherapy.

9. TISSUE BIOPSIES OR ASPIRATES

- House Officers may be involved in making histological diagnoses of cancer where they perform procedures such as pleural aspirates, ascitic paracentesis, LP, or arrange FNA or CT/USS-guided biopsies.

- Request cytology, and ensure an adequate quantity of fluid or specimen is sent (if in doubt, ring the laboratory to ask how much is required). When performing thoracocentesis or paracentesis, send as much fluid as possible to the lab, i.e. entire amount drained (refer to Gastroenterology/Respiratory for procedure technique).

In specific circumstances, such as where lymphoma or other haemopoietic malignancy is a possibility, fresh tissue may be needed for surface markers, cytogenetic and DNA analyses. Other samples may need to be cultured. It is recommended that a pathologist is contacted for advice.

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Palliative Care

PALLIATIVE CARE INTRANET SITE

WHO TO CALL

- The Adult Hospital Palliative Care team consists of Palliative Care Physicians and Clinical Nurse Specialists and operates from Monday to Friday 8:00am-4.30pm.
- After hours, weekends and public holidays please refer to the Palliative Care webpage on Hippo Palliative Care.
- For urgent advice or other enquiries, contact the Triage clinician.
- For referrals, please click on the “How to make a referral” green tile on the Palliative Care webpage on Hippo Palliative Care.
- For symptom control guidelines and resources including care in the last days of life, please click on the Symptom Control and Last Days of Life Care blue tiles on the Palliative Care webpage on Hippo Palliative Care Guidelines and Resources and Last Days of Life Care.

Note: Paediatric Palliative Care is provided by Starship Children's Hospital.

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WHEN TO CONTACT PALLIATIVE CARE

Refer to the Adult Hospital Palliative Care team for:

- Difficult symptom control in adults with life-threatening illness, for example pain, shortness of breath, anxiety, nausea and vomiting Palliative Care Guidelines and Resources.
- Care for people with complex needs in the last days of life Last Days of Life Care.
- Complex decision-making in life-threatening illness where the outcome is uncertain Advance Planning and Care Goals.
- Support for people exploring assisted dying – please note we do not provide nor assess people for eligibility for assisted dying Palliative Care and Assisted Dying.
- Specific information regarding hospice and support with complex discharges Discharge process and Palliative care services in the community.
- Uncertainty about management of syringe drivers Syringe driver resources.
- Support for psychological, social, cultural and spiritual care needs associated with life-threatening illness Psychological, Spiritual and Cultural Support.
- Support for staff caring for people with palliative care needs Learning and Development.

Referral to palliative care is based on NEED and NOT on diagnosis or prognosis. It is relevant for any person with a life-threatening illness, non-malignant or malignant, at ANY STAGE. The most common problem we encounter is seeing people and/or their whānau who could have benefited from earlier referral.

SUBCUTANEOUS MEDICATIONS

- The subcutaneous route is useful for parenteral continuous or ‘as required’ medication when the oral route is not appropriate or unavailable, e.g. unable to swallow or absorb oral medication due to vomiting.
- This route avoids the need for intravenous access and can be used at home.
- Administering medications by continuous subcutaneous infusion (CSCI) using a syringe driver allows continuous symptom relief and reduces the need for repeated dosing. It does NOT imply that a person is dying.
- Generally, up to 3 medications that are compatible can be administered together by syringe driver. Please see Syringe Driver Pump Resources tile on the Palliative Care intranet page on Hippo for drug compatibilities Syringe driver resources.
- Please see Syringe Driver Pump Resources tile for advice on starting and discharging a person home on a syringe driver including education for whānau Syringe driver resources.
- There is no one "recipe" for a continuous subcutaneous infusion (CSCI). Medication needs to be individualised the same way as medication via any other route.
- Syringe drivers may be stopped once symptoms are controlled and converted back to oral medications. Please seek advice if you are unsure about conversions.

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Starting doses for common medications prescribed via syringe driver

Opioids

- Opioid naïve
    - Morphine injection 10 mg/24h via CSCI and 2.5 mg subcut q1h PRN up to a maximum of 4 doses in 24 hours then review by doctor
    - Oxycodone injection 5 mg/24h via CSCI and 1.25 mg subcut q1h PRN up to a maximum of 4 doses in 24 hours then review by doctor
    - Fentanyl injection 100 microgram/24h via CSCI and 25 microgram subcut q30min PRN up to a maximum of 4 doses in 24 hours then review by doctor (for patients with severe renal impairment eGFR <30 mL/min)
- On regular opioid
    - Morphine: halve the oral 24h dose e.g. morphine modified release 30 mg po BD = 60 mg/24h
      divide by 2 = 30 mg/24h morphine injection via CSCI
    - Oxycodone: halve the oral 24h dose e.g. oxycodone modified release 10 mg po BD = 20 mg/24h
      divide by 2 = 10 mg/24h oxycodone injection via CSCI

Anti-emetics

- **Metoclopramide:** 30 mg/24h via CSCI
- **Haloperidol:** 1 mg/24h via CSCI (dose range 1-3 mg) and 0.5 mg subcut q4-6h PRN (total maximum dose 5 mg/24h or 3 mg/24h in elderly)
- **Cyclizine:** 75 mg/24h via CSCI (dose range 75-150 mg) and 25 mg subcut q8h PRN (total maximum dose 150 mg/24h)
- **Levomepromazine:** 6.25 mg/24h via CSCI (dose range 6.25-12.5 mg) and 3.125-6.25 mg subcut q6h PRN (total maximum dose 25 mg/24h)

Other Medications in Last Days of Life

- Hyoscine butylbromide for respiratory tract secretions: 60 mg/24h via CSCI (dose range 60-120 mg, maximum 120 mg/24h)
- Midazolam for anxiety or seizure prophylaxis: dose 10 mg/24h via CSCI
- Haloperidol for agitation or nausea and vomiting: 1 mg/24h via CSCI (dose range1-3 mg/24h, maximum 5 mg/24h or 3 mg/24h in elderly)

Prescribing on drug chart

- Use CSCI prescribing sticker where possible
- See example below

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Continuous Subcutaneous Infusion (CSCI) Prescription (in a single syringe via syringe driver) Please use a new sticker if any changes are made to the medicines prescribed			
Date	Medicine	Dose & units	Route
			subcut
			subcut
			subcut
			subcut
Diluent (circle one) sodium chloride 0.9% (preferred) OR water for injection (only if cyclizine included)		Duration (circle one) 24 hours OR 12 hours	Prescriber's signature
Volume Must dilute to a max volume of 23 mL in a 30 mL BD syringe		Pharm	Sign, date and time to cancel

PAIN

- Effective pain management needs to be individualised, using a range of strategies that include self-care, social, psychological, pharmacological, and interventional approaches.
- It involves selecting the right analgesic(s) given at the right dose, at the right time, by the right route, to maximise pain relief and minimise adverse effects.
- Ask about impact of pain on physical function, psychologically, socially and spiritually, and the person's ideas, concerns and expectations.
- The goal is to reduce pain to a level that enables function and allows for quality of life that is acceptable to the person.
- A pain assessment tool can be helpful especially where a person has cognitive impairment – see Pain in palliative care – principles and assessment.

NON-OPIOID ANALGESIA FOR MILD PAIN

Paracetamol

- 500 mg to 1 g po or rectally 4 times a day (maximum dose 4 g per 24 hours).
- Safe to use if patient has liver metastases. If hepatic failure, modify the dose.
- Reduce the dose in elderly and frail patients, e.g. 500 mg four times a day or 1000 mg twice a day.
- Continue if a definite benefit is seen. Stop if there is no benefit as adds significant tablet burden.

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Non-steroidal anti-inflammatories (NSAIDs)

- Useful for bone pain or when anti-inflammatory effect is desirable.
- Examples include: ibuprofen immediate release 200 mg to 400 mg po three or four times a day; diclofenac modified-release 75 mg po once or twice a day.
- Avoid concurrent use of corticosteroids if possible as this combination increases gastric inflammation.
- Prescribe a proton-pump inhibitor (PPI) if used e.g. omeprazole 20 mg or pantoprazole 20 mg po once a day.

Adjuvants are medications with a primary indication other than pain that have analgesic properties. These include:

- Tricyclic antidepressants (amitriptyline, nortriptyline) for neuropathic pain.
- Gabapentinoids (gabapentin, pregabalin) for neuropathic pain.
- Steroids e.g. dexamethasone can reduce inflammation and tumour oedema and may be helpful with pain and symptom control.
- Bisphosphonates for bony pain secondary to bone metastases.

WEAK OPIOIDS FOR MILD TO MODERATE PAIN

Weak opioids e.g. codeine and tramadol have limited use in palliative care due to their poor side effect profile and/or dose escalation limits. These should be stopped whenever a person is started on a strong opioid.

Codeine phosphate

- 15 mg to 60 mg po every 4 to 6 hours (maximum dose 240 mg per 24 hours). It is about one tenth as potent as oral morphine, i.e. 60mg codeine equals approximately 5mg oral morphine.
- It is more constipating than morphine.
- Avoid in renal impairment.
- Approximately 10% of the Caucasian population will not get pain relief because they are unable to metabolise it to its active form.
- If a person is taking selective serotonin re-uptake inhibitors (SSRIs) concurrently, codeine phosphate may be ineffective.

Tramadol

- Immediate release 50 mg to 100 mg po every four to six hours or modified release 100 mg po twice daily (Total daily maximum 400 mg in 24 hours). It is about one tenth as potent as oral morphine, i.e. 100 mg tramadol equals approximately 10 mg oral morphine.
- Nausea is the main side-effect.
- Use with caution with people who have known seizure disorder as it lowers seizure threshold.
- Should not be prescribed concurrently with selective serotonin reuptake inhibitors (SSRIs) or monoamine oxidase inhibitors (MAOIs) due to risk of serotonin syndrome.

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STRONG OPIOIDS FOR MODERATE TO SEVERE PAIN (E.G. MORPHINE, OXYCODONE, FENTANYL, METHADONE)

- See the Opioid use in palliative care adult guideline on the palliative care webpage on Hippo for up to date advice on starting and prescribing opioids.

- **Morphine** is the opioid of choice for moderate to severe cancer pain. In renal impairment, morphine metabolites accumulate and are neurotoxic. Alternative opioids are oxycodone, fentanyl and methadone.

    - **Oxycodone** is 1.5 to 2 times more potent than morphine. Oxycodone 5 mg orally is approximately equal to morphine 7.5 mg-10 mg orally. It is an alternative to morphine when morphine is contra-indicated e.g. mild to moderate renal impairment (eGFR 30-60 mL/min) or not tolerated due to side effects.

    - **Fentanyl** is preferred in severe renal failure (eGFR <30 mL/min) or severe hepatic disease. It can be given by subcutaneous injection or infusion, intranasal, sublingual or transdermal patch. See Fentanyl Use in Palliative Care - Adult.

    - **Fentanyl patches** should **NOT** be used in acute uncontrolled pain or in a person who is opioid naïve as it is 100 times more potent than oral morphine e.g. 25 microgram patch = 25 micrograms per hour = 600 micrograms/24 hours = approximately 60 mg oral morphine/24h. The onset of peak effect also takes a long time and clearance is slow. It should be prescribed **under specialist guidance.**

    - **Methadone** can be used in renal impairment but **requires specialist supervision** from Palliative Care or Pain Service for conversion from other opioids and titration.

    - Oral route is preferred unless the patient has nausea and/or vomiting or is unable to swallow or absorb medication. If parenteral opioids are required, the subcutaneous route is preferred, either as baseline analgesia via syringe driver or prn doses. **Avoid using the IV "as per protocol" for people with cancer pain as many people are under-dosed in this way.**

    - **Start low and go slow.** For people who are **opioid naïve**, use the lowest dose of opioid of choice e.g. morphine immediate release 2.5 mg po q4h or morphine modified release 10 mg po twice daily.

    - Opioids share the same side effect profile, most common being constipation and nausea and vomiting. Other side effects include: euphoria, sedation, confusion, hallucinations, cognitive impairment, urinary retention, and pruritus.

    - A regular laxative must be prescribed when an opioid is prescribed. The preferred laxative for opioid-induced constipation is a combination softener and stimulant (e.g. Laxsol® tablets). See Constipation in palliative care.

    - Symptoms and signs of opioid toxicity include agitation, confusion, ataxia, sedation, myoclonic jerks and respiratory depression. Naloxone reverses opioid-induced respiratory depression and the dose should be titrated according to response to minimise risk of precipitating a pain crisis. See Opioid use in palliative care adult for more information on when and how to prescribe naloxone for opioid-induced respiratory depression.

Morphine

Starting a person on morphine (see Opioid use in palliative care adult guideline) Assess the pain – see Pain in palliative care - principles and assessment Start immediate release morphine 2.5 mg to 5 mg po q4h, for at least 48 hours until pain controlled OR start morphine modified release 10 mg po q12h with PRN immediate release morphine 5 mg po q4h.

1. When the pain is controlled, calculate the total dose of morphine used in the previous 24 hours and divide the total by two to give the 12-hourly dose of modified release morphine. Prescribe the modified release morphine dose every 12 hours. Example: total morphine use in previous 24 hours = 60 mg/24h = morphine modified release 30 mg po q12h.

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2. Prescribe the PRN dose as 1/6th of the total 24-hour dose morphine for breakthrough pain. Prescribe this dose to be given every one hour when required up to a maximum (e.g. 4 doses) in 24 hours which will prompt a review by a doctor. Example: the PRN dose for a person on morphine modified release 30 mg po twice daily = 60 mg/24h divided by 6 = 10 mg immediate release morphine po q1h (maximum dose 40 mg/24h).

3. Adjust the dose of oral morphine according to the patient's pain and opioid requirement. Dose increases of modified release morphine should **not exceed 33-50% every 24 hours** unless guided otherwise by the Palliative Care or Pain Service.

4. If a person is experiencing side effects from morphine, then conversion to an alternative opioid may be considered e.g. oxycodone with advice from Palliative Care or Pain Service.

5. **Converting from oral to subcutaneous route**

Medications are more bio-available when given by the subcutaneous route. This means that the dose given by CSCI will be less than the dose given by the oral route.

Dose conversions are indicated below – reduce the estimated dose further by 25-50% to allow for incomplete cross-tolerance and other variable patient factors.

Conversion	Ratio	Calculation	Example
PO morphine to subcut morphine	2:1	Divide 24-hour oral morphine dose by 2	morphine 60 mg PO/24 hours = morphine 30 mg subcut/24 hours
PO morphine to subcut oxycodone	2:1	Divide 24-hour oral morphine dose by 2	morphine 60 mg PO/24 hours = oxycodone 30 mg subcut/24 hours Reduce by 25-50%. Oxycodone 15-20 mg subcut/24 hours
PO morphine to subcut fentanyl	100:1[A]	Divide 24-hour oral morphine dose by 100	morphine 60 mg PO = fentanyl 0.6 mg (600 micrograms)/24 hours Reduce by 25-50% Fentanyl 300-400 micrograms subcut/24 hours
PO oxycodone to subcut oxycodone	1.5:1[A]	Divide 24-hour oral oxycodone dose by 1.5 (i.e. decrease by 1/3)	oxycodone 30 mg PO/24 hours = 20mg oxycodone subcut/24 hours
	2:1[B]	Divide 24-hour oral oxycodone dose by 2	oxycodone 30 mg PO/24 hours ~> oxycodone 15 mg subcut/24 hours
[A] Accepted common practice based on expert use [B] Manufacturer's recommendation **Note:** For conversions not listed here, contact the Palliative Care Team.			

Changing from one subcutaneous opioid to another

Conversion	Ratio	Calculation	Example
subcut morphine to subcut oxycodone	1:1	Use same dose as 24-hour subcut morphine dose	morphine 30 mg subcut/24 hours = oxycodone 30 mg subcut/24 hours Reduce by 25-50% Oxycodone 15-20 mg subcut/24 hours
subcut morphine to subcut fentanyl	50-75:1[1A]	Divide 24-hour subcut morphine dose in mg by 50-75	morphine 30 mg/24 hours = fentanyl 0.4-0.6 mg (400-600 micrograms)/24 hours Reduce by 25-50% Fentanyl 200-300 micrograms subcut/24 hours
[A] extrapolated from the manufacturer's recommended ratios for morphine PO to fentanyl TD which varies according to the duration of use of the previous strong opioid. **Note:** For conversions not listed here, contact the Palliative Care team.			

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NAUSEA AND VOMITING

- See **Nausea and vomiting in an adult with palliative care needs** for full guideline.
- Identify and treat any reversible causes where possible e.g. hypercalcaemia, uraemia, drug or treatment related, gastric stasis, bowel obstruction, raised intracranial pressure, fear and anxiety etc.
- Consider non-pharmacological measures for symptom relief e.g. small frequent meals, ginger in drinks/tea/biscuits, avoid smells, apply acupressure wristbands.
- If prescribing anti-emetics, select the medication according to its mechanism of action, chart regularly and consider giving via the subcutaneous route if persistent nausea and/or vomiting (see Table). A continuous subcutaneous infusion (CSCI) will give 24-hour cover and can be supplemented by as required (PRN) doses.
- If unresponsive to treatment, consider other physical causes and/or psychological distress. Olanzapine and cannabinoids should be reserved for persistent nausea and vomiting where other treatments have failed. Seek specialist advice.
- For nausea and vomiting in the last days of life, refer to **Nausea and vomiting** in the Last Days of Life symptom management algorithms on the Palliative Care webpage on Hippo.

Table: Medications for nausea and vomiting

Key: ACh – Anticholinergic receptors; 5-HT2 or 5-HT3 – serotonin receptors; D2 – dopamine receptors; H1 – histaminic receptors; PO – orally; subcut – subcutaneously

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Cause and symptoms	1st line treatment	2nd line treatment	Cautions and side effects
"Chemical" cause • medications e.g. opioids • biochemical e.g. hypercalcaemia, uraemia, toxins **Symptoms** • persistent, severe nausea • little relief from vomiting	**Haloperidol** • 0.5-1 mg PO/subcut nocte **AND** 0.5-1 mg PO/subcut PRN q4-6h • CSCI: 1-3 mg/24h • **Maximum 5 mg/24h (or 3 mg in elderly)** **OR** **Metoclopramide** • 10 mg PO/subcut TDS • CSCI: 30 mg/24h • **Maximum for five days**. Seek specialist advice	**Levomepromazine** • 6.25-12.5 mg PO/subcut nocte **OR** • 3.125-6.25 mg PO/subcut PRN q6h • CSCI: 6.25-12.5 mg/ 24h • **Maximum 25 mg/24h**	**Haloperidol** and **metoclopramide** are dopamine (D2) antagonists • extrapyramidal side effects (EPSE) • caution in young women (metoclopramide) • lowers seizure threshold (haloperidol) • QT prolongation • contraindicated in Parkinson disease (PD) **Levomepromazine** is a broad spectrum anti-emetic with activity at 5-HT2, D2, ACh, H1 • hypotension • drowsiness • lowers seizure threshold • EPSE • QT prolongation
Gastrointestinal cause • gastritis • gastric stasis • gastrointestinal malignancy **Symptoms** • intermittent nausea • relieved by large volume vomiting	**Metoclopramide** • 10 mg PO/subcut TDS • CSCI: 30 mg/24h **OR** **Domperidone** • 10 mg PO TDS • subcut route not available • **Maximum for seven days**. Seek specialist advice	**Dexamethasone** • 8 mg PO/subcut mane if hepatomegaly or liver capsule involvement **Levomepromazine** as above	**Metoclopramide** and **domperidone** are prokinetics • not for use in malignant bowel obstruction with colic • side effects as above • domperidone is safe in PD • QT prolongation **Levomepromazine** as above **Dexamethasone is a corticosteroid (glucocorticoid)** • Gastrointestinal effects • Can alter mood and behaviour • Cause insomnia (best given in the morning)

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Intracranial/Vestibular cause • raised intracranial pressure • radiotherapy to brain • malignancy **Symptoms** • persistent nausea with headache • worse with movement	**Cyclizine** • 25-50 mg PO/subcut TDS • CSCI: 75-150 mg/24h • **Maximum 150 mg/24h**	**Dexamethasone** • 8-16 mg PO/subcut mane for raised intracranial pressure **Levomepromazine** as above	**Cyclizine** is an H1/ACh anti-emetic • avoid in severe heart failure • anticholinergic side effects • skin reactions sometimes with subcutaneous route **Levomepromazine** as above **Dexamethasone** as above
Chemotherapy/ Radiotherapy	**Ondansetron** • 8 mg PO/subcut BD • CSCI: 16 mg/24h **Maximum 8mg in hepatic impairment** **Dexamethasone** • refer to chemotherapy treatment protocol	**Levomepromazine** as above.	**Ondansetron** is a 5-HT3 antagonist • risk of serotonin syndrome • QT prolongation • constipation • headaches

CONSTIPATION

- See Constipation in palliative care guideline on Hippo.
- Thorough assessment and examination of the person including; rectal exam, medications, review and assessment for obstruction. Abdominal x-ray may be helpful.
- People can become agitated, confused and delirious because they are constipated.
- Review regularly aiming for a bowel motion every two to three days regardless of oral intake. Consider escalation of treatment if bowels not open for two days.
- Normal bowel movements are aided by adequate hydration, mobility, privacy and nutrition.
- Choice of natural aperients may be helpful and reduce medication need e.g. prunes, kiwifruit, Kiwi Crush, herbal products and juices – if accepted and tolerated.
- In the last days of life, it may not be appropriate to treat constipation.
- Laxatives should be prescribed at the time of prescribing opioids.
- Lactulose should not be used in people who have poor fluid intake and is often poorly tolerated in very ill patients. It is not the medication of first choice.
- Avoid oil enemas in people with a stoma as this affects adherence of appliances.
- Avoid phosphate-containing products in patients with end-stage renal failure.

Note: For intractable constipation not responding to suggestions in this guideline please contact the Hospital Palliative Care Team.

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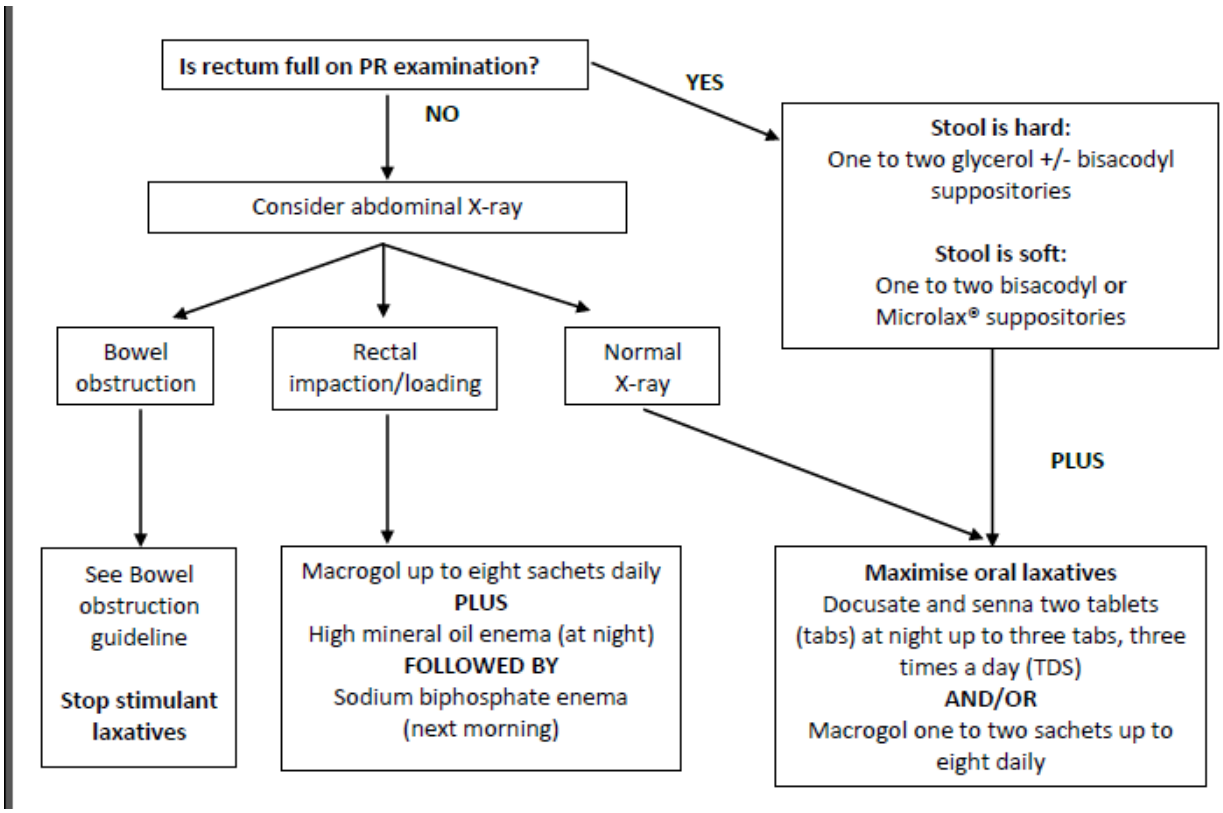
PROCESS FOR TREATING CONSTIPATION

Step	Description
1.	**Assessment** Frequency/consistency of bowel motions, change in pattern, abdominal pain, nausea, environmental factors, co-morbidities, medications etc.
2.	**Examination** Including rectal (PR) exam – more detail below.
3.	**Treat reversible causes where possible** • Drugs e.g. opioids, anticholinergics, ondansetron, cyclizine, chemotherapy, diuretics • Metabolic e.g. hypercalcemia, hypothyroidism, hypokalemia, diabetes • Neurological e.g. spinal cord/cauda equina compression, sacral plexopathy • Mechanical e.g. Intra/extra-luminal masses, adhesions, strictures, ascites • General e.g. low fibre/fluid intake, inactivity, weakness, depression, debility.
4.	Maximise oral laxatives (see below) and co-prescribe when starting opioids.

FLOWCHART TO AID DECISION MAKING



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CONTRAINDICATIONS

Rectal interventions may be contra-indicated under the following circumstances:

- Allergy to any of the ingredients
- Bowel obstruction (abdominal colic pain, no bowel sounds, no flatus)
- Acute inflammatory bowel disease
- Severe abdominal pain associated with nausea and vomiting
- Neutropenia and thrombocytopenia
- Frail or near end of life – consider burden versus benefit
- Recent gastrointestinal or gynaecological surgery
- Recent radiotherapy to the lower pelvis unless medical consent given
- Malignancy of the perianal region/bowel

MANAGEMENT OF MALIGNANT BOWEL OBSTRUCTION IN PALLIATIVE CARE

- See full guideline: Management of Malignant Bowel Obstruction in Palliative Care on Hippo under P: Palliative Care: Symptom Management.
- Malignant bowel obstruction (MBO) is obstruction of the transit of gastro-intestinal contents caused by cancer or the consequences of cancer treatment. It can be caused by mechanical obstruction by cancer (within or outside the bowel wall), functional obstruction due to infiltration of the nerve plexus or bowel musculature, or combination of both. Post-surgical adhesions and radiation-induced fibrosis can also cause obstruction.
- In people with advanced cancer and inoperable MBO, mean survival is four to five weeks. Early palliative care involvement, careful weighing of risks and benefits of interventions, estimated life expectancy, and the person's goals and preferences of care as part of an individualised multi-disciplinary treatment are essential components of management.
- Relatively fit people with a single level of obstruction should be considered for surgical intervention and/or endoscopic stenting as a less invasive alternative.
- Multi-level bowel obstruction generally indicates a poor prognosis. Medical management is generally aimed at relief of symptoms and optimising quality of life. In some circumstances, this may include parenteral hydration, nasogastric tube drainage or venting gastrostomy.
- Discontinue bulk forming (e.g. psyllium husk – Konsyl D®/Metamucil®) and stimulant (e.g. bisacodyl, sennoside B, Laxsol®) laxatives if colic is present. In partial MBO, consider a stool softener such as sodium docusate (Coloxyl®) 100 mg, 200 mg po up to twice daily.
- Provide good mouth care and allow sips of fluid/ice chips for dry mouth. See https://adhb.hanz.health.nz/Policy/Oral hygiene in adult palliative care patients.pdfguideline (refer Associated documents).
- Consider intravenous fluids if dehydrated and correcting electrolyte imbalances (e.g. phosphate, calcium, magnesium, potassium etc.)
- Consider giving combination of medications for symptom control by continuous subcutaneous infusion (CSCI) using a syringe driver.

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- Consider addition of dexamethasone for five to seven days for pain and nausea symptom relief by reducing tumour oedema.

- Consider omeprazole 20 mg - 40 mg IV up to twice daily to reduce gastric secretions.

- Consider nasogastric tube insertion only for symptomatic relief of large volume vomiting of more than two to three times per day that is unresponsive to parenteral medications.

- Eating and drinking can be a significant concern for a person with MBO and their whānau/ family. Generally, for people with advanced cancer and limited anti-cancer treatment options, parenteral nutrition is not indicated. See Artificial Nutrition and Hydration in Palliative Care guideline.

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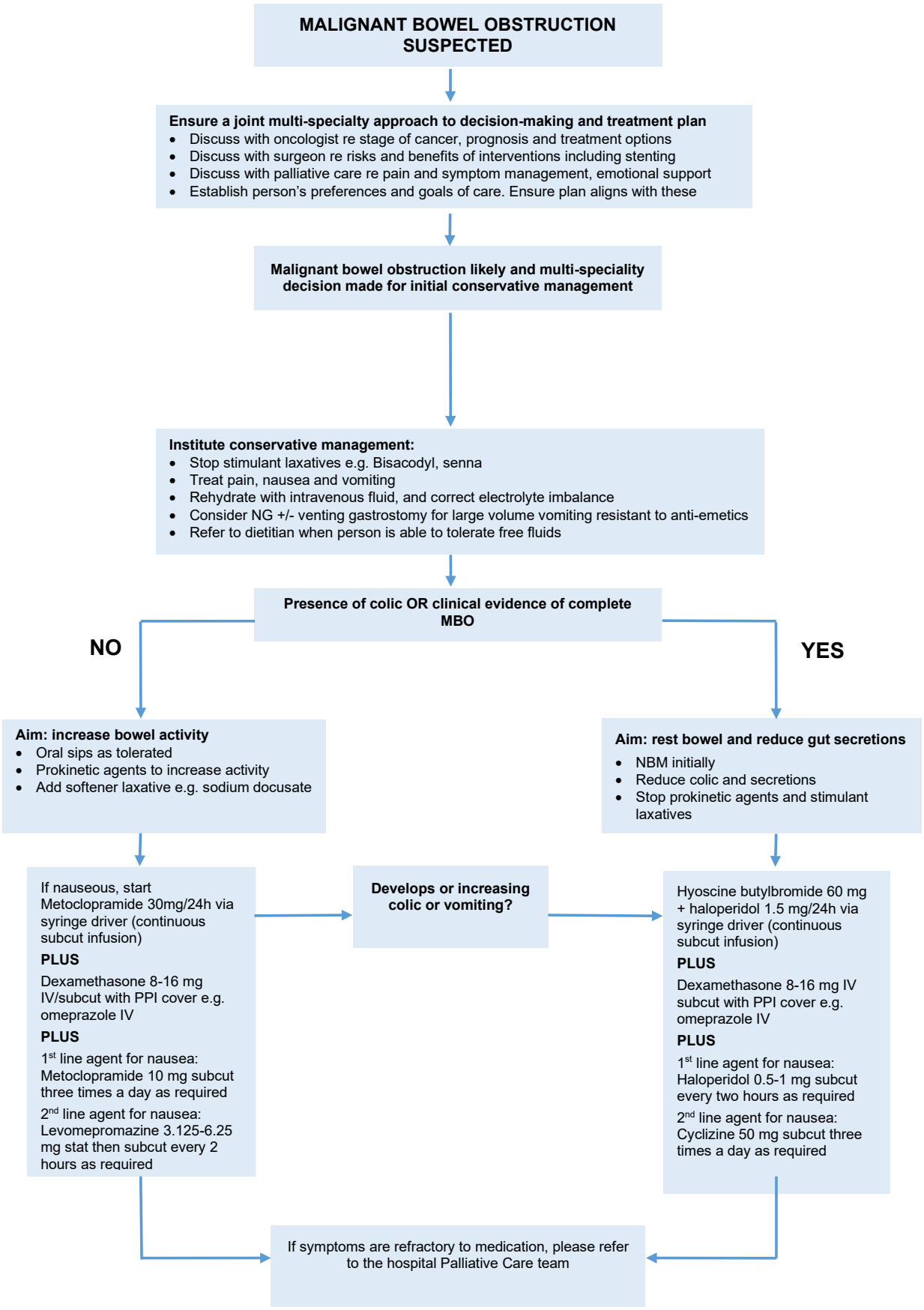
MANAGEMENT OF MALIGNANT BOWEL OBSTRUCTION IN PALLIATIVE CARE



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CARE IN THE LAST DAYS OF LIFE

See Last Days of Life Care tile on the palliative care webpage on Hippo for best practice recommendations from the Ministry of Health Te Ara Whakapiri principles and guidance for health care professionals caring for the person and their whānau in their last hours to days of life.

Step 1: Recognising dying

- See Recognising dying flow chart for full details.
- Early recognition of a person who may be entering the last weeks to days of life and sensitively communicating this to a person and their whānau is important to prevent unnecessary suffering and distress due to uncontrolled symptoms, inappropriate life prolonging treatments, cultural and spiritual needs not being met and missed opportunities.
- Changes that can indicate that dying is starting to occur include: profound weakness, reduced intake of food/fluid, difficulty swallowing, becoming bedbound, lack of response to medical treatments and near death awareness (stories, travel, visitation).

Step 2: Starting the Last Days of Life Care plan

- See Medical management planning for full details.
- The Last Days of Life (LDoL) Care plan is a multi-professional document that supports staff in providing best care for the person and their whānau in the last days of life.
- The decision to start the LDoL care plan is made after multidisciplinary team (MDT) assessment to ensure that potentially reversible causes have been identified and treated and a person is recognised to be dying.
- People started on the LDoL care plan will be in their last hours to days of life.
- The LDoL care plan should be reviewed by the MDT every 3 days or if a person's level of consciousness improves or if concern is expressed by the person/whānau or staff. It can be stopped when a person's condition improves and/or stabilises.

Step 3: Symptom management algorithms

- Review prescribed medications
- There are five main symptoms that must be anticipated so that care is optimised. Anticipatory prescribing enables staff to respond quickly should a symptom arise or when swallowing becomes difficult. The symptoms are:
    - pain
    - nausea and vomiting
    - respiratory tract secretions
    - delirium, restlessness, agitation
    - breathlessness/ dyspnoea.
- It is important to anticipate potential symptoms and prescribe accordingly.
- Refer to symptom management flow charts:
    - Agitation, delirium and restlessness

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- Dyspnoea, breathlessness
- Nausea and vomiting
- Pain management in normal renal function
- Pain management in renal impairment
- Respiratory tract secretions

- Explain to the person (if able) and their family/whānau the rationale for anticipatory prescribing.
- If more than three doses of any prescribed medication are required within the minimum administration period (e.g. if prescribed Q1H PRN and three doses are required in three hours), review and consider whether a continuous subcutaneous infusion (CSCI) would be preferable.

Step 4: Deciding on place of care in the last days of life

- See Discharge of a person with palliative care needs for full details.
- It is important to have conversations early as part of advance care planning (ACP) as to where a person and their whānau would prefer to be cared for in the last weeks to days of life.
- Discharge planning often requires a minimum of 48 hours and involvement of the multi-disciplinary team including the person and whānau, medical and nursing team, physiotherapist, occupational therapist, and social worker.
- Consider a multidisciplinary team meeting early to determine a person's wishes regarding place of care in the last weeks to days of life.
- If a person and their whānau wishes to be at home in their last days of life, see Discharge home of a dying patient- guideline for advice.
- If a person is to be discharged to hospice or a residential care facility, see Discharge process page.
- Liaise with community services, including:
  - Community Palliative Care (hospices)
  - Adult Community Services (Rapid Community Access Team- R-CAT and District Nursing Services)
  - General Practitioner
  - Pharmacy (only certain pharmacies can make up syringe drivers – Syringe Driver Pharmacies for Auckland regional Heath Pathways)
- If a person is being discharged home on a syringe driver and on subcutaneous medications, see Discharging Patients on Syringe Driver and Subcutaneous PRN Medications and Education for family/caregivers in PRN Subcutaneous Medication Administration.
- If a person requires an ambulance letter and/or home oxygen to support safe discharge home, see Letter for Ambulance Personnel and Home oxygen.
- Prior to discharge if there is a change in clinical condition, this requires review and re-evaluation of the discharge arrangements by the ward team.
- For guidance on preparing for and completion of death certification and cremation certificates, please see Management of tūpāpaku, deceased patients.

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Step 5: Additional resources

For the person and whānau

- Bereavement care
- Care in last days of life
- Dying at home
- Planning a funeral
- Understanding the dying process
- Tissue donation information

For healthcare professionals

- Diabetes at the end of life algorithm
- Bereavement risk assessment tool
- Care of staff following a death
- Discharge of a person with palliative care needs
- End of life essentials. This site provides free online education for acute hospitals including recognising dying, goals of care, and communication skills
- Management of tūpāpaku, deceased patients
- Te Ipu Aronui website (Māori end of life care customs)

MANAGEMENT OF BREATHLESSNESS IN PALLIATIVE CARE

See Breathlessness in Palliative Care guideline on Palliative Care Symptom Management tile.

Step 1	**Identify and treat underlying causes as medically appropriate and aligned with a person's preferences and goals of care, for example:** • Bronchodilators for wheeze • Blood transfusion for anaemia • Steroids for lymphangitis carcinomatosis/ tumour obstruction • Radiotherapy for superior vena cava obstruction • Pleural/pericardial drainage for effusions Please note that the above list is not exhaustive and other medical management for specific indications not listed may be applicable and should be treated first.
Step 2	**Initiate and optimise non-pharmacological therapies:** Refer to patient information leaflet "Managing breathlessness – What to do when very breathless" and involve the multi-disciplinary team. • Acknowledge fear, anxieties and assess for anxiety and depression. Consider referral to psychological support services for cognitive behavioural/psychological therapies.

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	• Provide explanation, reassurance and education to person and whānau. • Educate on breathing (purse lip breathing, candle blowing), relaxation (e.g. mindfulness) and distraction techniques. • Check person and whānau's understanding of how medicines work and the use of regular and as required medicines. Refer to pharmacist for assistance. • Consider referral to physiotherapy and occupational therapy to educate on how to pace and plan activities, support, energy conservation and lifestyle modifications. • Educate on helpful positions to maximise comfort e.g. lean forward, drop shoulders. • Hand-held fan or stream of fresh air e.g. an open window. This can help trigger reflexes in the trigeminal nerve, providing relief from breathlessness. • Nutritional advice to maintain muscle strength. Consider referral to dietician. • Consider pulmonary rehabilitation for chronic obstructive pulmonary disease (COPD) patients.
Step 3	**Initiate and optimise opioid therapy:** • Review and maximise non-pharmacological therapies at all times. • For breathlessness at REST that persists despite optimisation of non-pharmacological treatments, trial low dose oral morphine as directed below. This does not cause respiratory depression. • There is poor evidence for the use of alternative opioids to morphine (e.g. oxycodone and fentanyl), but may be considered for patients who are unable to take morphine. • Evidence for optimal prescribing is unclear i.e. regular long acting versus as required/regular short acting opioid. When initiating an opioid for breathlessness, it is important to consider individual factors (elderly, renal impairment, multiple medications, lives alone) and personal preferences. • Evidence suggests up to 30 mg per day of oral morphine provides effective symptom relief of breathlessness. • Opioid doses for breathlessness are smaller than those used for pain, therefore separate opioid doses may be prescribed for pain and breathlessness and reason for this should be clearly indicated on the prescription chart: For example, a person taking morphine modified release 60 mg po twice daily may have morphine immediate release 10 mg po as required (PRN) every 30 minutes charted for pain AND morphine immediate release elixir 2.5 mg po every four hours PRN for breathlessness/dyspnoea. • If a person is unable to swallow and/or in the last days of life, please refer to the management of breathlessness in the Last Days of Life on the Palliative Care intranet page and/or contact the Hospital Palliative Care Team. **If creatinine clearance is greater than 30 mL/minute:** Trial morphine immediate release elixir 2.5 mg po every four to six hours prn for breathlessness at REST. If effective consider: • Regular morphine immediate release elixir 2.5 mg po four times a day (QID) **OR** • Regular morphine modified release 10 mg po twice daily and continue morphine immediate release elixir 2.5 mg po every four to six hours prn **If creatinine clearance is less than 30 mL/minute**: • Consider morphine immediate release elixir at a reduced dose of 1-2 mg po every six to eight hours prn

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	• Ensure laxatives are co-prescribed regularly e.g. docusate and senna (Laxsol®) two tablets po twice daily to prevent opioid induced constipation (see Constipation in Palliative Care refer Associated documents), and "as required" prophylactic anti-emetics (see Nausea and Vomiting in an Adult with Palliative Care Needs refer Associated documents)
Step 4	**If breathlessness at REST is exacerbated by anxiety that is unrelieved by non-pharmacological interventions and opioids alone,** depending on prognosis +/- features of depression, benzodiazepines and/or anti-depressants may be indicated. There is no evidence that benzodiazepines, including midazolam nasal spray, reduce breathlessness. Specialist palliative care advice is recommended.
Step 5	**If risk of acute respiratory event, consider crisis management plan:** • Midazolam 10 mg intramuscularly or subcutaneously for anxiety/sedation. Repeat every 15minutes until patient is comfortable; **AND** • Morphine 10 mg (or patient's usual opioid) intramuscularly or subcutaneously for pain/shortness of breath. Repeat every 15 minutes until patient is comfortable
Step 6	**Consider individualised action plan for management of breathlessness at home:** • Collaborate with MDT and community services including hospice community team • Regularly review advance care planning and goals of care • Assess carer needs and available social supports

MANAGEMENT OF DELIRIUM IN PALLIATIVE CARE

See Delirium in the hospital setting guideline on Hippo for full details. Refer to Psychiatry chapter for investigation and management of delirium.

See also https://adhb.hanz.health.nz/CLTC/Docs/Agitation%20restlessness%20and%20delirium.pdf?Web=1

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Pharmacy

MEDICINES INFORMATION INTRANET SITE

WHO TO CALL

Mon-Fri 0800-1630h

- Usual ward/service pharmacist at Te Toka Tumai (contact details on every ward)
- Medicines Information

Out-of-hours

- On-call pharmacist via switchboard

Clinical Pharmacists

- At Te Toka Tumai most wards have a pharmacist who will visit the ward on a regular basis
- The clinical pharmacist will prioritise patients to check and monitor inpatient drug therapy and can also help with medicines reconciliation, discharge planning, and patient counselling

REFERENCE VIEWER

- The Reference Viewer is an online resource for accessing information about medicines. It utilises the New Zealand Formulary (NZF) and also contains links to Te Toka Tumai medicine-related documents (e.g. Medicines Administration Guidelines, protocols etc.). It is available directly through the intranet (link is on the home page). The Reference Viewer can also be accessed through the "Applications" section in Regional Clinical Portal (RCP). Use the NZ Formulary link within the Reference Viewer to access:
    - Interaction checker
    - Prescribing restrictions (e.g. Infectious Disease only, etc.)
    - Subsidy status on discharge
    - Special Authority requirements
    - Links to drug company data sheets and patient information leaflets (CMI)

MEDICINES INFORMATION SERVICE

- Available to answer any medicine-related questions. If you can't find the information you need in the Reference Viewer then contact Medicines Information (listed as Medicines Info Service Te Toka Tumai in global address book).
- The Medicines Information intranet site contains a wide range of useful information. It has been designed so that information more relevant for prescribers is grouped together and has quick links to commonly used references such as the NZ Formulary and Medicines Administration Guidelines.

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MEDICINES HISTORY (MH) AND RECONCILIATION (MR)

The Medicines History process uses a minimum of two different sources (e.g. patient, patient's own medicines, community pharmacy, rest home or GP) to obtain and verify a medication history on admission, and the reconciliation aims to ensure that the appropriate medicines are continued during the patient's hospital stay and that any changes to the admission medicines are clearly documented and communicated.

This process aims to reduce medication errors that may occur from incorrect medicines being prescribed and from medicines being omitted.

If there are electronic MH and MR forms on RCP, please reconcile it as soon as possible to minimise harm from unintended discrepancies. Contact the Clinical Pharmacist if you have any questions about the MR process.

TestSafe Pharmacy

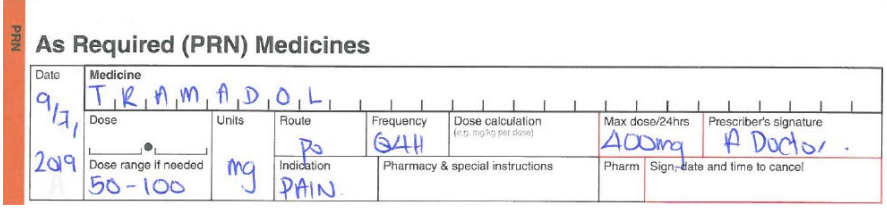
Community Pharmacy dispensing records from the Auckland region can be accessed via RCP. These dispensing records are an important resource that can be used in the MR process. Access the records via the 'By Service' tab within the results section of RCP. Select 'Pharmacy' and then select 'Recent Summary'.

NOTE: There are a number of limitations to this data. The information may be incomplete as patients and pharmacies can opt out of contributing to the data storage, resulting in some medications being missed out or incorrect. In addition, TestSafe data does not provide information on whether the dispensed medication was picked up by the patient, nor whether the patient takes all medicines exactly as prescribed.

Please ensure you read the data limitations, which are accessible on the Recent Summary page.

CHARTING INPATIENT MEDICINES

- Ensure correct patient identification is attached on the front and inside cover of the National Medication Chart (NMC).
- If first prescriber, please handwrite the patient name and NHI on the top right of the front cover.
- Ensure allergies and adverse drug reactions of medications are documented.
- Sign the front of the NMC (legal requirement).
- When recharting, the date of recharting is documented on the top left corner of the front cover. Date of medication initiation remains the same.
- Any changes to prescribing must be written as a new line on the chart.
- Prescribe by generic name unless the medicine is brand specific.
- Annotate an indication when prescribing a medication for non-standard use. e.g. Mylanta® for magnesium supplement.
- Medicine names, strengths and directions should be written clearly to reduce the possibility of error or misinterpretation by other health professionals. When an unusual dose is knowingly prescribed, the prescriber should indicate this by underlining and initialling the dose.
- When prescribing "PRN" medicines it is important that you also include the indication, dose range, and daily maximum. For example:



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- Verbal orders should only be used in exceptional circumstances. The order should be recorded on the Verbal Orders section of the medication chart. Verbal orders should be counter-signed by the prescriber within 24 hours of giving the order.
- All instructions should be written in English. However, the following abbreviations are acceptable:

BD	twice daily	**PO**	Oral
TDS	three times a day	**IV**	intravenous
QID	four times a day	**IM**	intramuscular
Q4H	every four hours	**PR**	per rectum
PRN	as required	**PV**	per vaginal
mane	in the morning	**NG**	nasogastric
nocte	at night	**NJ**	nasojujenum
midi	midday	**inhale**	inhalation
ac	before food	**subcut**	subcutaneous
pc	after food	**subling**	sublingual

Guidelines to aid clarity

USE	Instead of	Reason why
daily mane/nocte	OD	Can be confused with **BD**
units	U	Can be mistaken as **0** resulting in 10x overdose
units	IU	Can be mistaken as **IV** or **1** e.g. 3IU looks like 31U
microgram	mcg µg	Can be mistaken as **mg**
10 mg	10mg	Place a **space** between a number and its units
2 mg	2.0 mg	**Never** use a **trailing zero** after a whole number
0.5 mg	.5 mg	Always place a **leading zero** before a number less than one

Prescribing advice

Ask yourself the following questions each time you prescribe a medicine:

- What is the diagnosis or indication?

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- What medicines are appropriate for this condition? (check Reference Viewer, NZ Formulary, HML, antibiotic guidelines, etc.) Are there any restrictions associated with using this medicine? (check Reference Viewer).
- Is this medicine appropriate for this patient? (Consider age, allergies, underlying diseases, pregnancy, lactation, other medicines etc.).
- Is a loading dose necessary?
- What is the appropriate maintenance dose and dosing interval? (remember that adherence is more likely with medication taken once or twice daily).
- What monitoring is needed? (e.g. drug concentrations, renal or liver function tests, BP etc.).
- Should the medicine be administered with or without food?
- When should the effect of the medicine be reviewed?
- How long should the patient remain on the medicine (or at this dose)? This is particularly relevant for antimicrobials.
- Are any medicine interactions likely?
- What major and minor side effects might occur and have I informed the patient about these?
- What should the patient do if a dose is missed?
- Have you discussed the treatment regimen with the patient?
- Is this the most cost-effective medicine?
- Is the prescription CLEAR, CONCISE, CORRECT, COMPLETE and WRITTEN IN CAPITALS?
- Is there a patient information leaflet on this medicine that I could provide to the patient? (Consult Reference Viewer or Medicines Information intranet site).

TEN RULES FOR SAFE PRESCRIBING AND ADMINISTRATION

These are mandatory requirements and all staff must follow them.

1. All medication charts or prescriptions must have correct patient identification (patient label or written name, date of birth and NHI number) attached by the prescriber before the prescription is written. On medication charts the first prescriber should also handwrite the patient's name in the allocated space.
2. Prescriptions must be written as a complete order for administration to occur i.e. date, name of medicine, strength of medicine, dose, route and frequency.
3. As required medicines should include the indication and the maximum daily dose
4. Every medication chart should be reviewed daily by a doctor (does not apply at weekends)
5. The following abbreviations must **not** be written on any prescription: **OD – instead write DAILY** **U or IU – instead write UNITS** **mcg or µg – instead write MICROGRAMS**

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6. Medicines must only be prescribed or administered in relation to a specific patient with:

- Knowledge about the medicine and its effect
- Knowledge about the route of administration
- Knowledge of service-specific practices
- Knowledge of special precautions and vital-sign monitoring required
- Knowledge of the patient's allergy and ADR status

7. Information must be provided by the prescriber if they are prescribing outside standard prescribing guidelines or dosing texts. This information must be placed in the patient's clinical notes as a reference for all staff to fulfil their duties.

8. Staff have the right to **refuse to administer or dispense** a prescription they cannot read or understand. The prescriber, or in their absence the patient's team, must be informed immediately if this decision is made. This may delay the treatment the patient receives.

9. A medicine must only be administered if the prescription is identifiable to the correct patient, is legible and complete with a signature, printed name and date. The prescriber will be contacted to rewrite the prescription if this is not the case.

10. If medicines have been omitted this must be followed up within the shift by informing the patient's doctor

DOSE ALTERATIONS

Medication dosing in renal disease

It is beyond the scope of the handbook to provide a list of medications and dosage recommendations in renal disease. Patients with impaired renal function should have their medications continually reassessed to see if any dosage or dosage interval changes need to be made.

- Medicines with a high fraction excreted unchanged in the urine and a low therapeutic index (i.e. narrow range between the toxic and therapeutic dose) require dose adjustment in renal impairment. Consider alternative medicines that have less renal excretion.
- The first dose of a newly initiated medicine rarely needs adjusting – it is the subsequent doses that will need to be reviewed
- Estimate the creatinine clearance using the Cockcroft & Gault equation (neither the Modification of Diet in Renal Disease (MDRD) equation nor CKD-EPI equation have been validated for medication dosing recommendations). The calculator for CrCl can be accessed via the page icon in upper left corner of RCP results page.
- Renal replacement therapy (dialysis) can affect clearance of some medicines and may require review of dose and timing.
- Check the Data Sheet via Reference Viewer (NZ Formulary link) or Medsafe to see if dosage adjustment is required.
- If unsure, contact the Renal team, your Clinical Pharmacist, Medicines Information, or on-call pharmacist out of hours for advice.

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Medication dosing in hepatic impairment

The majority of patients with deranged liver function tests would not require medication dose adjustment. The patients at greatest risk of increased medication levels are those with liver cirrhosis and signs of decompensation such as prolonged prothrombin ratio or INR (>1.2).

- There is no general guidance about the degree of dose adjustment so decisions should be made on a case-by-case basis. Consider dose adjustment for medications that have narrow therapeutic index or are predominantly metabolised via first-pass and hepatic metabolism. Patients with cirrhosis tend to also have renal dysfunction, so the medication may require renal dose adjustment.
- Avoid sedatives and NSAIDs in end-stage liver disease.
- If opioids are required, use short-acting or immediate release preparations and a longer dosing interval or lower doses to minimise accumulation.
- If pain relief is required, paracetamol can safely be used in normal doses with end stage liver disease.
- Check the Data Sheet in the Reference Viewer (NZ Formulary link) or Medsafe to see if dosage adjustment is required.
- If unsure, contact the Liver team, your Clinical Pharmacist, Medicines Information or on-call pharmacist out of hours.

The elderly

- Adjust dosing for renally eliminated medicines (see above).
- For other medicines use doses at the lower end of those recommended for young adults.
- Remember older patients may have increased sensitivity to certain medications e.g. confusion with anticholinergic medicines.
- Review medicines regularly and stop any that are unnecessary – avoid polypharmacy if possible.
- Contact your Clinical Pharmacist or Medicines Information if you require information about patients with swallowing difficulties, compliance aids, etc.

Pregnancy and lactation

It is beyond the scope of the handbook to provide a list of drugs and recommendations for use in pregnancy and lactation. Refer to the Reference Viewer (NZ Formulary link) or Medsafe, your Clinical Pharmacist, Medicines Information or on-call pharmacist out of hours.

THERAPEUTIC DRUG MONITORING (TDM)

Measurement of plasma concentrations of medicines with a low therapeutic index (or narrow therapeutic range) can assist with management. Some examples of commonly monitored medicines are: ciclosporin, digoxin, gentamicin, lithium, phenytoin and vancomycin.

Sampling

- Timing of samples with regards to dose is often important and incorrect timing of samples may lead to interpretation error or the need for additional samples to be taken.
- Aminoglycosides and lithium usually require sampling at specific times. For other medicines, trough concentrations (just prior to next dose) often give the best guide to accumulation. Consult the LabPlus handbook for specific details.

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- Sampling should be done at steady state (i.e. 4-5 half-lives after the first dose, or after a change in dose). If a loading dose was given then sampling can be done earlier.
- Times of dosing, duration of dosing, and times of sampling should be recorded accurately for adequate interpretation.

Common Medicines that require TDM

Medicine	Sampling time	Usual Therapeutic Range	Comments
Ciclosporin	Trough (before the next dose is due) Recent solid organ transplant monitor C2 concentration: 2 hours after dose is taken	160-360 microgram/L 800-1700 microgram/L depending on indication and time post-transplant (months)	Ranges vary with indication and time post- transplant (months)
Digoxin	At least 6 hours after the last oral dose	AF: 0.6 to 2 nmol/L HF: 0.6 to 1 nmol/L	
Gentamicin (2 methods)	0 to 4 hours before the next dose is due OR	< 1 mg/L	See Aminoglycoside Guideline on HIPPO for amikacin and tobramycin
	1 hour and 6 hours after the first dose	AUC 70-100 calculated by clinical pharmacist	
Lithium	12 hours after the last dose	0.5 - 1.0 mmol/L	See the Lithium - Best Practice Guideline for Management and Monitoring for further information
Phenytoin	Trough (before the next dose is due)	40 to 80 µmol/L Plasma albumin 30 g/L: 30 - 60 µmol/L Plasma albumin 20 g/L: 20 - 40 µmol/L	Strongly bound to albumin – test measures total phenytoin. Consider albumin level as risk of toxicity at lower drug concentrations.
Tacrolimus	Trough (before 10am dose is due)	5- 15 µg/L	Range may vary depending on indication
Vancomycin	1 hour and 6 hours after the first dose	AUC 400-600 calculated by clinical pharmacist	Use Vanculator on RCP for initial dosing

If unsure, consult the LabPlus handbook or call LabLink

Consult your Clinical Pharmacist or Medicines Information in case of difficulty

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ADVERSE DRUG REACTIONS (ADR)

Please ensure that the two boxes for Allergies and ADRs on both page 1 and 2 of the Medication Chart are completed (including the type of reaction) and that the boxes are signed and dated.

Allergies are a subset of ADRs. The following are the definitions used by the Health Quality and Safety Commission (HQSC)

- **Allergy**: immune-mediated and can cause reactions ranging from mild to anaphylaxis
- **Adverse drug reaction**: A response to a medicine that is noxious and unintended and which occurs at a dose normally used in humans

The Centre for Adverse Reactions Monitoring (CARM) is part of the New Zealand Pharmacovigilance Centre based in Dunedin.

Suspected reactions to medicines, vaccines or other remedies (including herbal) should be reported to CARM if they are:

- Unusual or unrecognised reactions
- Reactions caused by newer medicines
- Serious reactions (fatal, life-threatening, disabling, incapacitating or result in prolonged hospitalisation)

Reports can be made by post, fax, via the internet or free App.

See the Medicines Information intranet site (ADR Reporting) for more details.

It is good practice to also report ADRs on the Te Toka Tumai CR0008 form. This ensures that the relevant detail gets logged in the Te Toka Tumai patient management system (CMS) and subsequently displayed in Te Toka Tumai electronic systems (e.g. RCP). Your clinical pharmacist can advise on how to submit a report, or follow the links on the intranet to the Medicines Information site.

OUTPATIENT PRESCRIPTIONS

Prescribing on Discharge

All prescriptions require:

- A signature, date and contact details
- Medicines to have a dose, frequency, duration

Faxed Prescriptions

- Original prescriptions are required to be mailed to the pharmacy immediately after faxing (legal requirement)

Example discharge prescription:

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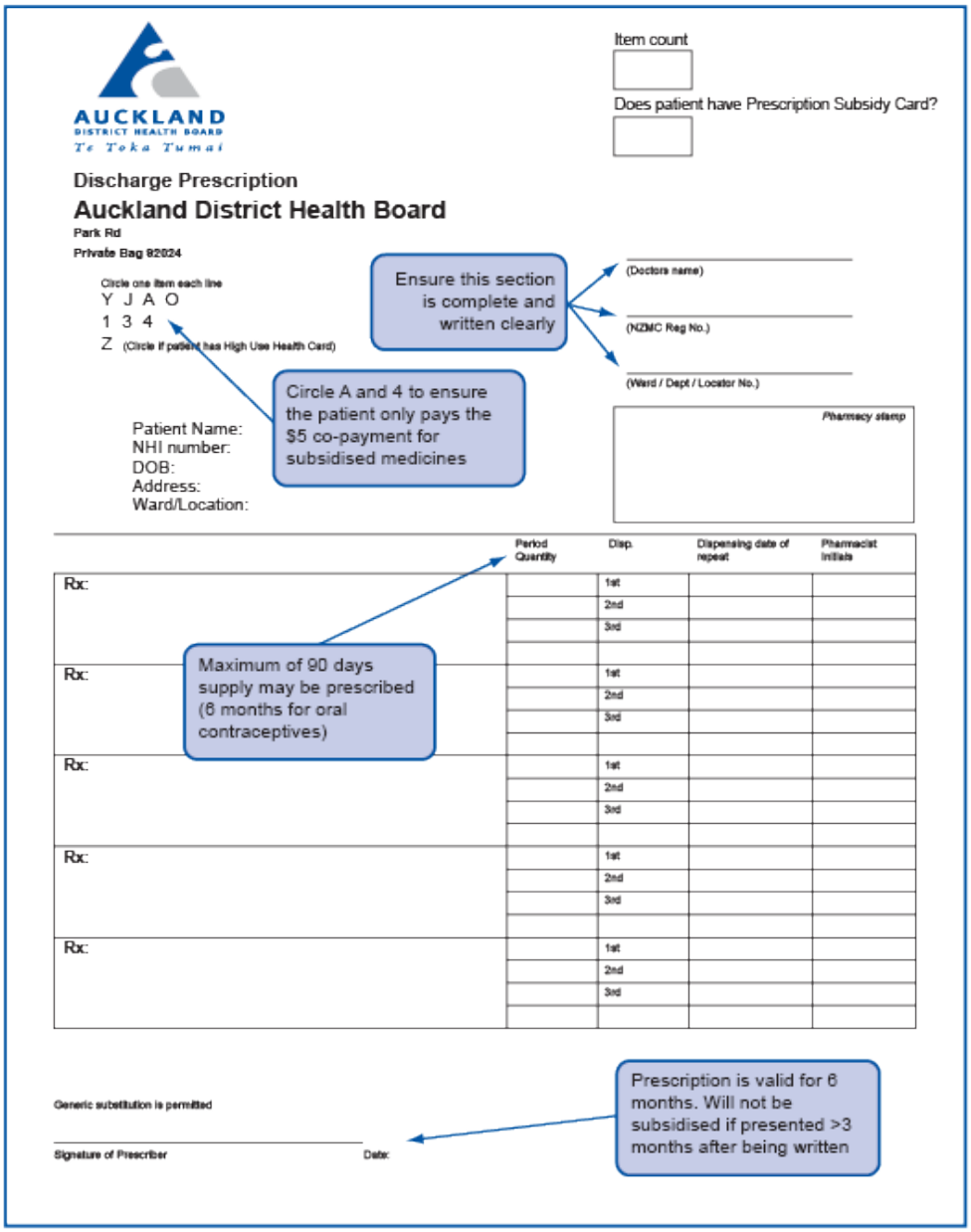

Discharge medicines and outpatient prescriptions are not routinely dispensed from the hospital inpatient pharmacy. Patients have the right to choose any pharmacy to dispense their prescriptions. There are Retail Pharmacies located at Auckland City Hospital and Greenlane Clinical Centre that will dispense discharge and outpatient prescriptions. Any questions relating to funding and availability of medicines in the community can be directed to any of the retail pharmacies at ACH and GCC.

Outpatient Electronic Prescribing

Indici is the application used across the Northern Region for generating electronic outpatient prescriptions. It replaces the paper outpatient prescription pads and Controlled Drug triplicate prescriptions. Indici is accessed via the Regional Clinical Portal. It utilises the NZ ePrescription Service (NZePS) and enables the electronic transmission of prescriptions to community pharmacies without the need to physically sign the prescription. It uses a secure transfer process and a barcode to validate the prescription before it can be dispensed. A reminder that patients have the right to choose any pharmacy to dispense their prescriptions, please ask the patient which pharmacy they would like the prescription sent to.

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Controlled drug prescriptions for outpatients

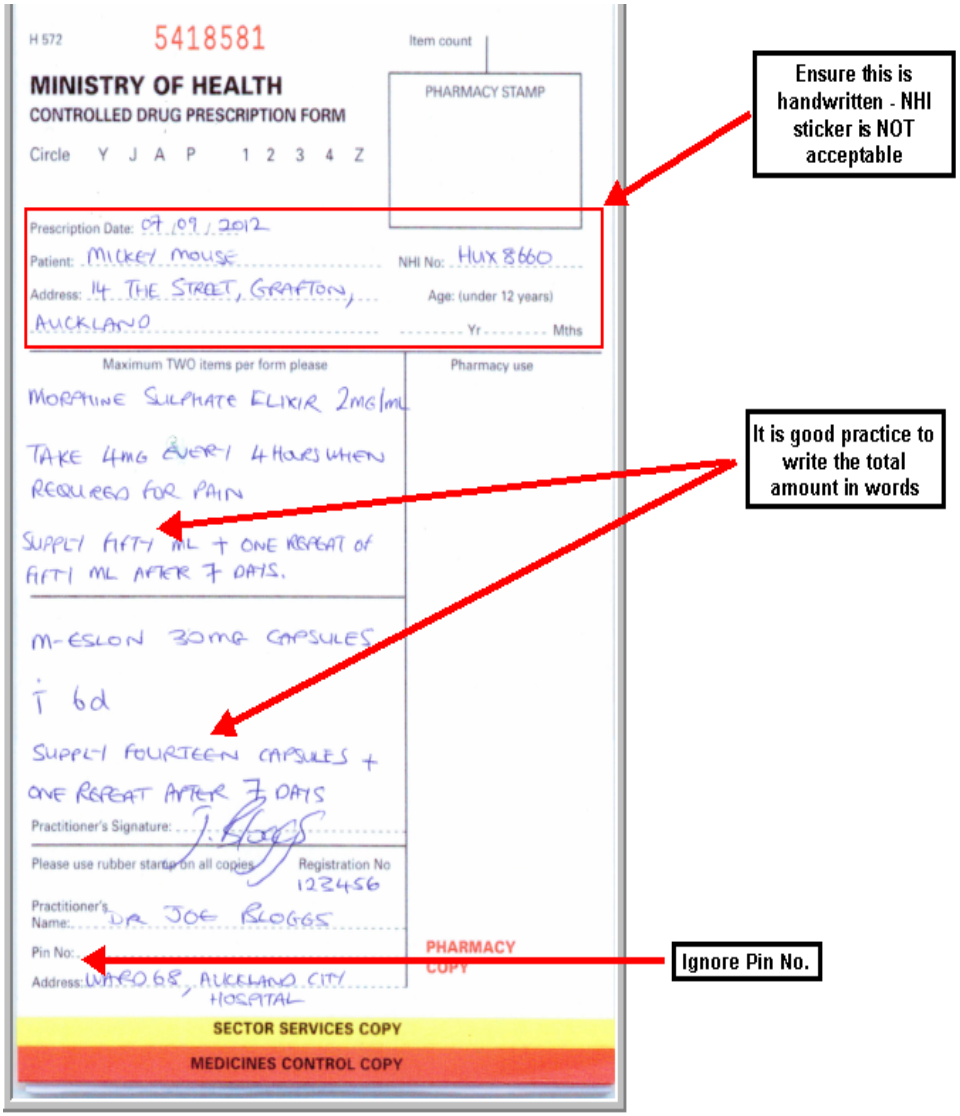
From 22 December 2022, changes to the Misuse of Drugs Regulations 1977 allow signature-exempt prescriptions for controlled drug medicines to be made through the New Zealand ePrescribing Service (NZePS) without the additional need for a wet-ink signature from the prescriber.

If providing a paper Controlled Drug Prescription (triplicate form) it should contain the details on outpatient prescriptions and additionally:

- Handwritten patient details. i.e. name, address and NHI
- All doses written in words. i.e. m-Eslon TEN milligrams
- PRN medicines should be prescribed as a fixed amount with maximum dose in 24 hours
- Maximum period of supply is 30 days
- Intentional high doses should be underlined and initialled by the prescriber
- All THREE copies of triplicate form should remain together

The prescription forms are kept in the Controlled Drug cupboards on the ward.

Example Paper Controlled Drug Prescription



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FUNDING CONSIDERATIONS

Hospital Medicines List (HML)

- The Hospital Medicines List (HML) is a national prescribing list developed by PHARMAC that contains medicines that are funded for patients in NZ public hospitals.

- The "Hospital Medicines List status" can be found in the NZ Formulary at the end of each drug monograph.

- Some medicines may have prescriber or indication restrictions. This can be viewed by clicking the "hml restrictions" link in the NZF monograph (links to the HML Online).

- If a patient is admitted to hospital and taking a medicine that is not listed on the HML, the DHB *may* provide the medicine if:
    a. the patient has not brought (or cannot arrange to bring) their own supply, or the supply brought in cannot be used and,
    b. it is not considered appropriate to switch to a HML listed medicine and,
    c. there are significant clinical implications if they don't receive the non-HML medicine

- If a patient requires a medicine not listed on the HML, funding may be obtained through the Named Patient Pharmaceutical Assessment mechanism (see later in this chapter).

- If a non-HML treatment is required urgently then a Rapid Assessment may be completed for consideration either locally by the Hospital Medicines Committee or by Pharmac. Contact the Lead Pharmacist – Medicines Management for further information.

Named Patient Pharmaceutical Assessment (NPPA)

Sometimes a prescriber will want to use a treatment that isn't on the Pharmaceutical Schedule or the Hospital Medicines List (either at all or for their patient's clinical circumstances). The process for applying for an unlisted treatment for an individual patient is called Named Patient Pharmaceutical Assessment (NPPA).

Information about NPPAs can be found on the Pharmac website. Contact your Clinical Pharmacist or Medicines Information if you require further information.

Special Authority medicines

- Subsidies for certain medicines are only available to patients meeting the clinical criteria specified in the Community Pharmaceutical Schedule.

- Applications for a Special Authority number must be completed before the medicine is prescribed. Delays in the supply of medicine may occur if this is not done.

- Special Authority applications can be applied for either manually (paper-based system) or electronically. Electronic access can only be granted after the registration forms have been completed. See "How to apply for Electronic Special Authority Access".

- Refer to the Reference Viewer (NZ Formulary link) for information on Special Authority status. The information is found at the end of each monograph by clicking on the "restrictions" link. If it is a Special Authority medication, the link to the relevant form will be listed.

- Alternatively, all Special Authority forms can be found https://pharmac.govt.nz/medicine-funding-and-supply/make-an-application/special-authority-forms/

Hospital medicines in the community

- Medicines on the Hospital Medicines List (HML) that are not subsidised in the community may be issued from the hospital retail pharmacies.

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- HML restrictions must be met and the quantity prescribed should not exceed 30 days supply. These medications do not require NPPA approval.
- An SO12 form must accompany the prescription for a medicine on the HML. These forms are usually kept with the Charge Nurse.
- Contact your Clinical Pharmacist or Medicines Information if you require further information.

Section 29 Medicines

- Medicines that are unregistered in New Zealand are regulated by Section 29 of the Medicines Act.
- Section 29 medicines may or may not be registered in another country.
- Depending on the status of the medicine and the anticipated use, it may be necessary to obtain either verbal or written consent from the patient prior to administration.

For further clarification, please contact your Clinical Pharmacist or Medicines Information.

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Psychiatry

WHO TO CALL

Liaison Psychiatry reception / e-Referral Liaison Psychiatry

For urgent or semi urgent referrals, or to discuss informally please contact Liaison Psychiatry Registrar during office hours.

After hours: contact Liaison Psychiatry Nurse Specialist (until 2300h, 7 days a week). Overnight, the on-call Psychiatric Registrar is available via the switchboard.

Referral process

Information to include in the referral:

- Current referral question (be specific e.g. diagnostic query; advice about management).
- A brief outline of reason(s) for admission and relevant medical and/or surgical issues.
- A brief psychiatric history that will include current psychiatric symptoms, relevant aspects of past psychiatric history and current mental state examination.

Mental state examination (MSE):

- Behaviour (appearance, motor behaviour)
- Speech (rate/volume, intonation, quantity of information)
- Mood (depressed/euphoric/suspicious)
- Affect (restricted/flattened/inappropriate)
- Thought form (organised, disorganised)
- Thought content (delusions)
- Perception (hallucinations)
- Orientation and cognition
- Insight/awareness of difficulties
- Safety concerns
- If relevant, a cognitive assessment e.g. Mini-ACE or ACE-III (see Older People's Health chapter)

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COMMON PROBLEMS

1. Depression (and anxiety disorders)
2. Suicidal ideation
3. Delirium (and related challenging behaviour)
4. Dementia related challenging behaviour
5. Medication issues, interactions and complications
6. Psychotic disorders, pre-existing psychiatric disorders
7. Consent/capacity issues
8. Alcohol withdrawal

1. DEPRESSION

Depressive symptoms occur in up to 30% of general hospital patients and are often under recognised in this group. Prolonged hospital stays, chronic illness, pain, and certain medication groups are all associated with an increased likelihood of depression. There may be a pre-existing history of depressive disorder.

In general, psychological symptoms (such as anhedonia, hopelessness or suicidal ideation) are of more value in determining possible depression than somatic symptoms (sleep, appetite or energy levels) in this patient group.

Investigations

- FBC if fatigue is a prominent feature
- Endocrine, including thyroid function tests
- Vitamin B12 and folate levels
- Metabolic parameters including calcium and sodium levels
- No specific imaging

Management

- Where there is a clear diagnosis of Major Depressive Disorder using DSM V criteria and there is no major medical morbidity, it is reasonable to commence an antidepressant (such as an SSRI, starting at a low dose).
- Bear in mind that antidepressants take 1-2 weeks to start working so it may be more appropriate to liaise with the GP about starting treatment, especially as they will have to follow up.
- If there are significant psychosocial issues or stressors, consider referral to the ward Social Worker.

When is it appropriate to refer to Liaison Psychiatry?

- To assist with diagnosis
- For advice on commencing an antidepressant – especially in medically compromised patients and where patient has failed to respond to the first line antidepressant treatment
- Mandatory referral if risk issues identified (e.g. suicidal ideation)

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2. SUICIDAL IDEATION

Evaluate

- Frequency and severity of ideation
- Degree of intent
- Plan (and whether this is viable)
- Previous self-harm attempts
- Risk factors:
    - Stress, support and marital status, age, lethality of plan, etc.
    - Presence of Axis I or II pathology: major depression/psychosis, personality disorder, substance use

Management

- All suicidal ideation must be discussed with a senior colleague (Consultant or Registrar) as soon as possible.
- Be cautious and err on the side of safety.
- Utilise constant watches or 1-on-1 nursing to ensure safety as required.

In cases where there are significant risks and/or safety concerns a psychiatric consultation is mandatory. Patients expressing suicidal ideation and attempting to leave can be detained under a number of legal provisions. You are able to detain a person against their will in this situation and will not be criticised or encounter legal difficulties for doing so.

3. DELIRIUM

Delirium is a reversible organic acute confusional syndrome. It is common in hospital settings but is often unrecognised. It is associated with significant morbidity and mortality if left untreated. Management of delirium most appropriately involves a thorough medical assessment and treatment.

Features of delirium

- Acute change in mental state/usual function
- Fluctuating presentation (often worse at night)
- Impaired attention, registration and recall
- Disorientation (especially to time and place)
- Reversed or fragmented sleep/wake cycle
- Disorganised thinking and speech
- Behavioural changes (agitation vs. more withdrawn/sleepy)
- Perceptual disturbance (auditory and visual hallucinations)
- Abnormal thinking (paranoid ideation)
- Emotional changes (tearfulness, anger, apathy)

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Not all of these features need to be present in order to make a diagnosis of delirium. If you are not sure, screening tools like the 4AT can be useful (https://www.the4at.com/).

Groups at high risk of delirium

- Older age
- Dementia
- CNS disease
- Severe illness
- Post-op
- Previous history of delirium
- Sensory impairments
- Poly-pharmacy
- Palliative Care settings

Prevalence of delirium on medical wards ranges from 10-31% and up to 50% of people who undergo surgery develop delirium.

Assessment of delirium

Consider "capacity" issues (if the patient refuses appropriate assessment and treatment and is considered to lack capacity to make such decisions then medical care needs to be provided against the patient's will). Refer to the Legal Services page on patients with diminished capacity (https://adhb.hanz.health.nz/Pages/Patients-with-diminished-capacity.aspx) on the intranet.

- Identify underlying causes of delirium (including thorough medical examination, review of alcohol/drug history, review of medication).
- Obtain collateral history regarding pre-morbid cognitive function.
- Consider risks (e.g. falls, agitation, wandering, self-harm, aggression towards others).

Investigations

- Basic screen to include infective causes (FBC, CRP, urinalysis, CXR), metabolic causes (electrolytes, creatinine, LFTs, glucose, calcium, thyroid, B_{12}, folate), ECG.
- Consider further screen depending on clinical context e.g. blood cultures, CSF, serologies (HIV, HSV, syphilis), Mg^{2+}, PO_4, blood gases, EEG, CT/MRI, urine toxicology.
- Often multiple aetiologies, but occasionally no clear cause can be identified.
- Be aware that delirium features can be prolonged even after treatment of underlying cause.

Interventions to prevent and treat delirium

This consists of non-pharmacological and pharmacological methods.

Refer to full delirium guidelines on intranet.

Refer also to Better Brain Care pathway on intranet.

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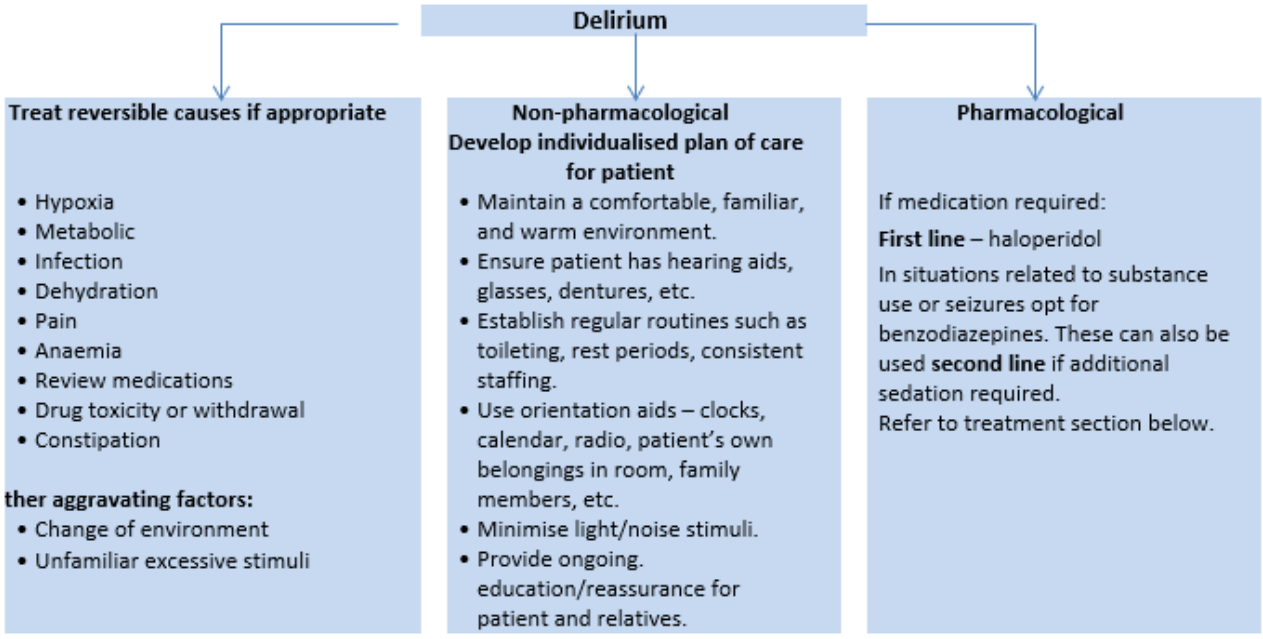

Pharmacological options

- Review and rationalise medications that could have the potential to contribute to a delirium (e.g. anticholinergic medications, opiates, steroids, benzodiazepines).
- Remember that in general, medications to treat agitation associated with delirium are likely to prolong the course of the delirium, so should not be used unless necessary.

Haloperidol helps reduce level of arousal, perceptual disturbance and persecutory ideas

- Adult dose 0.5-1 mg po or IV every 2-4 hours as needed (often much less is required).
- Elderly dose 0.25-0.5 mg po or IV every 4 hours as needed. Higher doses may need to be considered in severely agitated patients
- Use lower dose if via IV route – (haloperidol 1 mg IV = 2 mg po).
- Consider subcutaneous route in patients who cannot tolerate po or IV.
- Avoid in Parkinson's disease or parkinsonism.
- A baseline ECG is recommended where possible, particularly for people with other risk factors for QTc prolongation e.g. elderly, existing cardiac disease, electrolyte disturbances.
- Monitor for side effects such as parkinsonism, akathisia and QTc prolongation.
- Aim to discontinue haloperidol once delirium resolved.

Benzodiazepines

- Use if delirium is associated with alcohol withdrawal (refer to guideline on intranet for managing alcohol withdrawal).
- Use only if additional sedation is required (especially where safety issues are a concern or sedation is needed at night).
- Choose a potent, short-acting BDZ e.g. lorazepam 0.5-1 mg po (elderly 0.25-0.5 mg) at night.
- Be aware of cognitive side effects.

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When to involve Liaison Psychiatry

- When a second opinion is required to clarify diagnosis.
- For further help in management of behavioural, emotional or perceptual disturbance.
- For further management of risk issues.
- When haloperidol is not tolerated/ineffective.

4. DEMENTIA-RELATED CHALLENGING BEHAVIOUR

- Dementia is common in the older population and a small number of patients suffering from dementia present with challenging behaviours that may include aggression and irritability, mood changes and more rarely psychotic symptoms (usually paranoid ideation or hallucinations).
- Dementia is a major risk factor for the development of delirium and any recent onset behavioural change in a person with cognitive deficits should be presumed to be related to delirium unless this is ruled out.
- The management of behavioural difficulties in the context of dementia is essentially similar to the management of delirium and includes environmental and pharmacological interventions. However, collateral history is especially important here as family and care home staff may have a good idea around what calms the person.

Environmental	**Pharmacological**
MDT Assessment of: • Behaviours • Identification of potential triggers • Factors maintaining the behaviours • Any ameliorating factors	The following medications play a limited role • Antipsychotics • Rarely, mood stabilisers • Acetylcholinesterase inhibitors

Note that the use of antipsychotics in dementia is associated with an increased risk of cerebrovascular adverse events, particularly in the first four weeks of treatment. Treatment should be reviewed regularly and only continued if there is a clear benefit.

When is it appropriate to refer a patient with dementia to Liaison Psychiatry?

- If there are frequent or severe behavioural difficulties that require more comprehensive multidisciplinary input.
- If there are prominent mood and/or psychotic symptoms.
- If the diagnosis is not clear.
- Where pharmacological management options are considered.

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5. MEDICATION ISSUES

The following section is a very brief summary of common issues related to the use of psychotropic medication in a general hospital population.

Selective Serotonin Reuptake Inhibitors (SSRI) / Serotonin and Noradrenaline Reuptake Inhibitors (SNRI)

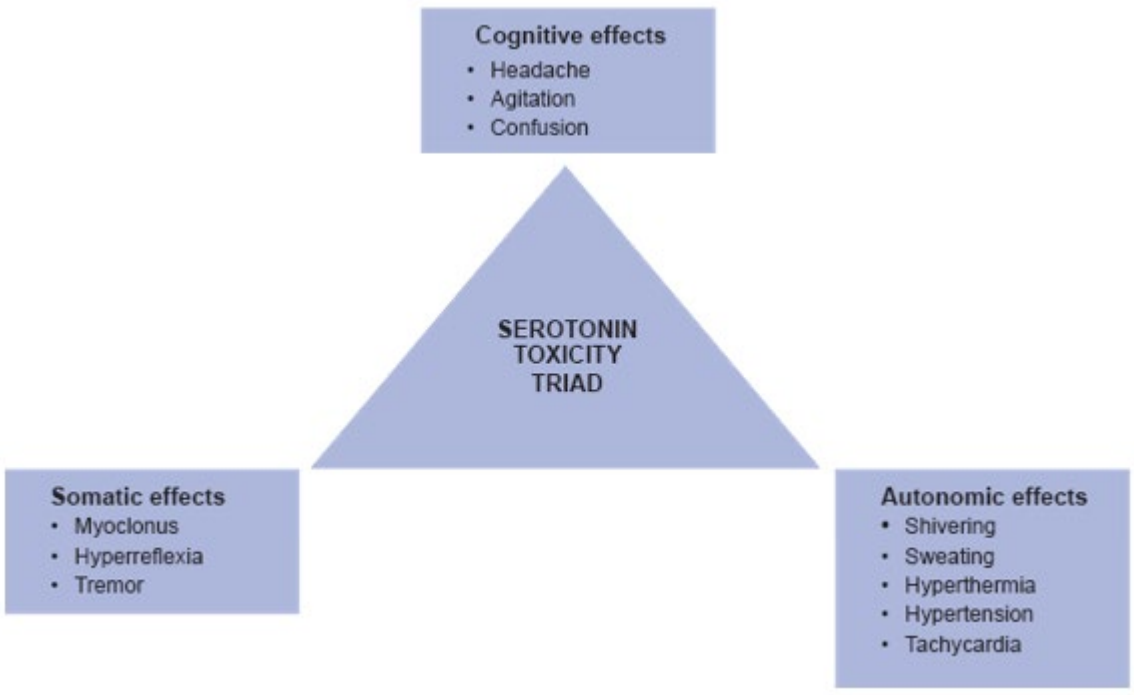
a) Common treatment related adverse effects

- Initial serotonergic symptoms (cramps, hot flushes, tremor, restlessness and nausea) − see the serotonin toxicity triad figure below. These can be minimised if doses are commenced low and titrated up gradually.
- Treatment induced hyponatraemia. If a patient is commenced on an SSRI/SNRI it is prudent to request follow up monitoring of electrolytes, particularly in older adults.
- Recurrent SSRI-related hyponatraemia. In these cases consultation with Liaison Psychiatry is advised. Alternative treatments include nortriptyline/moclobemide/ mirtazapine, although these treatments also carry a risk of hyponatraemia.
- Discontinuation syndromes. Following rapid cessation or tapering of SSRI/ SNRI such as paroxetine/venlafaxine, patients may present with agitation, mood symptoms and/or insomnia. The treatment here is preventative i.e. tapering of treatment rather than abrupt discontinuation. Note the taper may be over a prolonged period for people who have been on long-term treatment.

b) Potential medication interactions

SSRIs have significant potential interactions with other medications via the cytochrome p450 metabolism system. These include warfarin, macrolide antibiotics, antifungal medications, omeprazole, isoniazid and grapefruit juice. SSRIs can also lead to serotonin toxicity when used with other serotonergic agents such as tramadol. Check the NZ Formulary for interactions (using the 'Interactions' tab).

SEROTONIN TOXICITY



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LITHIUM

Lithium is used as a mood stabiliser and has a narrow therapeutic window. The serum levels are affected by diuretics, ACE inhibitors and NSAIDs. Levels can also be raised by dehydration or diarrhoea.

Lithium Level	Effect/Symptoms
0.6 – 1.2 mmol/L	Therapeutic
1.0-1.5 mmol/L	Mild toxic lithium effects • Impaired concentration • Lethargy • Tremor • Slurred speech • Nausea
1.6-2.5 mmol/L	Moderate toxic lithium effects • Confusion • Disorientation • Drowsiness • Unsteady gait • Dysarthria • Muscle fasciculation
>2.5 mmol/L	Severe toxic lithium effects • Impaired consciousness • Coma • Delirium • Ataxia • Impaired renal function • Convulsions

GI effects	Nausea, vomiting, abdominal cramps and diarrhoea
Mild-mod neurological symptoms	Tremors, confusion, lethargy, weakness
Mod-severe neurological symptoms	Altered mental state, muscle fasciculation, stupor, seizures, coma, hyper-reflexia, cardiovascular collapse

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Management of lithium toxicity

- ABC
- Withhold lithium and exacerbating agents such as NSAIDs.
- Check lithium level.
- In mild-moderate toxicity, rehydration is often enough.
- In mod-severe toxicity, haemodialysis may be required.
- In most cases lithium can be restarted when levels are less than 1.0 mmol/L and symptoms of toxicity have resolved. Dose adjustments may be needed depending on the cause of toxicity.

TRICYCLIC ANTIDEPRESSANTS

Common treatment-related adverse effects

- Anticholinergic side effects (constipation, dry mouth, difficulties with visual accommodation, confusion, urinary retention).
- Can precipitate/exacerbate delirium.
- Postural hypotension.
- ECG changes, arrhythmias and QTc changes – cardiotoxic in overdose.

ANTIPSYCHOTICS

Conventional/Typical Antipsychotics	**Second Generation/Atypical Antipsychotics**
Examples: • Haloperidol • Flupenthixol • Zuclopenthixol • Chlorpromazine	**Examples:** • Olanzapine • Clozapine • Amisulpride • Aripiprazole • Paliperidone • Quetiapine • Risperidone
Common adverse effects • Dystonia • Parkinsonism • Psychomotor restlessness • Anticholinergic effects (Chlorpromazine) • Prolactin elevation	**Common adverse effects** • Excessive sedation (less with aripiprazole) • Metabolic syndrome (less with aripiprazole) • Less commonly, but all of the listed extra-pyramidal side effects seen with conventional anti-psychotics • Increase QTc intervals (highest risk in quetiapine and ziprasidone) – see guideline on QTc Prolongation due to Psychotropics • Prolactin elevation with amisulpride, risperidone and paliperidone

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Neuroleptic malignancy syndrome	• Rare but serious • Clinical features: FALTER (Fever, Autonomic instability, Leucocytosis, Tremor, Elevated CK and Rigidity) • Can lead to multi-organ failure • Investigations: CK, FBC, low iron, high LDH • Causative medication should be stopped. Manage aggressively with dopamine agonists, cooling, fluid resuscitation and circulatory support • If suspected, discuss with General Medicine Registrar
Movement disorders	• Common with older antipsychotics. Usually extra-pyramidal parkinsonism • Can manage with anti-cholinergics or changing medications
Cardiovascular effects	• Increased risk of metabolic syndrome, DM and IHD. Need CV risk modification. Regularly monitor fasting lipids, HbA1c and BP – treat as necessary
QTc Prolongation	• See ADHB guidelines on QTc prolongation due to anti-psychotics
Hyperprolactinaemia	• Can cause lactation if Prolactin level >1000miu/L • Associated with subfertility and loss of libido • Sexual dysfunction can be distressing for patients
Other adverse effects	• Pancreatitis, GI upset, lowered seizure threshold, blunted personality and responsiveness

6. PSYCHOTIC DISORDERS

- It is important to differentiate between psychotic symptoms and a psychotic disorder.
- In the hospital setting the most common causes of psychotic symptoms are delirium, acute intoxication and withdrawal states. Psychotic symptoms are also seen in dementia.
- Occasionally a patient may present with an undiagnosed psychotic disorder and this is typically characterised by a gradual onset of symptoms that are pervasive over time.
- Appropriate treatment of the psychotic symptoms therefore depends on accurate diagnostic formulation. All patients who present with new onset psychotic symptoms require a baseline physical examination to exclude delirium and conditions affecting the central nervous system and a substance screen where appropriate.
- All patients with pervasive psychotic symptoms (where delirium has been excluded) should be referred to Liaison Psychiatry for a formal psychiatric assessment.

CLOZAPINE

For a complete guide to clozapine and its adverse effects, please refer to ADHB Policies and Guidelines [ADHB Intranet and "C" for Clozapine].

All patients admitted to hospital on clozapine and any clozapine related medication changes must be discussed with and/or referred to Liaison Psychiatry.

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NOTE: Cigarette smoking is a potent inducer of the CYP1A2 enzyme. Sudden changes in smoking habit can lead to significant changes in serum clozapine levels which can lead to toxicity or therapeutic failure.

Major side effects of clozapine:

Side effect	Management

Bowel toxicity → toxic megacolon	• Commonest cause of clozapine-associated mortality in New Zealand.
	• 80% of patients on clozapine will have clozapine-induced hypo-motility.
	• Treat urgently if constipation lasts for >2 days.
	• Patients >3 days without a BM or new abdominal distension, abdominal pain, vomiting or fever should be admitted under General Medicine.
	• All inpatients on clozapine need a bowel chart and laxatives charted
	  ○ Day 1 – stimulant: Laxsol® 2 tab nocte
	  ○ Day 2 – if still constipated, can increase Laxsol® to 2 tab bd max
	  ○ Day 3-4 – if still constipated, add: macrogol (Lax-sachets®) 1 sachet bd
	  ○ Day 5-6 – consider enema: phosphate (Fleet®) or sodium citrate (Micolette® preferred). Urgent review if moderate to severe abdominal pain lasting over an hour; or any abdominal pain/discomfort lasting over 1 hour with distension, diarrhoea, vomiting, absent or high pitched bowel sounds, metabolic acidosis, haemodynamic instability, leukocytosis or other signs of sepsis.

Myocarditis	• Refer also to ADHB clozapine guidelines. • Early onset adverse event – usually within 5 months of therapy. • Diagnosed by flu-like symptoms, fever, markedly elevated troponin and inflammatory markers. • Can have pericarditis changes on ECG or can have no changes. • Discuss stopping clozapine; discuss with Psychiatry SMO and will need referral to General Medicine/Cardiology. • Tachycardia is common in patients on clozapine, but usually only increases their baseline heart rate by 10-20bpm. This happens soon after the initiation of the medication. A rise of greater than this or a later second increase in heart rate should raise suspicion of myocarditis. • Anyone with flu-like symptoms or fever needs: FBC, CK, LDH, serum Iron, troponin, CRP, electrolytes, renal function, LFTs, ECG and a chest x-ray. Consider nasal swabs for respiratory viruses.

Cardiomyopathy	• Usually a later complication after 4 months of therapy.
	• Always ask your patients on clozapine about deteriorating exercise tolerance. Suspect cardiomyopathy if progressively worsening fatigue, dyspnea and reduced exercise tolerance.
	• If suspected, obtain:
	  ○ ECHO, FBC, troponin, BNP, CRP, thyroid function tests, HIV screen, clozapine level, chest x-ray, ECG.
	  ○ Discuss with Psychiatry SMO about stopping clozapine if overt symptoms of cardiac failure and refer to General Medicine.

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Agranulocytosis	• The headline side effect but relatively rare. • Ensure FBC is monitored in inpatients and follow up is arranged. Patients are either on weekly or 4-weekly FBC monitoring. Check with the clinical pharmacist as to whether your patient is on weekly or 4-weekly monitoring. • If WCC <3 or neutrophils <1.5, discuss with senior Psychiatry colleague and Clinical Pharmacist immediately with a view of stopping clozapine. • If low WCC, have a high index of suspicion for infection and beware of atypical presentations. • Always check the WCC in a patient on clozapine if there is a suspicion of infection, classically a sore throat. • Infection in patients with agranulocytosis needs General Medicine referral.
Other adverse effects include: weight gain, neuroleptic malignant syndrome, QTc prolongation, sedation, hypersalivation, postural hypotension, sexual dysfunction and reduced seizure threshold.	

Pre-existing psychiatric disorders

Psychotropic agents for chronic psychiatric disorders should not be discontinued without reason. It will be appropriate to discontinue them for some patients. Discuss any proposed changes to medication regimes with Liaison Psychiatry or request a formal review.

7. CONSENT / CAPACITY

See Consent for Procedures chapter

See Managing Patients with Diminished Capacity (https://adhb.hanz.health.nz/Pages/Patients-with-diminished-capacity.aspx) under the Legal section on the intranet, and the Capacity and Consent Guideline: https://adhb.hanz.health.nz/Toolkit/Diminished%20capacity%20-%20Capacity%20and%20competence.pdf

Clinicians are routinely required to assess capacity and a patient's ability to give informed consent for medical management during the course of a clinical assessment. It is therefore important to form a view of the patient's ability to give informed consent and the specific context of the consent.

When is it appropriate to refer to Liaison Psychiatry for an assessment of capacity?

- You should complete a capacity assessment, and if still unsure whether the person has capacity, discuss with the Consultant in charge of the patient's care. If you need a second opinion, then a Liaison Psychiatry referral may be appropriate, especially if there is a psychiatric condition impacting on capacity.
- It is important to remember that a **patient is presumed competent unless there are reasonable grounds to believe otherwise**. A psychiatric disorder does not necessarily indicate impaired capacity.
- Where the capacity issues relate to cognitive impairment, it is assumed that all clinicians would be able to perform a basic bedside cognitive assessment and determine how this relates to a patient's ability to (1) comprehend (2) recall (3) weigh information and (4) communicate their decision consistently.

In cases where there is diagnostic uncertainty or issues of borderline capacity, it is appropriate to request a second opinion from Liaison Psychiatry.

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8. MENTAL HEALTH (COMPULSORY ASSESSMENT AND TREATMENT) ACT 1992 (MHA)

- The MHA allows for the compulsory assessment and treatment of patients suffering from a mental disorder defined in the Act as:

  "an abnormal state of mind (continuous or intermittent) characterised by delusions or by disorders of mood or perception or volition or cognition"

- Experiencing symptoms from a mental disorder is not sufficient grounds for compulsory treatment.

- In addition, the patient must either:
  a. Pose a serious danger to their own health or safety or that of others **OR**
  b. Be seriously diminished in their capacity to care for themselves

- The MHA can ONLY be used to treat the psychiatric condition. Patients under the MHA can be detained in hospital to receive compulsory mental health care.

- If you are required to participate in a MHA process, Liaison Psychiatry staff will guide you through it.

If you are aware that a patient is subject to the Mental Health Act in the community, Liaison Psychiatry should be notified when they are admitted to hospital.

9. ALCOHOL WITHDRAWAL

See Recreational Drug Problems section and Alcohol Withdrawal policy on the intranet.

A proactive approach to alcohol withdrawal is ideal, where the potential for withdrawal symptoms is anticipated and planned for in advance.

If there are acute problems with alcohol withdrawal, then contact Liaison Psychiatry after reviewing the Alcohol Withdrawal Policy flowchart. If you identify an Alcohol Use Disorder and verbal consent is given by the patient, please refer them to CADS. An electronic referral form is available on the CADS intranet page http://staffnet/RADS/Refer/default.asp

10. THE STRESSED/ANXIOUS/"DIFFICULT" PATIENT

All patients experience stress related to their medical condition and hospital stay. At times more maladaptive coping styles come to the fore and can interfere with both the therapeutic relationship with the team and the delivery of care. You may find yourself aware of your own counter-transferential response to a "difficult" patient – this can be either negative (e.g. anger) or positive (e.g. sympathy) emotions. Retain your composure and professionalism. Do not be tempted to deviate from usual practice. Discuss with the senior members of your team in the first instance. A referral to Liaison Psychiatry MAY be indicated. At times a behavioural management plan for the patient can be utilized to optimise care and reduce conflict.

ANXIETY

Anxiety is common and can occur in anyone in the absence of overt pathology or an underlying psychiatric disorder. Hospitalization, medical/surgical illness, low health literacy and uncertainty regarding medical management and prognosis are some of the factors than can precipitate or worsen anxiety symptoms. The first step for effective management is to acknowledge the distress and gather information to make a preliminary diagnostic formulation.

Is it situational? Is there an underlying primary anxiety disorder? Is it secondary to a medical condition? Rule out or treat common physical causes such as alcohol/benzodiazepine withdrawal, hyperthyroidism, any illness causing breathlessness or tachycardia etc.

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Management

- Some teams have a clinical or health psychologist available to treat anxiety, especially health anxiety. Ask your charge nurse/SMO if there is one available to your specialty.
- If the anxiety disorder is not new and not interfering with the patient's care or causing severe distress, it is probably more appropriate to leave this to be treated in primary care. Advise the patient to seek advice from their GP, or contact Anxiety NZ 24/7 Helpline.
- If the anxiety is severe, transient, and not responsive to non-pharmacological interventions, and there are no identifiable contraindications, a short course of benzodiazepines can be used – for example PRN lorazepam 0.5-1 mg up to BD. Please remember to STOP this when the patient leaves hospital/no longer needs it, or to alert the GP to the need for an early review if this is impossible. Benzodiazepines are rapidly addictive, and taking them for a few weeks longer than needed can cause serious harm.

When to refer to Liaison Psychiatry

- If the anxiety is causing severe distress and there is no access to health psychology
- If the anxiety is interfering with the patient's medical care
- If there is diagnostic uncertainty

11. DE-ESCALATION TECHNIQUES

- Management of agitated and disturbed patients is most effective when approached with confidence that one will reach an appropriate resolution. It requires a high level of focus and the ability to manage one's own anxiety in challenging situations.
- Convey sincerity, professionalism and maintain composure.
- Safety first! Maintain a safe distance and ensure access to an unrestricted exit.
- The strategic goal should be to identify the troublesome issue and find a mutually accepted solution to their concerns.
- Have a low threshold for exiting the room and calling a code orange (security alert).
- If you can, stay and watch how the code team engage. The security staff and liaison nurses are expert in de-escalation techniques and you can learn a lot from seeing them in action.

Learn to identify signs of escalation:

- louder voice, verbal aggression
- blocking exits
- aggressive postures – e.g. standing over/entering personal space
- clenched fists, tense muscles
- increased pacing
- increased aggression e.g. punching walls, throwing things

If you notice these signs, then end the interview and leave.

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Work through these steps:

1. Introduce yourself and the team. Only one person should speak if possible
2. Allow the patient time to speak
3. Identify what the patient needs AND how they feel
4. Listen carefully – empathise and summarise key points
5. Agree with the patient whenever possible – it is likely that some of what they are angry about is reasonable –so find this out and use it to build rapport
6. Set clear boundaries – e.g. *'it's hard for me to concentrate when you're shouting – can we talk quietly about this?'*
7. Use a conversational loop – Listen; validate their position; state what you'd like to do. If the patient is very angry it may take a few cycles before they can engage

Assessment/investigation

- After the event, think about potential causes. Common causes to look for are delirium, hypoglycaemia, hypoxia, head injuries and substance intoxication or withdrawal.
- Patients with schizophrenia or other psychiatric illnesses in isolation are rarely aggressive.

Pharmacological management

- It is important to know what has caused the aggression so that you can tailor your treatment accordingly – e.g. if the patient has a delirium, haloperidol 0.5-1 mg (or 0.25-0.5 mg in older adults) would be first line management.
- In cases where you are unsure and need quick action, benzodiazepines are safe for most people – e.g. lorazepam 0.5-1 mg for medication naïve/older adults or 1-2 mg for patients with tolerance/larger adults. If giving higher doses, ensure you have access to flumazenil and the patient is monitored afterwards.
- Olanzapine 5 mg or haloperidol 1-2 mg are other options, and all of these can be given either orally or via IM injection. **Note: Do not give IM olanzapine and IM lorazepam within 2 hours of each other.**

When to refer to liaison psychiatry

- If there are repeated events for the same patient and you are not able to ascertain the cause.
- If preliminary pharmacological management is not helpful (if you are having to use more than one agent, then you should refer).
- If the patient has a primary psychiatric illness OR a substance intoxication/withdrawal problem which is not resolved by following the alcohol withdrawal guidelines.

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Public Health Service

Auckland Regional Public Health Service (ARPHS)

WHO ARE WE?

The Auckland Regional Public Health Service (ARPHS) is Auckland's main health protection, disease prevention and health promotion agency, serving the Auckland region. Through its work ARPHS commits to Te Tiriti and reducing health inequities between peoples. ARPHS is based at the Greenlane site (Level 2, Building 15).

OUR CONTACTS

Phone (24 hours)	A Duty SMO is available 0830-1700 Monday to Friday, and an on-call Medical Officer of Health is available at all times.
Internal Auckland Hospital	0800-1700 Monday-Friday (excluding public holidays)
Website	www.arphs.govt.nz
Social media	Facebook www.facebook.com/ARPHS Twitter twitter.com/aklpublichealth

WHAT WE CAN DO FOR YOU

ARPHS can provide information and advice on public and population health issues, such as:

1. Control of notifiable infectious diseases in the community (see list below) including regulatory options
2. Environmental health, including water, air quality, hazardous substances, housing conditions
3. Health promotion programmes on alcohol, tobacco, physical activity, nutrition, obesity and other health topics which need a community or population focus and in some instances a regulatory response

WHAT WE NEED FROM YOU: THE IMPORTANCE OF PROMPT NOTIFICATION

Notification of suspected or confirmed cases of notifiable diseases (listed below) is a key part of detecting and controlling the spread of disease in the Auckland population.

The ARPHS website includes

1. Instructions on how to notify and links to notification forms, see www.arphs.health.nz/health-professionals/notifiable-diseases/
2. Information on disease notification, exclusion criteria, incubation and infectious periods, see www.arphs.health.nz/assets/Uploads/Resources/Health-professionals/Public-Health-Disease-Notification-Manual-20190308.pdf

Most notifiable infectious diseases are notified directly by laboratories, but clinical notification on suspicion is important, especially where prompt public health action is needed. Please notify ARPHS urgently for:

- Meningococcal disease

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- Measles
- Monkeypox
- Pertussis
- Rheumatic fever
- Pulmonary tuberculosis
- Gastroenteritis outbreaks or high risk cases.

ARPHS staff will contact clinical staff following direct laboratory notification of many (but not all) notifiable diseases to obtain clinical information. If public health follow-up is required we ask you to inform the patient of the diagnosis and that ARPHS staff may contact the patient directly.

Investigation of individual cases and outbreaks can involve:

1. Identification of the causative agents and source of exposure
2. Identifying and screening contacts
3. Advising control measures to prevent spread of the disease in the community including isolation, quarantine and exposure event management

NOTIFIABLE DISEASES

Clinical and laboratory notification of the diseases listed here are required under section 74 and 74AA of the Health Act 1956. The disclosure of relevant personal and clinical information is allowable under the Health Information Privacy Code.

If the disease resulted from an occupational exposure, notification to WorkSafe NZ may be needed. ARPHS can advise you about this.

There are several groups of notifiable diseases listed in the Health Act.

Schedule 1 A diseases include enteric and other infections with potential food, water, and environmental sources. If necessary ARPHS will involve local councils (you do not need to notify the council directly).

Acute gastroenteritis (see note below)	Campylobacteriosis
Cholera	Cryptosporidiosis
Giardiasis	Hepatitis A
Legionellosis	Listeriosis
Meningoencephalitis—primary amoebic	Salmonellosis
Shigellosis	Typhoid and paratyphoid fever
Yersiniosis	

Note*: not all cases of acute gastroenteritis need to be notified. Please notify us when there appears to be an outbreak, or if the person is in a high risk occupation (e.g. food handler, childcare or health care worker), or where chemical, bacterial toxin, shellfish toxin, scombroid (histamine), ciguatera or other food poisoning is suspected.*

Schedule 1 B diseases are mostly spread person-to-person or by animals or insect vectors and include most diseases on the National Immunisation Schedule.

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Anthrax	Arboviral diseases (including dengue, Zika, Ross River Disease, Japanese Encephalitis)
Brucellosis	Creutzfeldt Jakob Disease and other spongiform encephalopathies
COVID-19	Cronobacter species
Diphtheria	*H. influenzae b* invasive disease
Hepatitis B (Acute)	Hepatitis C (acute)
Hepatitis (viral) not otherwise specified	Highly Pathogenic Avian Influenza (including HPAI subtype H5N1)
Hydatid disease	Invasive pneumococcal disease
Leprosy	Leptospirosis
Malaria	Measles
Middle East Respiratory Syndrome (MERS-CoV)	Mumps
N. meningitidis invasive disease	Monkeypox
Non-seasonal influenza (capable of being transmitted between human beings)	Pertussis
Plague	Poliomyelitis
Q fever	Rabies and other lyssaviruses
Rheumatic fever	Rickettsial diseases (including typhus)
Rubella	Severe Acute Respiratory Syndrome (SARS)
Tetanus	Tuberculosis
Verotoxin-producing or shiga toxin-producing Escherichia coli (VTEC and STEC)	Viral haemorrhagic fevers
Yellow fever	

Schedule 1 C diseases are primarily sexually transmitted. Notification is mainly for disease surveillance and outbreak control. ARPHS does not do contact tracing for STIs (please contact Sexual Health Services). Cases must be notified without identifying the patient directly, but notification does include the NHI. There is an on-line notification system through ESR, the national infectious disease surveillance agency. A web site link is included in the laboratory result. You do not notify directly to ARPHS except for AIDS.

Acquired Immunodeficiency Syndrome	Gonorrhoeal infection
Human Immunodeficiency Virus (HIV) infection	Syphilis

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Schedule 2 diseases are mainly from environmental exposures.

Cysticercosis	Decompression sickness
Lead absorption equal to or in excess of 0.24 µmol/L	Poisoning arising from chemical contamination of environment
Taeniasis	Trichinosis

Other diseases may become notifiable temporarily during outbreaks.

Notification list is current to November 2022.

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Recreational Drug Problems

WHO TO CALL

Liaison Psychiatry

- For urgent or semi urgent referrals or to discuss informally please contact Liaison Psychiatry Registrar during office hours.
- After-hours contact Liaison Psychiatry Nurse Specialist (until 2300h/7 days a week).

CADS Detoxification Medical Officer on call (available 24/7) **or via Pitman House Detoxification Unit (24/7).**

Auckland Opioid Treatment Service (AOTS)

- For general enquiries or to speak to an AOTS doctor or keyworker (0830-1630h)
- For AOTS pharmacy (0900-1200h, including weekends and public holidays)
- After-hours, contact the CADS Detoxification Medical Officer on call 24/7

For nicotine dependent patient referrals to ADHB Smokefree Services (voicemail) or organise a completed fax form.

Common problems

1. Alcohol intoxication
2. Alcohol withdrawal
3. Drug intoxication
4. Drug withdrawal
5. Managing patients on opioid substitution
6. Nicotine dependence – withdrawal management and smoking cessation issues

When to call

- If you are uncertain about the severity of alcohol or drug dependence and/or management, especially where there is polysubstance use.
- If there are concerns about the patient's mental state in the context of intoxication/withdrawal.

Be aware that alcohol, GHB/GBL and benzodiazepine withdrawal syndromes are potentially extremely hazardous/life threatening. Although other withdrawal syndromes are uncomfortable and may cause considerable distress, they are not as clinically risky.

CADS referral pathways

- Fax through elective detoxification referrals.
- With patient consent, you can refer directly for CADS counselling support via online referral https://www.cads.org.nz/contact/referral/
- Patients can self-refer.
- Patients can also self-present at walk-in clinic at CADS, Central 1st Floor, 409 New North Rd, Kingsland, weekdays between 1000-1300h

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INTRODUCTION

History

- How much alcohol, how often, time of last drink, recent change in drinking, any negative effects (blackouts, previous withdrawal/withdrawal seizures, legal, self-harm/suicidal behaviours while intoxicated, harm while intoxicated including inability to keep self safe from situations and others, health or relationship problems etc.).

- Use of other substances – which drugs, how much, how often, prescribed / illicit / OTC, time of last use, mode of use, negative effects including health-related problems.

- Current symptoms of withdrawal, severity.

Denial is often a factor. Get history from significant others if possible, especially if history is inconsistent with physical findings.

Examine

- For signs of intoxication or withdrawal
    - Alcohol: anxiety, tremor, restlessness, sweating, tachycardia, hypertension, vomiting, diarrhoea and eventually confusion/hallucinations
    - Drugs: see section 3 and 4

- For evidence of alcohol or drug-related disease (hepatic, gastrointestinal, neurological, endocrine)

- For signs of IV drug use on arms, legs, groin, neck (needle marks, localised inflammation/infection, old scarring)

Investigations

- Toxicology: serum ethanol, urine drug screen (note: results take >24 hours; standard panels do not detect all drugs of abuse including zopiclone, tramadol, oxycodone, methadone, methylphenidate etc.)

- Haematology: FBC (macrocytosis, thrombocytopenia)

- Biochemistry: LFTs (GGT is often, but not always most sensitive)

- Serology: hepatitis B and C tests, HIV test

Brief Intervention

All patients with alcohol or other drug problems should receive a brief intervention

1. Help the patient identify some “not so good things” or problems related to their use.

2. Give factual information about recommended use guidelines, for example low risk alcohol advice http://www.alcohol.org.nz/help-advice/advice-on-alcohol/low-risk-alcohol-drinking-advice.

3. Advise how to access help.

4. If the patient is resistant to your intervention, do not persist.

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1. ALCOHOL INTOXICATION

- Use a quiet, firm approach
- If aggressive, call security/police for help
- Exclude other causes of agitation, confusion, slurred speech etc., such as traumatic brain injury or delirium
- Be cautious with sedatives until other causes have been excluded
- Monitor vital signs

Intoxicated patients may have significantly impaired judgment and may be treated under "duty of care" principles.

2. ALCOHOL WITHDRAWAL

Patients are not generally admitted to hospital for detoxification, but any withdrawal will need to be treated to ensure safe and adequate healthcare for other health needs. Failure to adequately treat alcohol withdrawal increases the chance the patient will prematurely self-discharge.

Increased risk of complicated alcohol withdrawal occurs if:

- The patient drinks more than 15 standard drinks daily
- The patient is alcohol dependent and has ANY concurrent acute physical health problems
- The patient drinks ANY amount and has evidence of alcohol related physical illness
- The patient has a past history of complicated withdrawal (seizures ± hallucinations)
- The patient has brain injury

IV Pabrinex® should be given to all patients who are alcohol dependent (poor absorption of oral thiamine) especially if evidence of alcohol related neurological compromise e.g. cerebellar ataxia. See ADHB Alcohol Withdrawal Guideline for further information.

Alcohol withdrawal in the absence of acute medical/surgical problems:

- People who present to the emergency department who are suitable for elective treatment/detoxification via CADS should be advised to continue maintenance drinking until they can commence a supported withdrawal – give this information sheet to the patient and their family/support person.

  http://staffnet/QualityDocs/Quality%20Documentation/S6%20Mental%20Health%20Services/CADS/03%20CADS%20Information%20Sheets/%5BI%5D%20Safe%20Drinking%20Guide%20before%20your%20medicated%20detox%20starts%20-%20CADS%20Dec14.pdf#search="alcohol safe drinking"

- Diazepam should not be prescribed on discharge, due to the risk of interaction between alcohol and diazepam
- Confirm a referral pathway to CADS before discharge – see CADS Referrals section

Inform the patient and their support people that unsupervised alcohol cessation may be hazardous and should not be undertaken.

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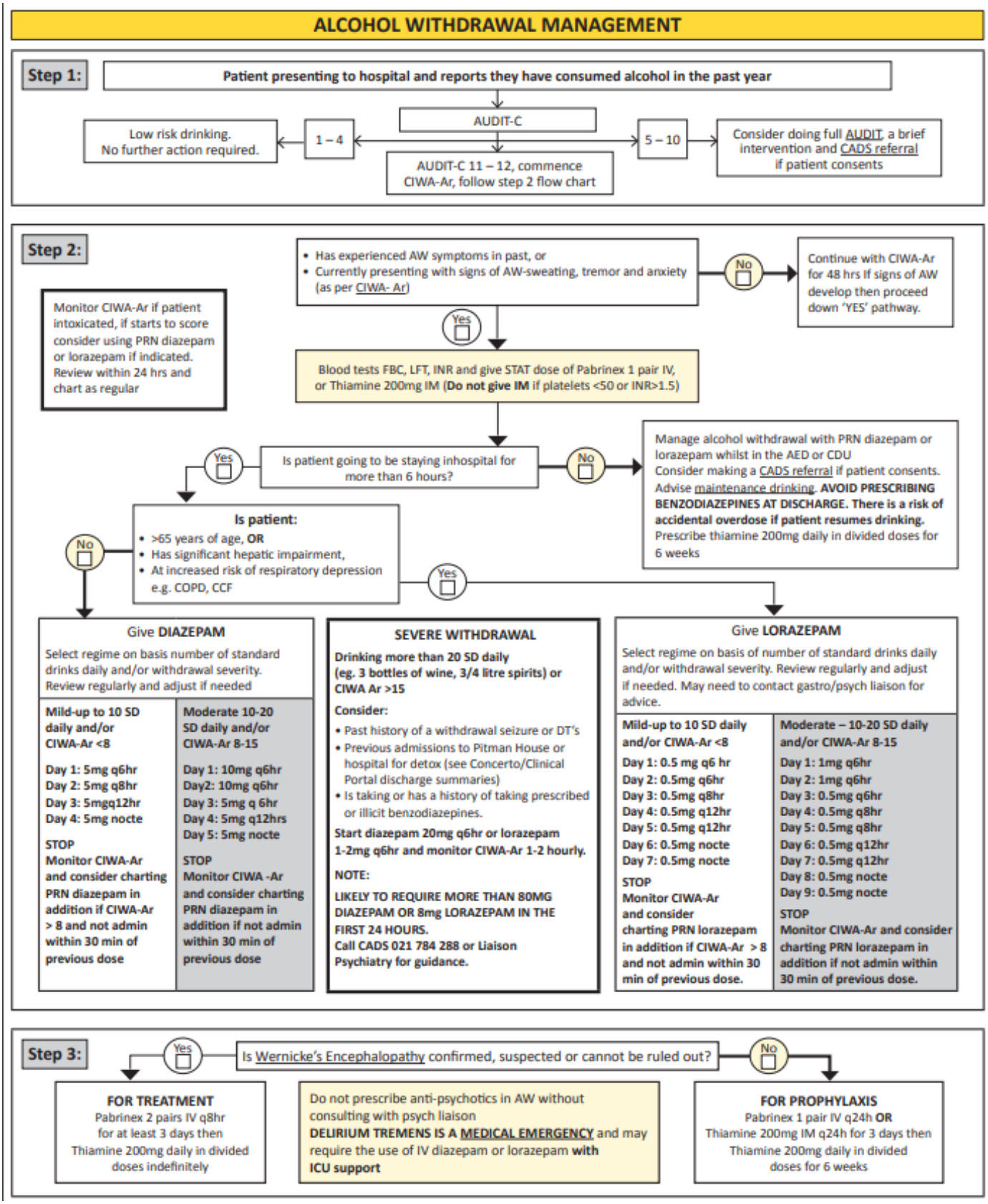
ALCOHOL WITHDRAWAL MANAGEMENT (see AWS guideline)



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3. DRUG INTOXICATION

- Monitor, resuscitate if required.
- Use antagonists e.g. naloxone for opioid intoxication (see Altered Level of Consciousness in ED section) until no evidence of respiratory depression and patient is rousable.
- Be cautious about using high dose antagonists precipitously due to risk of cardiovascular side effects.
- Drug-induced psychosis – contact Liaison Psychiatry Service (see **WHO TO CALL** section).
- Methamphetamine intoxication:
  - Can present with agitation, behavioural disturbance, aggression and psychosis
  - You will often see choreiform movements – e.g. grinding teeth/chewing, and myoclonus
  - Usually acute, rapid onset of behavioural change, with resolution over 6-12 hours
  - For management, see Violent / Agitated Patient in ED Section.

4. DRUG WITHDRAWAL

OPIOIDS

- Early signs: pallor, restlessness, anxiety, yawning, watering eyes/nose, intense cravings.
- Later signs: sweating, goose-pimples, dilated pupils, vomiting/diarrhoea.
- If mild, provide hydration/mild sedation; if more severe, contact the CADS Detox Medical Officer on call or Auckland Opioid Treatment Service if substitution treatment may be required (see Who to Call).

AMPHETAMINES/METHAMPHETAMINE

- Fatigue, depression, intense craving
- Use low-dose diazepam if required for a maximum of 2-3 days
- Do not prescribe benzodiazepines on discharge
- If severe depression, mental state changes or risk concerns, contact Liaison Psychiatry Service

BENZODIAZEPINES

- Similar withdrawal syndrome to alcohol with the risk of seizures if severe
- Anxiety, agitation or psychological distress may be prominent
- Chart any regularly scripted, long-term benzodiazepines while the patient is in hospital
- If ongoing issues, contact Liaison Psychiatry for advice
- Include advice to GP in discharge summary if tapered withdrawal is appropriate

GHB (GAMMA-HYDROXYBUTYRATE, ALSO KNOWN AS “G”, “FANTASY”, “MLS” OR “WAZZ”) AND GBL (GAMMA-BUTYROLACTONE)

- Acute intoxication can cause reduced level of consciousness, respiratory depression and bradycardia.

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- Regular use can rapidly lead to physical dependence including marked tolerance and withdrawal symptoms.
- Withdrawal syndrome can be severe with symptoms including agitation, confusion, psychosis and seizures.
- Withdrawal is managed with benzodiazepines, titrated according to clinical response – monitor level of sedation and respiratory function when administering benzodiazepines in this setting.

5. MANAGING PATIENTS ON OPIOID SUBSTITUTION TREATMENT (OST)

On admission

To ensure clinical safety, **for ALL patients on the OST programme (methadone or Suboxone®) you MUST:**

- Inform the Auckland Opioid Substitution Treatment Service (AOTS) that the client has been admitted to hospital – see **WHO TO CALL** section.
- Always confirm the daily dose by contacting AOTS and contact the patient's dispensing pharmacy to confirm when the last dose (including any takeaways) was dispensed.
- Patients generally need to be maintained on their current OST dose.
- Check whether the patient has any takeaway doses – these must be handed to nursing staff and placed in the controlled drug cupboard.

On discharge

- **Do not provide OST as a discharge medication**
- Notify AOTS in advance of the patient's discharge date, timing of the last dose given in hospital, and details of any takeaway doses returned to the client; AOTS will reactivate dispensing at the patient's usual pharmacy.
- If the patient is discharged on a weekend or public holiday, notify the AOTS pharmacist (between 0900-12noon), who will coordinate dosing arrangements.
- Consult an AOTS doctor before providing a new discharge prescription for potential drugs of abuse e.g. benzodiazepines, additional opioids including tramadol.
- Advise the patient to contact their AOTS Keyworker and GP as soon as possible following discharge.

Pain management for OST patients

- Methadone OST provides little or no pain relief – it only maintains a normal physiological state although it can have a role in chronic pain management.
- Give pain relief in addition to usual full doses of methadone; patients often require larger doses of opioid analgesia due to tolerance.
- Regular doses of opioid analgesia are often more effective than PRN.
- For patients on buprenorphine (buprenorphine/naloxone – trade name Suboxone®) who require pain relief, or for further assistance with pain issues, contact an AOTS doctor or the Pain Service early in the admission.
- **Do not prescribe additional opioids on discharge unless you have consulted an AOTS doctor.**

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If you need assistance with the practicalities of prescribing Opioid Substitution Treatment, please contact your ward pharmacist.

For further information on legal aspects of prescribing OST in hospital, see https://www.health.govt.nz/system/files/documents/publications/nz-practice-guidelines-opioid-substitution-treatment-apr14-v2.pdf- NZ Practice Guidelines for OST 2014

6. TOBACCO DEPENDENCE

At or during admission

- **Ask** all patients on admission if they smoke and document smoking status
- **Brief advice*** to quit must be given to all smokers and documented
- **Cessation** support:

1. Medication:
    - Prescribe Nicotine Replacement Therapy (NRT) for withdrawal management – see below.

2. Referral to Smokefree as follows:
    - Voicemail – state patient name and NHI, your name and service/location
    - Fax completed referral form
    - Email (find address on Global email address book).
    - Smokefree intranet site – click Medications button

* Brief advice is a statement that links current and/or potential health problems with smoking and then giving strong advice to the patient to stop smoking with the addition that "I can help you" e.g. "John you are experiencing recurrent chest pains that may be stomach or heart related but one thing that is connected to both is smoking. John you really do have to stop smoking and I can help you."

At discharge

- EDS – in order to complete this accurately please check medical admission paperwork/nursing assessment and select the appropriate option out of the 5 presented

If a current smoker, and if a Quit Card has not already been provided:

- **Prescribe** NRT as below for 4 weeks and document in the discharge summary
- **Refer** to ADHB Smokefree Services as above for post-discharge support

Contraindications for providing NRT are:

- Known allergy to nicotine, or any other active ingredients in the patch or lozenge
- Under 12 years old

Use with caution:

- In patients who have just experienced a cardiovascular event or stroke and are medically unstable, discuss use with a Senior Medical Officer.

- In pregnant women – remove the patch at night and use nicotine lozenges for cravings.

- Following certain surgical procedures e.g. free flap surgery, some forms of neurological surgery, some forms of transplant surgery.

Nicotine withdrawal symptoms: Depressed mood, irritability or anger, insomnia, increased appetite, anxiety, decreased heart rate, difficulty concentrating, restlessness.

Toxicity of other drugs as a result of stopping smoking: Smoking induces hepatic enzymes. Stopping smoking can result in the increase of some drug concentrations e.g. propranolol, verapamil, warfarin,

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clozapine, olanzapine, theophylline. Prescribing NRT does not change the interaction as nicotine is not the inducer – it is the hydrocarbons in cigarette smoke that interact.

7. NICOTINE REPLACEMENT THERAPY (NRT)

Note: NZ smoking cessation guidelines state no evidence that weaning patches is necessary. Not necessary for routine advice to reduce the dose if patient is not ready.

Nicotine replacement prescription			
	<10 cigs/day **<30 g/week loose tobacco**	**10-30 cigs/day** **>30 g/week loose tobacco**	**>30 cigs/day** **>100 g/week loose tobacco**
Patches **Lozenges**[1]	1 x 14 mg/24h (if cannot tolerate oral product) **OR** 1 or 2 mg	1 x 21 mg/24h **AND** 1 or 2 mg	2 x 21 mg/24h **AND** 1 or 2 mg
Gum[1]	**OR** 2 or 4 mg	**OR** 2 or 4 mg	**OR** 2 or 4 mg
Prescribe each item for 4/52 [1]These should be prescribed prn with a max of 12 doses/24h. Only prescribe high dose if patient normally has first cigarette <60 minutes after waking.			

If abstinence is not achieved, the strength of the patch used should be maintained or increased until the patient is stabilised.

Treatment should continue for 3 months before reducing the dose.

Note: The use of combination of patch + gum/lozenge is associated with a significantly higher rate of smoking cessation than either treatment alone.

Other options also available:

Nicotine inhalators and oral sprays are funded for inpatient use only. They are restricted to perioperative use for patients who are NBM; for use in mental health inpatient units; or for use in agitated patients who are unable to leave the hospital facilities. These preparations are not funded in the community. See NZ Formulary for further detail.

Bupropion (Zyban® – modified release tablets)

- Fully funded
- Start 1-2 weeks before target stop date
- Initial dose: 150 mg po daily for 6 days
- Maintenance dose: 150 mg po BD (max daily dose 300 mg)
- Period of treatment: 7-9 weeks (discontinue if abstinence not achieved at 7 weeks)
- Can be used in conjunction with nicotine replacement therapy
- Caution: Predisposition to seizures, alcohol abuse, history of head trauma, diabetes

Varenicline (Champix®)

Special Authority required and HML restrictions – see NZF for further details

Dosage recommendation:

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- Start 1-2 weeks before target stop date (up to maximum 5 weeks before target stop date)
- Initial dose: 500 microgram po daily for 3 days, then 500 microgram po BD for 4 days
- Maintenance dose: 1 mg po BD for 11 weeks (reduce to 500 microgram po BD if not tolerated)
- Duration of course: 12 weeks course (can be repeated)
- Caution: Depression, insomnia on discontinuation, history of psychiatric illness, history of CVD

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WHO TO CONTACT

Adult Rehabilitation

https://adhb.hanz.health.nz/Pages/Ward-51.aspx

Provides a rehabilitation service for all types of rehabilitation needs (except spinal injuries and traumatic brain injuries) within Te Whatu Ora Te Toka Tumai - Auckland and Te Whatu Ora – Waitematā catchment.

Location: Taiao Ora/ Ward 51, Level 5 of Building 32, Auckland City Hospital

Consultation Service: 0800-1600h Mon-Fri

Electronic referral under “Rehabilitation Medicine – Ward 51”

Taiao Ora/ Ward 51 Reception

Consultants: contact via Ward 51 Ward Clerk

All referrals via E-referral

Stroke Rehabilitation Service, Te Whatu Ora Te Toka Tumai Auckland patients

Provides a rehabilitation service for stroke patients residing within the Te Whatu Ora Te Toka Tumai Auckland area.

Location: Taiao Ora/ Ward 51, Level 5 of Building 32, Auckland City Hospital

Consultation Service: 0800-1600h Mon-Fri

Electronic referral under “Rehabilitation Medicine – Ward 51”

Taiao Ora Reception

Registrars

Consultants: contact via Ward 51 Ward Clerk

All referrals via E-referral

Auckland Spinal Rehabilitation Unit (ASRU)

http://www.healthpoint.co.nz/public/spinal/auckland-spinal-rehabilitation-unit-asru

1 of 2 Spinal Rehabilitation Units in New Zealand; provides regional (Taupo to Gisborne and all areas north) in-patient and outpatient spinal rehabilitation.

Location: 30 Bairds Road, Otara

Consultation Service: 0800-1630h Mon-Fri

Admissions Coordinator: contact via ASRU reception

Registrar

Consultant: contact via ASRU reception

Referrals completed via E-referral on Clinical Portal

Referral management

For all inpatient referral queries, contact Admissions Coordinator via ASRU reception

For all outpatient referral queries, contact Admissions Coordinator via ASRU reception

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Adult/Neuro Rehabilitation Unit, Ward 23, Middlemore Hospital

Location: Colvin building, Middlemore hospital

Consultation Service: 0800-1630h Mon-Fri

Admissions Coordinator: Margaret Ghadiali

Registrar

Consultants: contact via Middlemore Hospital switchboard

Referral management

For all referral queries, contact Admissions Coordinator or Consultant.

Acquired Brain Injury (ABI) Rehabilitation

www.abi-rehab.co.nz

ABI Rehabilitation provides regional traumatic/acquired brain injury rehabilitation.

Locations: 2 Owens Rd, Epsom (Auckland community services) and 180 Metcalfe Road, Ranui (Head Office and Auckland Intensive Inpatient service)

Consultation Service: 0800-1600h Mon-Fri

Brain Injury Nurse Specialists (contact re inpatient referrals)

Fax for Concussion Clinic referral

Email for Concussion Clinic referral

Registrar

Consultant: contact via ABI Ranui

For all rehabilitation services

Information needed when calling the Rehabilitation Registrar / Rehabilitation Medicine Specialist

- Patient's ID information
- Underlying diagnosis/pathology, investigations, previous findings
- Current and prior medical/physical/cognitive/behavioural/functional status
- Interdisciplinary team assessment updates
- Current medications
- Patient's rehab goals and realistic goals to be achieved during inpatient setting

Call for advice regarding:

- Spinal patient pathway/protocols (bowel and bladder management, pressure wound prevention and management, prevention of contractures, management of spasticity, DVT prophylaxis, therapy interventions, management of hypotension, education and management of Autonomic Dysreflexia). Please contact ASRU.
- Amputee management to prevent complications like joint contractures, stump care, pain management (both phantom and nociceptive stump pains) etc. If there are any concerns regarding optimal surgical level pre-operatively, this can be discussed with a rehab specialist. Pre- and post-surgery patient counselling and education can be very useful and is advisable; advice can be sought by contacting the rehab specialist at Rehab Plus.

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- Acute management of acquired brain injury (ABI) related cognition and behavioural concerns. Please contact Liaison Psychiatry for advice (ABI will have role in rehabilitation and can give advice).

- Rehabilitation strategies to help prevent short term and long term complications (especially post-stroke) e.g. spasticity management, pressure sores, joint contractures, positioning, UTIs, faecal retention, renal/bladder complications, upper/lower limb resting splints, etc.

- Suitability for inpatient vs. outpatient rehabilitation. Rehabilitation can assist with safe transition to home. Early involvement of the Allied Health team (physiotherapist, occupational therapist, speech and language therapist and social worker) is imperative to assist with discharge planning.

Note: There is a significant psychological impact on patients (and their families) with a newly acquired disability. Careful attention should be paid not only to physical, but also to psychological/counselling support for the patient and the family.

ADMISSION CRITERIA

Eligibility for Adult Rehabilitation (Rehab Plus)

- Adults aged 16-64 residing in ADHB and WDHB catchment areas that would benefit from a comprehensive rehabilitation programme following accident, illness or injury resulting in complex cognitive and/or physical deficits.

- Medical/psychological stability, stable discharge destination, patient motivation and consent from patient /families are important pre-requisites for consideration of inpatient rehabilitation.

- Appropriateness for inpatient rehabilitation is determined by the triage team led by the Rehabilitation Medicine Physician.

Referral management

Outpatient clinic referrals can be made via electronic referral.

Eligibility for Auckland Spinal Rehabilitation Unit (ASRU)

Persons 15 years of age and older who have an acquired spinal cord impairment through either an accident or medical condition. Individuals must be medically able to participate in comprehensive and interdisciplinary spinal rehabilitation. This is a regional service from Taupo to Gisborne and all areas north.

Referral management

For all referral queries, contact Admissions Coordinator or Consultant.

Eligibility for ABI Rehabilitation Service

Any person aged 16 and over with a moderate to severe brain injury as the primary diagnosis. This includes TBI, hypoxic brain injury or stroke. ABI Auckland covers the Waikato, Auckland region and Northland DHBs. Persons with mild to moderate traumatic brain injury (concussion) who are to be discharged may be referred to the Concussion Clinic for outpatient community assessment and therapies.

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Clinical stability for transfer to ABI

These patients should be medically stable enough to be managed in a step down rehabilitation environment i.e. no active infection or bleeding, not on a ventilator, stabilised fractures, little likelihood of neurosurgical or other specialist surgical intervention.

However, note ABI routinely look after persons with lowered levels of consciousness and agitation as well as those with tracheostomies and PEGs.

Referral management

Phone the **Brain Injury Nurse Specialists**. Useful information to have available is age of client, nature of injury, current hospital and likely funder (ACC, Health, Private, Other).

Or contact Registrar or Consultant.

Eligibility for Adult/Neuro Rehabilitation Unit, Ward 23, Middlemore Hospital

https://www.healthpoint.co.nz/public/neurology/counties-manukau-health-adult-general-rehabilitation/

Persons aged 16-64 who have experienced neurological, cognitive and/or physical deficits following accident, illness or injury. Individuals must be medically able to participate in comprehensive and interdisciplinary rehabilitation.

Referral management

All internal inpatient referrals for inpatient rehab are through Task Manager on Clinical portal.

E-referral portal is available for GPs and other DHBs. These may change in accordance with Health NZ policies & protocols in future.

MANAGEMENT TIPS FOR COMMON REHABILITATION ISSUES

Acquired Brain Injury

- ABI patients (traumatic, non-traumatic or hypoxic) have special environmental needs (dark, quiet single room, minimal stimulation, orientation cues, etc).
- Avoidance of both physical and mental over-activity (fatigue management) is paramount as this can lead to more cognitive, behavioural and physical deterioration.
- Patient and families/friends need proper education.
- Avoid sedatives (unless clearly indicated). Sodium valproate (200 mg bd to tds) can be useful for agitation/restlessness and behavioural difficulties and has less undesirable side effects than medications like haloperidol and benzodiazepines.

Amputees

- Rigid Removable Dressing (RRD) applied immediately post-operatively is preferable to stump bandaging for amputees as it controls oedema more effectively, promotes early healing and offers protection for the stump (consult with the surgeon in charge first for wound appropriateness for RRD use).
- Manage stump pain adequately with analgesia (including opiates/tramadol for severe pain).

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- Phantom pain responds well to amitriptyline, starting at 10mg nocte (caution: may cause sedation and increase risk of falling). Add/change to gabapentin/ pregabalin if amitriptyline is not able to control pain.

- Beware of risk of falls while transferring in the early post-operative period.

Stroke patients

- Taiao Ora/ Ward 51 at Auckland Hospital and Adult Neuro Rehabilitation Unit at Middlemore Hospital follow the same guidelines for management and prevention strategies as the acute Stroke Units at Auckland City Hospital and Middlemore Hospital.

- Special attention to preventive strategies. Liaise with Physiotherapists/Occupational Therapists regarding splints (elbow/wrist/ankle) to prevent joint deformity and tendon shortening, elbow support (e.g. with a pillow) at all times to prevent shoulder pain/subluxation and regular stretching of the affected joints to avoid contractures. Nursing skin cares to prevent pressure sores (especially sacrum and heels); consult with Occupational Therapists regarding best mattress/cushion to aid with management/prevention of pressure sores.

- DVT prophylaxis – Early mobilisation and maintenance of hydration can help prevent DVT post stroke. Use of graduated compression stockings is not recommended. Low-molecular-weight heparin can be considered if cleared by Neurology, Neurosurgery or the Stroke Service.

- Avoid constipation/impaction – this is often overlooked. Maintain daily bowel regimen with medication as needed.

Spinal Cord Injury (SCI) Patients

Bladder

- Monitor renal/bladder function by keeping a urine flow chart, check urine concentration, check bladder scan for post-void residual volumes; overall ability to pass urine.

- Encourage adequate hydration (generally 2+ litres/24h).

- Catheterise if urinary retention (volume>100 mL).

- If unable to pass urine, catheterise by intermittent catheterisation.

- "Uri-tip" (external catheter) for males with urinary incontinence and with residual bladder volumes less than 100 mL.

- Place indwelling catheter only as a last resort as persons with indwelling catheters have the highest rate of urinary tract infections.

- For clarification regarding bladder issues, contact ASRU Admissions Coordinator via ASRU reception.

Bowel

- Bowel to be managed with flaccid regime (lower motor neurone lesion/all cases spinal shock) or reflexic regime (upper motor neurone lesion) as per spinal protocol.

- For clarification regarding bowel issues, contact ASRU Admissions Coordinator via ASRU reception.

Skin / decubitus / pressure ulcer prevention

- Regular turning q2h initially then if tolerated, q3-4h taking necessary SPINAL PRECAUTIONS and with close skin observation.

- Positioning with close skin observation.

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- Maintain dry skin, avoid urinary and faecal contact.
- Heel protection (position heels off ALL surfaces or use heel protection/ankle positioning boots/splints which maintain heel off surface).
- Patient and family education.

DVT prophylaxis

- Subcutaneous Low Molecular Weight Heparin (enoxaparin).
- Pneumatic compression.
- TEDS.
- Those with spinal fractures should be managed as per spinal surgeon's advice, keeping in mind the basic rehabilitation principles of dealing with SCI as listed above.

AUTONOMIC DYSREFLEXIA IN PATIENTS WITH SPINAL INJURIES ABOVE THE LEVEL OF T6 IS A MEDICAL EMERGENCY

What is autonomic dysreflexia?

This is a condition of dysautonomia resulting in a sudden high blood pressure response to a noxious stimulus. Blood pressure may continue to rise and may cause brain haemorrhage, seizures or death.

The normal BP for patients with spinal cord injuries at or proximal to T6 is generally around 100-110/60 mmHg lying and lower when sitting. Therefore, a BP of 130/90 mmHg can be high for that individual. If untreated, the BP can rapidly rise to extreme levels, e.g. 220/140 mmHg.

Symptoms and signs

The patient may present with all or some of the following:

- Pounding headache, which gets worse as the blood pressure rises
- Blurred vision
- Flushing and blotching of the skin above the level of the spinal cord injury
- Profuse sweating
- Goose bumps
- Chills without fever
- Bradycardia
- Hypertension
- Anxiety

Common causes

- Bladder irritation e.g. distended bladder, urological procedure, urinary tract infection, kidney stones, 'kinked' or blocked catheter, urinary retention.
- Bowel irritation e.g. constipation, chemically irritant suppositories, digital dilatation.

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- Skin irritation, e.g. pressure sore, ingrown toenail, burns.
- Other, e.g. contracting uterus, fractures, acute intra-abdominal disease, ANY noxious stimulus below the level of injury.

Patients with chronic SCI and their carers should know about this condition and can often suggest the cause.

Treatment

- Two people are required to control the situation.
- Sit upright or elevate the head of the bed. Loosen clothes and remove compression stockings and abdominal binder.
- If the patient has an IDC or SPC, check that the catheter or tubing is not kinked or flow is not impaired by a blocked inlet to the leg bag or perished valve in the leg bag.
- If the patient does not have a permanent catheter, insert a catheter to drain the bladder.
- If constipation is suspected, check the rectum for faecal loading. If present apply topical analgesic (e.g. Ultraproct® ointment). Using adequate lubricant, slowly and gently remove faecal material. Discontinue if signs or symptoms worsen.
- If the blood pressure persists >170 mmHg systolic, start glyceryl trinitrate spray (1 spray under the tongue, to be repeated in 5-10 minutes depending on response.
- If no response, i.e. if the elevated blood pressure does not start to fall within 1 minute of the above procedures, or the cause cannot be determined, call Code Red.

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Renal Medicine

WHO TO CALL

Renal Registrar mobile (0800-2200h 7 days/week)

Medical Specialties Registrar mobile (2200-0800h)

Dialysis Access Nurse Specialist mobile (0800-1700h Mon-Fri)

Renal Nurse Specialist mobile (0800-1700h Mon-Fri)

Renal Medicine Physician on call (via contact centre)

Renal Transplant Physician on call (via contact centre)

IV LINES AND RENAL PATIENTS

The veins of renal patients are their future lifelines. AVOID placing IV lines in anterior forearm or ante-cubital fossa to protect veins. This applies to patients on any form of dialysis and to patients with renal disease who may need dialysis in the future.

Haemodialysis access

Note: Dialysis lines and fistulae/grafts should not be accessed unless it is required in an emergency in which case it should be discussed with the on-call Renal Physician. Blood tests and blood pressure measurements should not be taken from the same side as a functioning fistula/graft.

AVF (arteriovenous fistula) – artery and vein are connected by a surgical procedure, usually in the arm.

PTFE graft – graft material used to connect artery and vein.

Tunnelled line – large bore central line into the internal jugular and tunnelled under the skin on the anterior chest wall (or sometimes placed in the femoral vein in the groin/thigh area).

Peritoneal dialysis

Patients on peritoneal dialysis (PD) typically require 4 exchanges of peritoneal dialysis fluid (1500-3000 mL/exchange) per day or have the exchanges done by a cycler (Automated Peritoneal Dialysis) overnight. The PD access (Tenckhoff catheter) is a permanent catheter that runs through the abdominal wall to the peritoneal cavity.

CALCULATING GFR

The eGFR is measured by the CKD-EPI formula (can be found online and does not require patient weight to calculate). This formula is not validated for people at extremes of body weight and is not useful when serum creatinine is changing rapidly (in this instance a kinetic GFR may be calculated if needed).

Stage of CKD		eGFR (mL/min/1.73m²)
Stage 1	Kidney damage with normal kidney function e.g. proteinuria	≥90

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Stage 2	Mildly reduced kidney function	60 - 89
Stage 3	Moderate loss of kidney function	30 - 59
Stage 4	Severe loss of kidney function	15 - 29
Stage 5	End stage kidney disease	<15 or on dialysis

EMERGENCIES IN DIALYSIS PATIENTS

Emergency	Causes	Management
Fluid overload	• Excessive salt/fluid intake • Heart problems, acute or chronic • Weight significantly higher than target weight	• Find out patient's target weight • Assess O_2 saturation and give oxygen as per standard guidelines • CXR, ECG and troponins • Urgent referral to Renal for dialysis to remove extra fluid • If patient passes >300mL/day of urine then try to off-load with 80 mg IV furosemide. If no response in 1 hour give 250 mg IV furosemide while awaiting dialysis • GTN sublingual or IV can be used as per cardiology heart failure guidelines • Avoid morphine
Hyperkalaemia	See hyperkalaemia section that follows	See hyperkalaemia section that follows Dialysis is the best way to remove potassium in dialysis patients. Refer promptly to Renal team
Vascular access problems from special access sites	• Clotted	• A thrill should be palpable over the fistula/PTFE at all times OR a loud bruit heard on auscultation • If not, refer to Renal Registrar or Consultant without delay • Thrombolysis/thrombectomy is often successful if undertaken within 12-24 hours of thrombosis
Infection	• Usually from vascular access point – especially central venous lines • Very high temperatures are	• Blood cultures from central line and periphery • Haemodialysis lines are locked with gentamicin and trisodium citrate 4% after use (see Renal Adult guideline), best to get Renal Registrar to help with central line sample

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	associated with bacteraemia • Pneumonia more common in haemodialysis patients	• Empiric treatment with STAT doses of IV cefuroxime (750 mg) and gentamicin (2 mg/kg) will be effective in most episodes of sepsis • Promptly refer to Renal or Medical Specialities Registrar
PD PERITONITIS	• Peritoneal dialysis patients are prone to developing peritonitis • Suspect in setting of abdominal pain, cloudy bags **OR** sepsis	• Check for cloudy PD bag • Look on the ADHB intranet under Policies and Procedures for management of PD peritonitis – for guidance about administration of antibiotics into the PD bags • Send a sample of PD effluent to the lab for Gram stain, culture and susceptibilities prior to starting antibiotics • Contact Renal or Medical Specialties Registrar or Consultant

ACUTE KIDNEY INJURY (AKI)

The most common cause of AKI in hospital is pre-renal/reduced effective circulating volume. Most patients with AKI will need IV fluids – start IV fluids early while further investigations and reviews are being arranged. Call for more senior help early if needed.

Definition	An abrupt (within 48 hours) absolute increase in serum creatinine of ≥30 micromol/L from baseline, or an increase in serum creatinine of ≥50% within 7 days, or oliguria of less than 0.5 mL/kg per hour for more than 6 hours.
Causes	**1. Pre-renal** • Hypovolaemia • Hypotension (sepsis, cardiogenic, volume depletion) **2. Renal** • Ischaemic or medicine-related (nephrotoxins; radio-iodine contrast, aminoglycosides, NSAIDs) • Acute Tubular Necrosis (50% of AKI) • Acute on chronic kidney disease (15%) • Acute interstitial nephritis (<3%) • Acute glomerulonephritis (<5%) • Vasculitides (<1%) • Haemolytic uraemic syndrome • Tubular deposition of urate (tumour lysis syndrome) or Myeloma (light chains)

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	3. Post-renal • Obstructive uropathy – prostate, bladder outlet, ureteric obstruction (10%)
Investigations	• Evaluate volume status – JVP, weight change, lying and standing BP • Bladder distension • Fever • Urine – RBC, protein (urine PCR) • Renal tract USS to diagnose post-renal cause if no recent imaging • Bloods – including potassium, venous bicarbonate, calcium, phosphate • Consider screening tests for glomerulonephritis, myeloma, SLE, vasculitis plus a serum CK if clinically appropriate (not needed in most patients)
Management	• Stop nephrotoxic medicines • Ensure adequate hydration is achieved with Plasma-Lyte® (preferred as it does not lead to hyperchloraemic acidosis as it is a buffered electrolyte solution), sodium chloride 0.9% next best option • Reassess volume status regularly especially when giving fluids • Use diuretics if patient is in heart failure • Keep close fluid balance chart of fluid in and out, daily weights • Regular blood tests for electrolytes, bicarbonate and serum creatinine • Post-renal AKI – likely need urinary catheter. Discuss with Urology

When to consider a renal consult for acute kidney injury

- Doubling of serum creatinine OR serum creatinine >200 micromol/L if baseline unknown
- Oliguria (<0.5mls/kg/h for 12 hours) not responding to hydration
- Patients with potassium >6.5 mmol/L and ECG or neuromuscular signs of hyperkalaemia
- RBCs or red cell casts or protein in the urine with AKI
- AKI with fluid overload, not responding to diuretics
- Patients with AKI and multi-system disease (e.g. SLE)

ACUTE GLOMERULONEPHRITIS/VASCULITIS

Causes of glomerulonephritis can be primary or secondary (broadly immunological, infection, medicines, malignancy). Glomerulonephritis could present as proliferative or non-proliferative. Patients may present with nephrotic syndrome, nephritic syndrome, rapidly progressive glomerulonephritis, or an overlap of symptoms.

Presenting features

- Haematuria, proteinuria, granular or cellular casts

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- Significant loss of renal function in the absence of other explanations (acute volume depletion, exposure to nephrotoxic medicines, etc.)
- New hypertension may be present
- Oedema, particularly in acute nephrotic syndrome

Initial glomerulonephritis screen (with consultation with Renal Service)

- Urine protein/creatinine ratio, Bence-Jones protein
- MSU, cells and casts
- Serum biochemistry, including albumin
- ANA, dsDNA +/- ENA
- Urgent vasculitis antibody screen (PR3, MPO, anti-GBM) call Laboratory, Immunology department to get approval
- Anti-GBM level, anti-neutrophil cytoplasmic antibody (ANCA)
- Hepatitis B, C, HIV
- Serum protein electrophoresis, serum immunoglobulins, serum free light chains
- Complement C3, C4

Refer to Renal Service for further assessment and consideration of renal biopsy.

MANAGEMENT OF HYPERKALAEMIA

- Potentially life threatening
- Call Lab to check if sample was haemolysed; if so, repeat potassium bloods
- Do urgent ECG
- Make sure patients are rehydrated
- Call for advice if unsure or concerned

K+ 6.0-6.4 mmol/L	• If ECG normal, give calcium resonium 15 g po QID and lactulose 15 mL po with each dose. This takes up to 12 hours to have an effect • Stop any medicines that cause hyperkalaemia • Consider flexi-monitoring and discuss with SMO or Registrar
K^+ ≥6.5 mmol/L and/or QRS widening on ECG	• Calcium gluconate 10% 10 mL IV over 5 min if ECG abnormal • Repeat above step again in 10 min if ECG changes persist, then again at 30-60 min **INSULIN** **a) 10 units of short-acting insulin (Actrapid®) + 500 mL glucose 10% (in the same bag) IV over 60-120 min**

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	b) If fluid restricted, consider giving 10 units short-acting insulin (Actrapid®) IV in 100 mL glucose 10% over 60 minutes (monitor for hypoglycaemia) c) When giving insulin check blood glucose within 1 hour and continue to monitor at least hourly d) If blood glucose >14.0 give insulin without glucose e) Doses can be repeated every 2-4 hours **SALBUTAMOL** a) 10 mg diluted with 4 mL of sodium chloride 0.9%, nebulised over 10 min b) Doses can be repeated in 1-4 hours c) Avoid in people with unstable angina or acute MI • **Stop medications contributing to hyperkalaemia – potassium supplements, ACE inhibitors, ARBS, NSAIDs, potassium-sparing diuretics (amiloride, spironolactone)** • **Flexi monitoring** • **Consider IV sodium bicarbonate if pH <7.25** • **150 mmol of 8.4% Sodium bicarbonate in 1 L 5% Dextrose over 6 hours** • **Urgent Renal consult for consideration of dialysis**

- Dialysis is the best way to remove potassium in patients with severe renal impairment or on dialysis
- Re-check serum potassium within 1 hour of initiating any treatment and check for acid/base disturbance (ABG or VBG). Then do further checks every 2-4 hours depending on severity. This is because insulin and salbutamol treatments have transient effects and potassium may rebound.
- Anuria and hypercatabolism can lead to rapid rises in serum K+. If the patient is anuric and/or hypercatabolic, seek an urgent Renal consult as urgent dialysis may be required

MEDICINES AND THE KIDNEY

The list below is not exhaustive. If uncertain of dose or medication, always check with a clinical pharmacist or check reference viewer prior to prescribing, especially in patients with moderate-severe AKI or Stage 4 or 5 CKD.

MEDICINES TO AVOID in those with AKI, CKD 4 and 5

- Tetracyclines (except doxycycline)
- Potassium-sparing diuretics such as amiloride, and only give spironolactone 25 mg dose if necessary
- NSAIDs
- Codeine
- Morphine (preferred alternative to use is fentanyl or oxycodone)

Medicines where dosing should be modified in patients with CKD

- Aminoglycosides
- Vancomycin

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- Beta-lactams (cephalosporins and most penicillins)
- Fluoroquinolones
- Digoxin
- Co-trimoxazole
- Aciclovir, ganciclovir, valganciclovir
- Colchicine
- β-blockers (atenolol, nadolol, sotalol)
- Gabapentin and pregabalin
- Enoxaparin
- Tramadol

RADIO- AND MR CONTRAST AGENTS

1) Radio-contrast in patients with known renal disease

- Always mention this to the radiologist when discussing CT scans – they may suggest alternative imaging depending on creatinine and eGFR so have these numbers on hand
- Give Plasma-Lyte® IV at 1-2 mL/kg/hour beginning on day of procedure for up to 6 hours pre- and post-procedure
- Diuretics are not protective against contrast-induced nephropathy
- Acetylcysteine is not of proven use in the prevention of contrast nephropathy
- Radiologist to limit dose and select lower toxicity agents for high risk patients
- Dialysis is not required after iodinated radio-contrast

Note: patients with diabetic nephropathy and/or heart failure are at an increased risk

2) Radio-Contrast In patients with normal renal function

- To avoid causing AKI from radio-contrast agents, do not give NSAIDs in the 48 hours prior to the radiology procedure
- Avoid metformin on the day of procedure and until renal function is stable post procedure
- Pre-procedure – reverse any volume depletion with fluids

In all patients – check serum creatinine 24 and 48 hours post procedure and if a significant rise occurs, continue to monitor and manage as a patient with AKI. If patient is discharged, arrangements must be made for renal function to be checked with general practitioner or as post discharge review with primary team.

3) MR contrast (Gadolinium) in patients with known renal disease

- Gadolinium contrast is associated with Nephrogenic Systemic Fibrosis (NSF) in patients with advanced CKD (eGFR <=30 mls/min/1.73m^2)

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- Refer to the published radiology policy – MR angiography in adults with renal dysfunction
- Haemodialysis patients requiring gadolinium MR contrast need haemodialysis afterward. This needs to be discussed with the renal service before the imaging study is undertaken

LOWER URINARY TRACT INFECTIONS

- Confirm from MSU if the patient has significant pyuria (>10 x 10^6 /L)
- Confirmation from MSU culture – in women colonising >1 x 10^8 is significant and in men >1 x 10^7 is significant

Investigations

Men	Women
Consider urinary/renal tract ultrasound to find cause	Renal tract ultrasound if having infections prior to commencement of sexual activity
If an abnormality is noted, then contrast CT urogram should be considered	Renal tract ultrasound if acute pyelonephritis, frequent infections, unusual organisms (e.g. Proteus) or persistent haematuria
Assess for prostatitis – digital rectal examination	
Consider possibility of sexually transmitted disease	Consider possibility of sexually transmitted disease
Cystoscopy in some older males	Cystoscopy in postmenopausal women

UTI management

Refer to Script App for antimicrobial management advice.

ACUTE PYELONEPHRITIS

- A syndrome of fever (≥38ºC) + rigors, loin pain or tenderness together with infected urine
- Lower urinary tract symptoms may be absent
- Symptoms may be unilateral or bilateral
- Patients with severe acute pyelonephritis require hospitalisation
- 10-15% will have a bacteraemia

Causes

Acute pyelonephritis may occur in a structurally normal urinary tract or as a complication of some underlying urinary tract disorder (i.e. it may be uncomplicated or complicated).

Investigations

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- In patients with acute pyelonephritis, approximately 80% will have a colony count ≥1 x 10^8/L; 10-15% will have 10^5-10^8/L
- Significant pyuria (>20 x 10^6 white cells/L) will invariably be present
- In the setting of vaginal symptoms or poorly localized tenderness, a pelvic examination should be performed to distinguish pelvic inflammatory disease from acute uncomplicated pyelonephritis
- FBC, blood cultures, creatinine and electrolytes
- Serum protein electrophoresis (if >50 years)
- Ultrasound of urinary tract (and consideration of CT contrast urogram, depending on findings)

Management

- If the patient is dehydrated and/or vomiting, give IV Plasma-Lyte®
- Parenteral antimicrobial therapy should be given initially, and continued until the patient can tolerate oral medication
- Refer to Script app for antimicrobial management advice

RENAL TRANSPLANT

For transplant patients in Auckland City Hospital

- The management of renal transplant patients is based on the Auckland Renal Transplant Group (ARTG) protocol (available on Ward 71 and on the intranet under “R” for Renal transplants in the Policies and Guidelines Library).
- **Any acute events in transplant patients should be discussed early with the Transplant Physician on call (irrespective of the time of day or night).**
- Such acute events include fever, decreased urine output, pain over the allograft in an in-patient, bleeding from transplant wound or other sites.
- All renal transplant recipients who present to emergency services or other teams with acute illnesses for assessment should be discussed with the Transplant Physician on call.

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Respiratory Medicine

RESPIRATORY INTRANET SITE

WHO TO CALL

- For all referrals and advice - between 0800-1700h Mon – Friday (Respiratory SMO)
- Respiratory on-call Registrar between 1700-2200h Mon – Friday, weekends, Public Holidays; from 2200-0800h Medical Specialties Registrar

Information to have when calling:

- Reason for referral (what is the question?)
- Clinical summary
- Arterial blood gas results
- CXR (and CT) findings
- Spirometry/lung function, including previous results (if available)

RESPIRATORY FAILURE

Monitoring a patient with respiratory failure

Level of consciousness

- Conscious state is also a useful guide (be wary of the patient who becomes increasingly drowsy).

Respiratory rate

- Sensitive measure of respiratory distress; especially if monitoring the trend.

Blood gases

- Arterial blood gases: Gold standard and essential in all patients with severe respiratory distress.
- Use of local anaesthetic is usually recommended while performing ABGs.
- Venous blood gases: These are increasingly used in some areas e.g. the ED.

Briefly:

(a) If the venous pH is in the normal range, it is unlikely the patient is acidotic.
(b) Clinical decisions should not be based on an abnormal venous pH.
(c) It is NOT possible to estimate the arterial PaO2 or PaCO2 on the basis of the venous PaO_2 or $PaCO_2$.
(d) Venous bicarbonate concentration is generally similar to that in arterial blood (+/- 3 SD and thus if elevated may provide evidence of chronic hypercapnic respiratory failure).

Pulse Oximetry

- A useful tool for monitoring oxygen saturation, but gives no clue as to adequacy of ventilation (only arterial pH and PaCO2 do this). Changes in inspired O2 may mask trends in oxygen saturation.

Low saturations suggest poor gas exchange but if patient is receiving supplemental oxygen, normal saturations do not exclude poor or deteriorating respiratory status (including a rise in PaCO2).

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Conversion of kPa to mmHg

- In Auckland, blood gases are measured in kPa rather than mmHg.

1 kPa = 7.5mmHg

Alveolar (A) - arterial (a) gradient

- The A-a gradient is used to gauge the severity of the abnormality in gas exchange; the efficiency of the lung as a gas exchanger.
- The A-a gradient will be reported on the ABG if you provide the FiO2 on the blood request form.
- Note: Hypoxaemia with an elevated A-a gradient is due to ventilation-perfusion mismatch, diffusion and shunt. Hypoxaemia with a normal A-a gradient suggests hypoventilation (e.g. opioid narcosis).

Types of respiratory failure

Type I	**respiratory failure** (or hypoxaemic respiratory failure): PaO_2 <8.0 kPa
Type II	**respiratory failure** (or hypercapnic respiratory failure): PaO_2 <8.0 kPa; $PaCO_2$ >6.0 kPa

- **Note**: In patients with advanced chronic lung disease who are not acidotic i.e. have fully compensated for any increase in $PaCO_2$ by retaining HCO_3^+ (i.e. compensated respiratory acidosis), supportive ventilation is not required.

Is the patient in respiratory distress (respiratory failure, exhaustion or near to exhaustion)?

- If YES, discuss with senior staff early and formulate a plan in the event of further deterioration including a ceiling of care and resuscitation status for each individual patient
  - Commence maximal medical therapy for the underlying condition
  - Monitor respiratory status closely, especially respiratory rate and level of consciousness
  - Monitor ABGs

Is this patient suitable for invasive ventilatory support in ICU?

- If YES, discuss with DCCM (after discussion with SMO).
- If NO, should a trial of non-invasive ventilatory (NIV) support be considered? Discuss with Respiratory Registrar +/- Respiratory Consultant on call.
- In general the use of NIV in a ward setting should be limited to patients with COPD or obesity-hypoventilation syndrome who are not candidates for invasive ventilation. The use of NIV for type 1 respiratory failure should be reserved for an ICU setting.
- Admission of a patient under Respiratory Services for NIV for an indication other than COPD or OHS (Obesity Hypoventilation Syndrome) should only occur after discussion with the Respiratory Consultant on call.

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MANAGEMENT OF ACUTE OR ACUTE ON CHRONIC HYPOXIC (NORMOCAPNIC) RESPIRATORY FAILURE (TYPE I RF)

Aim: maintenance of adequate oxygenation (SpO_2 = O_2 saturation by pulse oximetry), target range 92-96% usually

- Treat underlying condition aggressively
- Protect from other organ failure (e.g. renal failure by fluid replacement)
- High flow oxygen via face mask; may require re-breathing mask or high flow nasal prongs

Success in raising SpO_2 does not mean the patient is out of danger e.g. if the patient is requiring 16 L/min O_2 and has a respiratory rate of 40/min to achieve adequate oxygenation, they are clearly very sick with major gas exchange problems and at risk of developing respiratory muscle fatigue.

Always discuss with Registrar/SMO and consider referral to ICU / DCCM if clinically appropriate.

MANAGEMENT OF ACUTE (ON CHRONIC) HYPERCAPNIC RESPIRATORY FAILURE (TYPE II RF)

- This typically occurs in patients with chronic respiratory failure who develop acute problems − usually a combination of worsening respiratory acidosis and hypoxaemia. The clue to chronic type 2 respiratory failure is the raised HCO_3^+, which suggests prolonged CO_2 retention with metabolic compensation.
- Classically occurs with exacerbations of COPD but consider in drowsy, obese patients, who may have (previously unrecognised) obesity hypoventilation syndrome; the bicarbonate in venous blood may provide a clue (≥27 mmol/L).

Aim:

- SpO_2 ≥88%, 88-92% acceptable in most
- Keep pH >7.35 (pH <7.25 carries very poor prognosis)
- Control and slowly reduce $PaCO_2$ (no need to normalize it)

Assessment

- How tired are they? (duration of illness, paradoxical diaphragmatic motion, speaking full sentences)
- What is their respiratory rate? (remember these patients may not demonstrate the typical features of "respiratory distress")
- How acidotic are they? (pH more important than $PaCO_2$)
- Exclude coexistent problems (e.g. pneumothorax or heart failure)

Management

- Treat underlying condition aggressively, including physiotherapy if indicated
- Determine after discussion with seniors if they are candidates for ICU or HDU, or if not, are they candidates for NIV?

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- Oxygen therapy (preferably controlled via low flow nasal prongs or Venturi mask)
- Be cautious with oxygen delivery as it may lead to an increase in $PaCO_2$ (have a low threshold for repeating the ABG)
- Non-invasive ventilation
    - Can be used in ED, Ward 72, 7A, or ICU
    - Should be discussed with Respiratory Registrar or Consultant prior to utilisation on wards
    - Pressure setting individualised to patient and should be discussed

Usual starting pressures		
	IPAP (cmH20)	EPAP (cmH20)
COPD	14-18	6
OHS	20-26	8-12
NMD	12-16	4

Re-assess the patient frequently, particularly over the first 12 hours. Repeat the above assessment every 1-2 hours +/- repeat ABG until the patient is clearly improving.

If more acidotic (lower pH) and SpO_2 is >92%, decrease inspired O_2 BUT DO NOT withdraw O_2. The patient must remain on enough oxygen to maintain SpO_2 target range 88-92%.

Remember that it is the target range that is more important than simply a SpO2 being greater than a single target level. Hyperoxaemia can cause adverse effects and is associated with hypoventilation, and coronary and cerebral vasoconstriction.

COPD

(See also COPD PATHWAY)

ACUTE EXACERBATIONS OF COPD

Assessment of patient on admission

- History and physical examination
- Chest radiograph (exclude pneumothorax, significant LVF, pneumonia or other pathology)
- ABGs (NOT venous blood gases as need to know about pH and arterial CO_2)
- ECG
- FBC, electrolytes, hepatic and renal function
- Sputum Gram stain and culture (cytology, mycobacterial culture: where appropriate)
- Blood culture should be taken if febrile

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- On-going pulse oximetry for 48h or until stable
- Other investigations as indicated

Initial management

- See Respiratory Failure (treat hypoxia) and maximal medical therapy (see below)
- Oxygen therapy
    - Usual aim is to maintain O_2 saturation (SpO_2) target 88-92% or PaO_2 >8 kPa (60 mmHg)
- Bronchodilators
    - Salbutamol 100 microgram 2-6 puff QID + PRN (MDI with spacer)
    - Ipratropium 20 microgram 2 puffs QID (MDI via spacer)
    - Nebulisers can be considered if unable to use MDI
        - Salbutamol 2.5-5 mg q4h regularly and prn up to q30min
        - +/- Ipratropium bromide 500 micrograms q4-6h (avoid combination LAMA therapy)
- Prednisone 40 mg PO daily or IV hydrocortisone (50 mg IV q6h) if NBM
    - Usual duration is 5-7 days, but this can be extended if required
- Antibiotics if evidence of bacterial infection
- Treat any complications (e.g. LVF, pneumothorax, pneumonia)
- Consider thromboembolism prophylaxis as per ACH protocol
- Consider non-invasive ventilation (NIV) if:
    - Acute type II respiratory failure is present as evidenced by respiratory acidosis (pH <7.35 and $PaCO_2$ >6.0) **AND**
    - No improvement despite maximal medical therapy for 1h
- Reassess frequently in the first 12 hours
- Keep an open mind for other diagnoses e.g. pulmonary embolism
- Avoid sedation (unless discussed with Consultant)
- Physiotherapy: early mobilisation and muscle strengthening exercises are recommended

Indications for ICU/DCCM admission of patient with acute COPD exacerbation

More sick or complex patients should be considered for intubation, unless NIV is deemed to be the ceiling of treatment.

Obtain a history of the patient's functional state and quality of life prior to becoming unwell, in order to inform decisions regarding ceiling of care.

Consider if:

- Persistent or worsening hypoxaemia despite supplemental oxygen, or severe/ worsening respiratory acidosis
- Confusion, lethargy or respiratory muscle fatigue

Discuss with Consultant and then ICU team

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INHALERS

Different devices are often chosen as per patient's preference and ease of use.

LAMA (Long-acting muscarinic antagonists): Usually used as the first-line long-acting bronchodilator, both for breathlessness and reduction of exacerbation risk.

Medication	Example doses
Incruse Ellipta® (unmeclidinium)	**62.5 microgram - 1 inhalation daily**
Spiriva® (tiotropium)	**18 microgram - 1 inhalation daily**
Spiriva Respimat® (tiotropium)	**2.5 microgram - 2 inhalations daily**
Seebri Breezhaler® (glycopyrronium)	**50 microgram - 1 inhalation daily**

LABA/LAMA if LAMA alone does not control breathlessness (LABA = Long-acting beta2-agonists)

Anoro Ellipta® (umeclidinium + vilanterol)	**62.5/25 microgram - 1 inhalation daily**
Spiolto Respimat® (tiotropium)	**2.5/2.5 microgram - 2 inhalations daily**
Ultibro Breezhaler® (glycopyrronium + indacaterol)	**50/110 microgram - 1 inhalation daily**

ICS (inhaler corticosteroid): to prevent exacerbations in patient with frequent exacerbations (≥2 per year) or Asthma/COPD overlap, (especially with eosinophilia ≥0.3)

Flixotide® (fluticasone)	**50-100 microgram - 1-2 inhalations BD**
Qvar® (beclometasone)	**50-100 microgram - 1-2 inhalations BD**
Beclazone® (beclometasone)	**50-250 micrograms - 1-2 inhalations BD**

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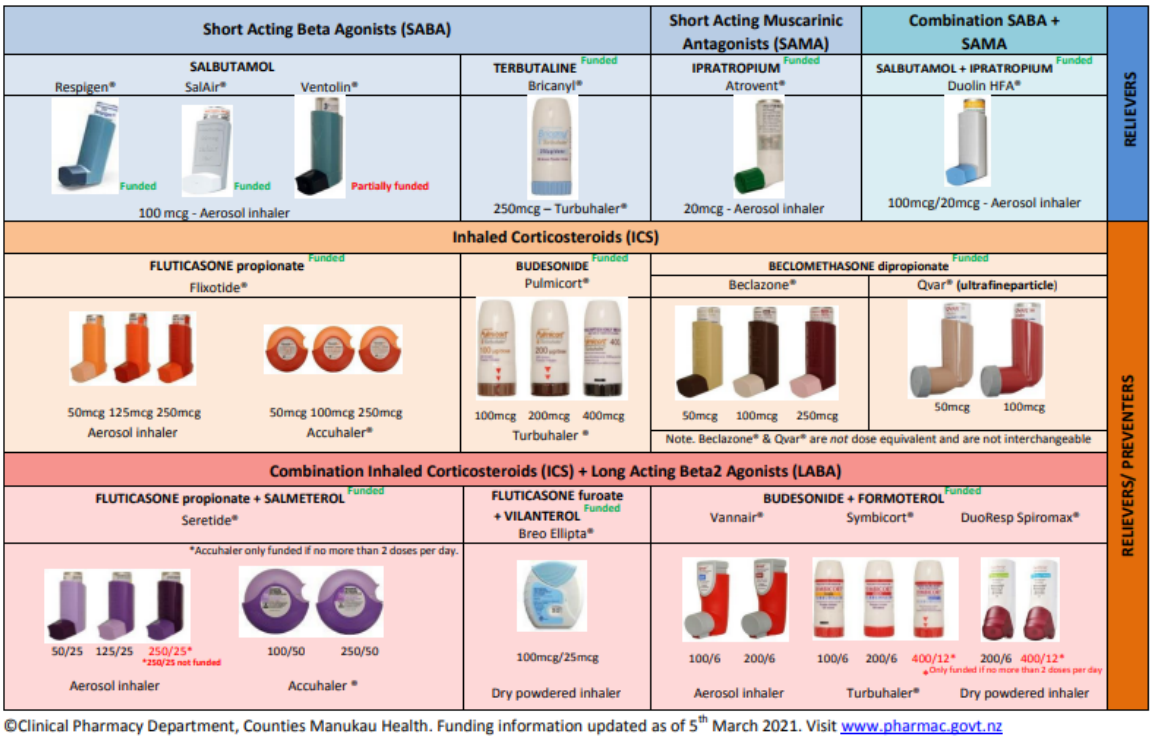
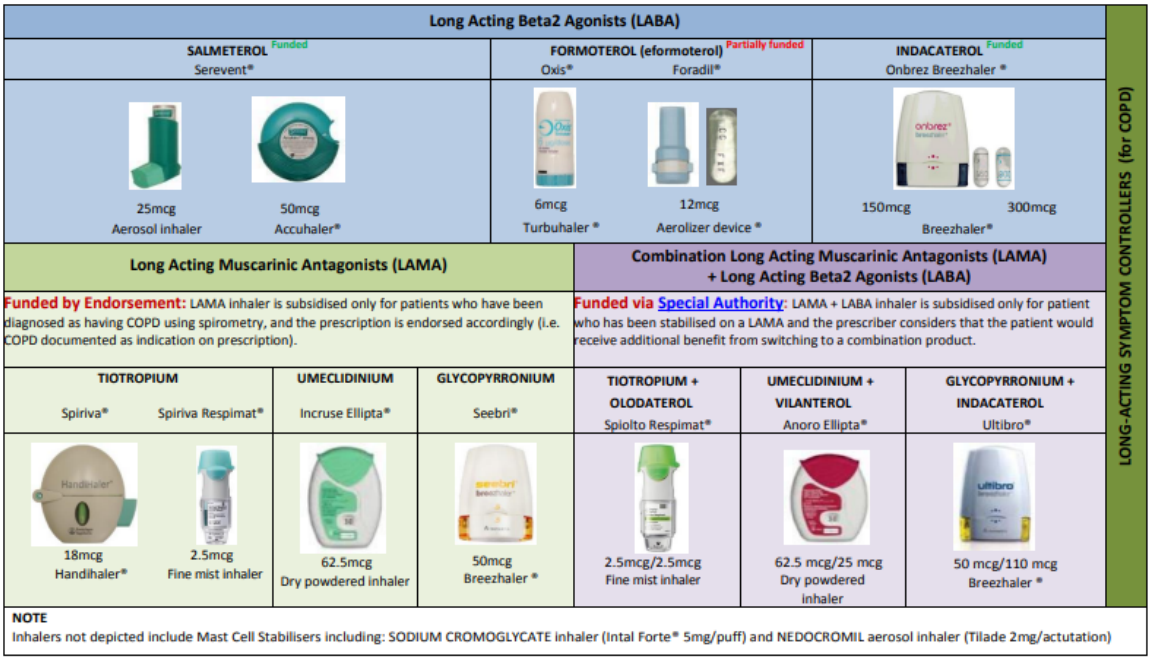
TYPES OF INHALER DEVICES

Inhaler Devices Identification Chart



Inhaler Devices Identification Chart



NOTE
Inhalers not depicted include Mast Cell Stabilisers including: SODIUM CROMOGLYCATE inhaler (Intal Forte® 5mg/puff) and NEDOCROMIL aerosol inhaler (Tilade 2mg/actutation)

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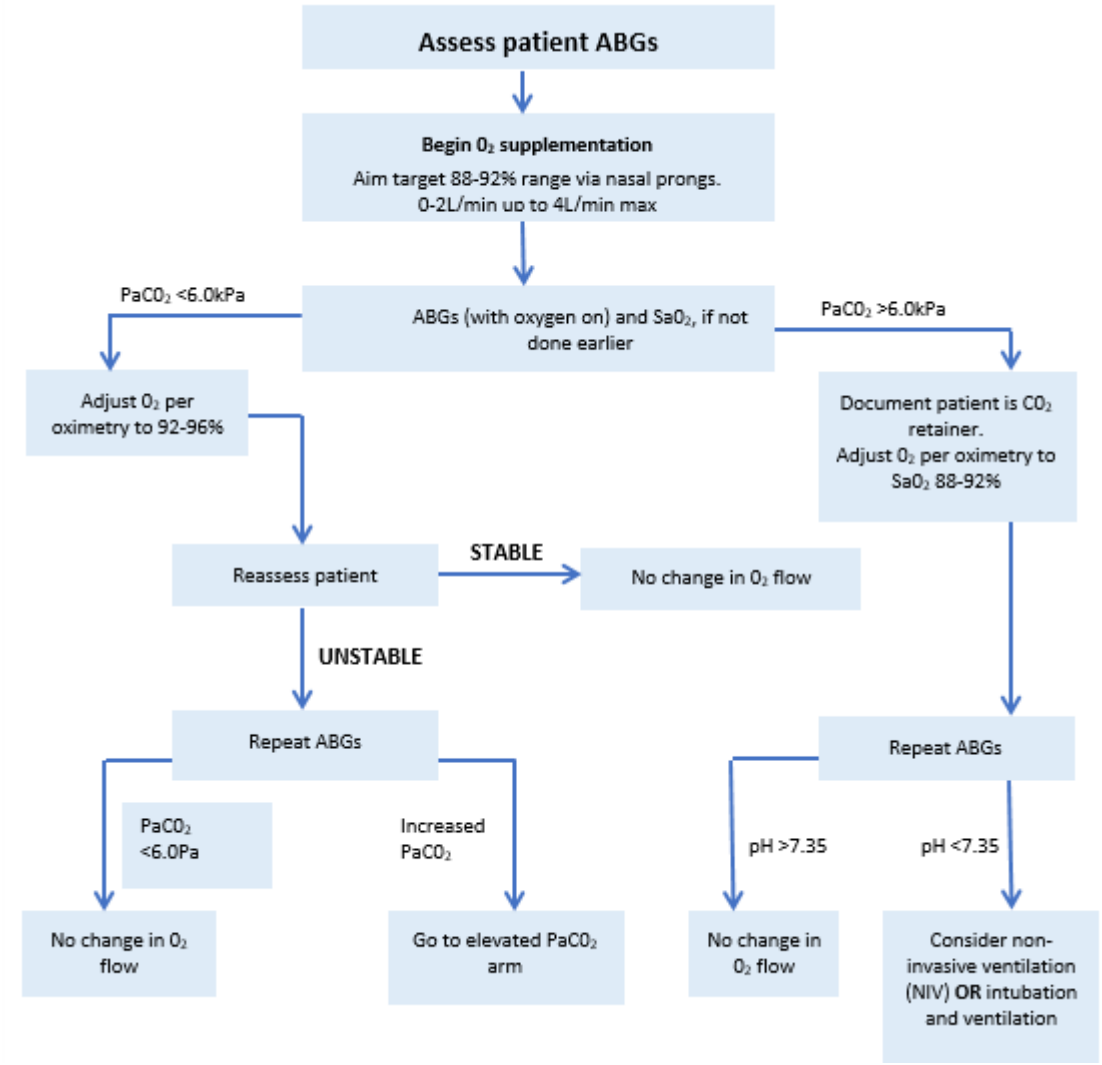
CORRECTING HYPOXAEMIA IN THE ACUTELY ILL COPD PATIENT



See guidelines:

- NZ COPD guidelines - https://www.google.com/search?client=firefox-b-d&q=NZ+COPD+guidelines
- www.goldcopd.org
- www.copdx.org.au

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ASTHMA

Initial assessment

- If acutely distressed give oxygen, nebulised β_2 agonist and insert IV line
- A detailed history and examination should be performed once therapy has been initiated

The following should be assessed in all patients presenting with acute asthma:

- Level of consciousness
- Speech
- Respiratory rate
- Heart rate
- Features of exhaustion

The table below describes indicators of severe and potentially life-threatening asthma

Life-threatening asthma (usually characterized by raised PCO_2 and/or need for ventilation)	**Any one of the following in a patient with severe asthma:**	
	Clinical Signs	**Measurements**
	Altered conscious level	Respiratory rate ≥25/min
	Exhaustion	SpO_2 <92%
	Limited ability to speak	PaO_2 <8 kPa
	Respiratory distress	"Normal" (4.6-6.0 kPa) or elevated $PaCO_2$
	Cyanosis	Tachycardia
	Silent Chest	

Beware the misleading "silent chest" due to feeble respiratory effort.

Initial management of acute asthma in adults

- All patients with moderate or severe asthma must be discussed with the Registrar.
- Refer patients with poor asthma control, recurrent exacerbations or admissions to the Respiratory Service and Asthma Nurse Specialist.
- See Respiratory Failure (treat hypoxia) and maximal medical therapy (see below).
- Oxygen therapy
  - Usual aim is to maintain O2 saturation (SpO2) target 92-96%
  - In patients at risk of T2RF, aim for a target saturation range of 88-92% pending the availability of ABGs
- Bronchodilators

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- Salbutamol 100 microgram 2-6 puff QID + PRN (MDI with spacer)
- Nebulisers can be considered if not improving
  - Salbutamol 2.5-5 mg q4h regularly and prn up to q30min
  - +/- Ipratropium bromide 500 micrograms q4-6h (avoid combination LAMA therapy)

- Prednisone 40 mg po daily or IV hydrocortisone (50 mg IV q6h) if NBM
  - Standard regimen is 40 mg daily for five days
  - An alternative regimen is 40 mg daily until there is definite improvement and then 20 mg daily for the same number of days

- Treat any complications (e.g. pneumothorax, pneumonia)

- Consider thromboembolism prophylaxis (as per protocol)

- Additional therapy
  - Magnesium sulphate 5-10 mmol IV over 20 minutes for life-threatening exacerbation or severe exacerbation that is not responding to initial therapy

Oxygen delivery devices (%= fraction of inspired oxygen [FiO_2])

Nasal prongs (L/min)	1 = 24%, 2 = 28%, 3 = 31% (approximately)
Simple face mask	5-10 L/min = varies from 40-60%
Venturi mask	Blue 24%, White 28%, Yellow 35%, Red 40%, Green 60%
High flow nasal prongs (Airvo)	21-90%
Reservoir mask	15 L/min near 100% (as long as reservoir bags doesn't empty)

Remember OXYGEN is a MEDICATION and must be appropriately prescribed including dose and method of administration

https://www.brit-thoracic.org.uk/quality-improvement/guidelines/emergency-oxygen/

COMMUNITY ACQUIRED PNEUMONIA

It is essential to make an accurate diagnosis. Not all shadowing on a CXR is due to pneumonia.

Consider the possibility of an alternate diagnosis e.g. pulmonary infarct, left ventricular failure, lung cancer, TB, diffuse ILD, diffuse alveolar haemorrhage etc.

Remember that pneumonia in an elderly patient may not be associated with typical symptoms (or signs).

Assessment of severity: "core" adverse prognostic features (CURB65 criteria).

C – Confusion (new) – MSQ ≤8 U – Urea >7 mmol/L R – Respiratory rate ≥30/min B – BP: ≤90 mmHg systolic or ≤60 mmHg diastolic	Consider discharge if score <2 Consider contacting Respiratory Services/ICU if score ≥3

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Age ≥65 years	

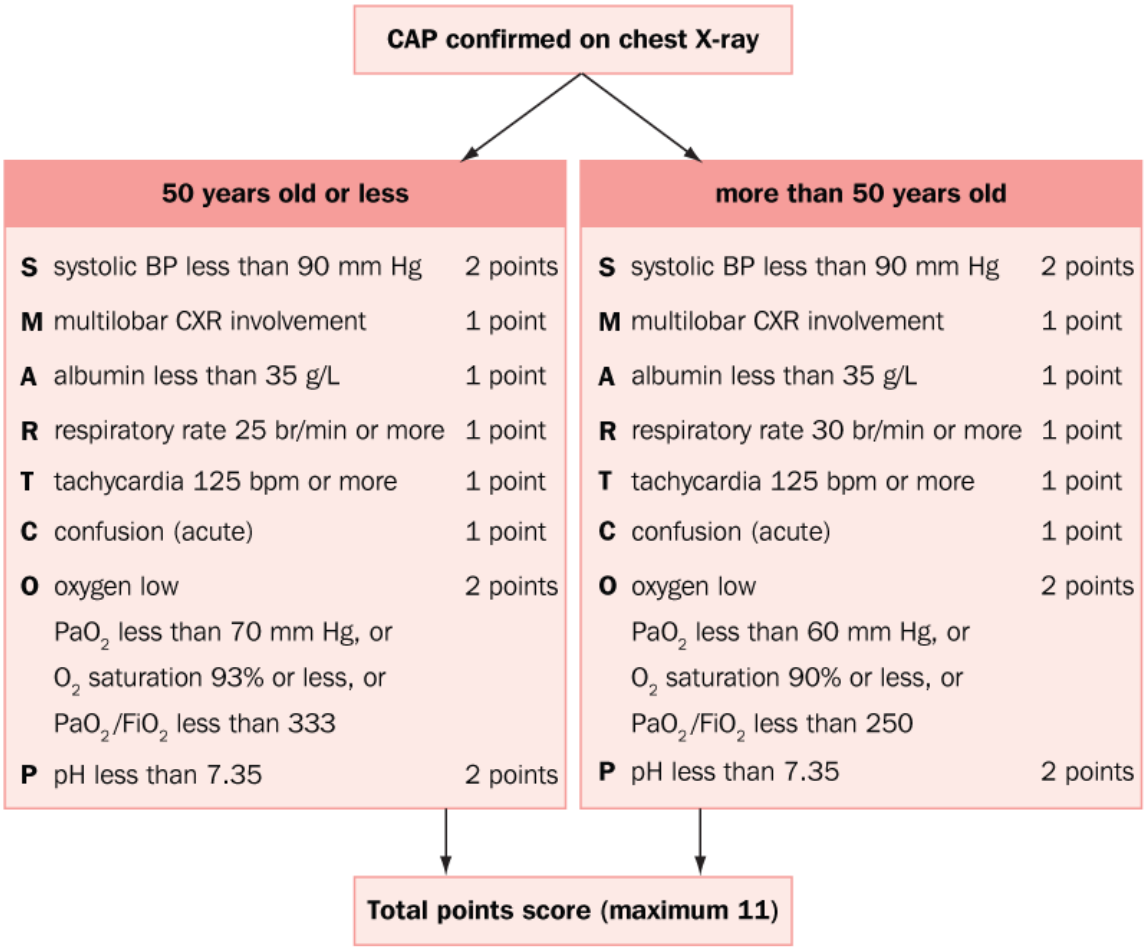
Additional adverse prognostic features:

- Hypoxaemia (O_2 sat <92%, PaO_2 <8 kPa)
- WCC <4 or >25 x 10^9/L
- Hb <90 g/L
- Bilateral or multi-lobar involvement
- Presence of co-existing disease

All patients having any CURB65 criteria or additional adverse prognostic features should be discussed with the Registrar.

http://www.brit-thoracic.org.uk/guidelines/pneumonia-guidelines.aspx

SMART-COP



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Interpretation of SMART-COP score

- 0 to 2 points – low risk of needing intensive respiratory or vasopressor support (IVRS)
- 3 to 4 points – moderate risk (1 in 8) of needing IRVS
- 5 to 6 points – high risk (1 in 3) of needing IRVS
- 7 or more points – very high risk (2 in 3) of needing IRVS
- Severe CAP = a SMART-COP score of 5 or more points

Indications for admission

"Core" adverse prognostic features	
"Additional" adverse prognostic features	
Complications: • Haemoptysis • Cavitation • Significant pleural effusion	Contact Respiratory Services
Social circumstances	

Suggested antibiotics (refer to Script app)

CURB-65 = 0-1 **SMART COP = 0-2**	amoxicillin 500 mg po TDS **OR** doxycycline 200 mg po BD on day 1 then 100 mg po BD
CURB-65 = 2 **SMART COP= 3-4**	amoxicillin 500 mg po TDS + doxycycline 100 mg po BD **OR, if allergy** doxycycline 200 mg po BD on day 1 then 100 mg BD
CURB-65 = 3-5 **SMART COP= 5-11**	amoxicillin + clavulanic acid 1.2 g IV q8h + azithromycin 500 mg po daily (clarithromycin 500 mg IV q12h if patient in ICU or enteral route unavailable) **OR, if allergy** discuss with ID/Micro

Investigations

- Chest radiograph
- FBC and Biochemistry (includes renal function)
- Sputum (M,C & S, consider Legionella PCR)
- Blood cultures (if febrile T ≥38C)
- Urinary pneumococcal antigens
- Nasopharyngeal swab for viral PCR if indicated

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Always discuss with your immediate senior colleague before consulting DCCM. Has the issue of ceiling of care been addressed?

Indications for DCCM referral

CURB score >= 3 and/or SMART COP >=5 and/or

- Evidence of severe sepsis
  - Hypotension (systolic ≤90 mmHg, diastolic ≤60 mmHg)
  - Requirement for vasopressors
  - Oliguria or impairment of renal function
  - Acidosis

- Respiratory failure
  - Severe hypoxaemia e.g. requirement of FiO_2 ≥35% to maintain O_2 Sat ≥90%
  - Hypercapnia
  - Exhaustion

HOSPITAL ACQUIRED PNEUMONIA

Definition: pneumonia that occurs 48 hours or more after admission to hospital.

Management

Antibiotic treatment: See Script App guidelines on pneumonia.

Download the Script App from the Play Store or iTunes App Store:

https://play.google.com/store/apps/details?id=nz.co.uniservices.script&hl=en

https://itunes.apple.com/nz/app/script/id1113276600?mt=8&ign-mpt=uo%3D4

TUBERCULOSIS

Those patients at greatest risk include:

- Patients recently exposed to TB.
- Patients with previous prolonged residence in a high incidence TB country.
- Patients who are immunocompromised, either from disease (including renal failure and diabetes) or from medical treatment. In such patients, the presentation and radiologic abnormality may not be "typical".
- Always consider TB in the patient with "pneumonia" who is not responding to antibiotics.

Symptoms of pulmonary TB:

- Often non-specific symptoms
- Chronic cough
- Haemoptysis
- Common systemic TB symptoms include fever, night sweats, weight loss, anorexia and malaise

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- Respiratory symptoms may not be prominent and a high index of suspicion is required
- Breathlessness may occur late when disease is extensive

Initial assessment

- Clinical signs are often few.
- CXR changes, especially in upper lobe or apical segment of lower lobe. (Note: TB can present with a wide variety of radiologic abnormalities, especially in those who may be immune compromised, including those with diabetes and/or renal impairment).
- FBC, ESR, renal and liver function.
- HIV, Hepatitis B/C, HbA1c.
- Send 2 x sputum, preferably on consecutive days, specifically for Acid Fast Bacilli smear and TB culture; consider sputum induction in those not readily producing sputum (discuss with Respiratory team).
- Routine MSU initially. Early morning urine should only be done if there is sterile pyuria or if renal TB is suspected.

When to isolate patients

- Compatible clinical history in an at risk patient, especially if currently coughing.
- Suspicious CXR changes, especially upper lobe or apical lower lobe.

- **Consider TB in all at risk patients with respiratory symptoms, especially if they have suggestive CXR changes.**
- **Manage the patient in respiratory isolation until the results of sputum AFB smears are known.**
- **Pulmonary TB can be highly infectious. In case of clinical suspicion of TB, wear N95 mask when assessing patient and move patient to negative pressure room.**
- **Induced sputum: discuss with Respiratory SMO.**

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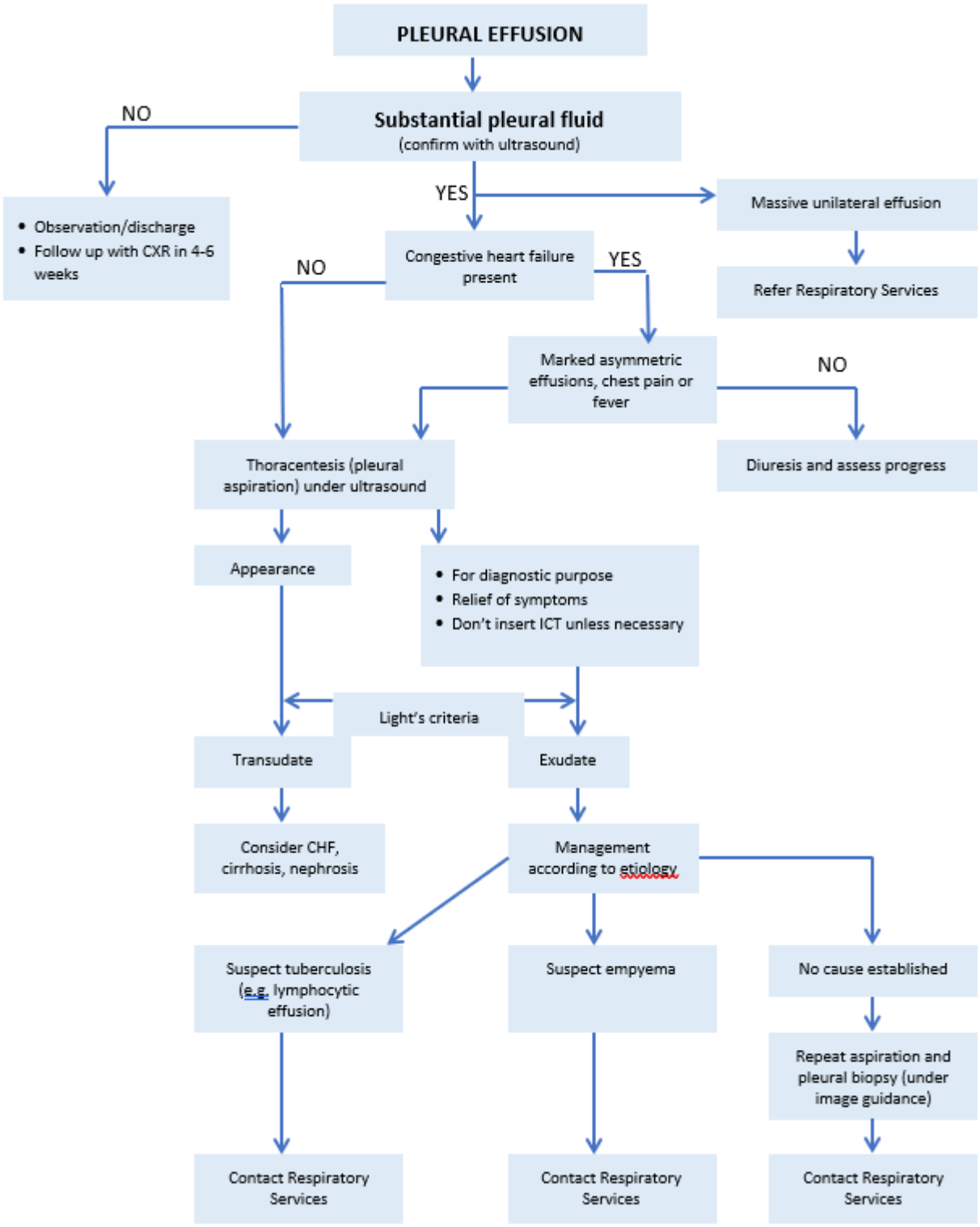
PLEURAL EFFUSION



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Investigation and management of pleural effusions

- Pleural aspiration should be performed with bedside US guidance. X-marked spot is no longer recommended. Technical competence (+/- close supervision) is an absolute pre-requisite for the performance of pleural aspiration.
- Aspiration is not required for bilateral effusions in a clinical setting strongly suggestive of pleural transudate e.g. heart failure, unless there are atypical features or failure to respond to therapy.
- If aspiration is performed, appropriate tests should be done on the fluid (see below), unless diagnosis is known and aspiration is being performed solely for relief of symptoms.

Tests on pleural fluid

- Document in clinical record the initial appearance of the fluid
- pH: requires fresh sample in capped syringe, as for blood gas analysis
- Glucose, Protein, LDH
- WCC and cell differential
- Cytology
- Gram stain and culture (including for AFB)
- Adenosine deaminase (if there is any possibility of tuberculosis)
- Serum samples for LDH, protein and glucose should be taken at the same time.
- Pleural lymphocytosis and adenosine deaminase >70 are pointers to tuberculosis (pleural fluid PCR for TB may be useful in this setting)

Light's criteria: ≥1 of follow is suggestive of exudate	
Ratio of pleural fluid protein to serum protein	>0.5
Ratio of pleural fluid LDH to serum LDH	>0.6
Pleural fluid LDH is > 2/3 the normal upper limit for serum LDH	

Criteria for complicated parapneumonic effusion/empyema

- pH <7.2
- Glucose <2.5 mmol/L
- LDH >1000 IU/L
- Turbid fluid with high WCC
- Organisms seen on Gram stain or culture
- Frank pus
- Loculation demonstrated on US or CT

These features are an indication for ICT drainage without delay.

For the management of any pleural effusion, other than simple/uncomplicated parapneumonic effusions, please make an urgent (<24 hrs) referral to Respiratory services.

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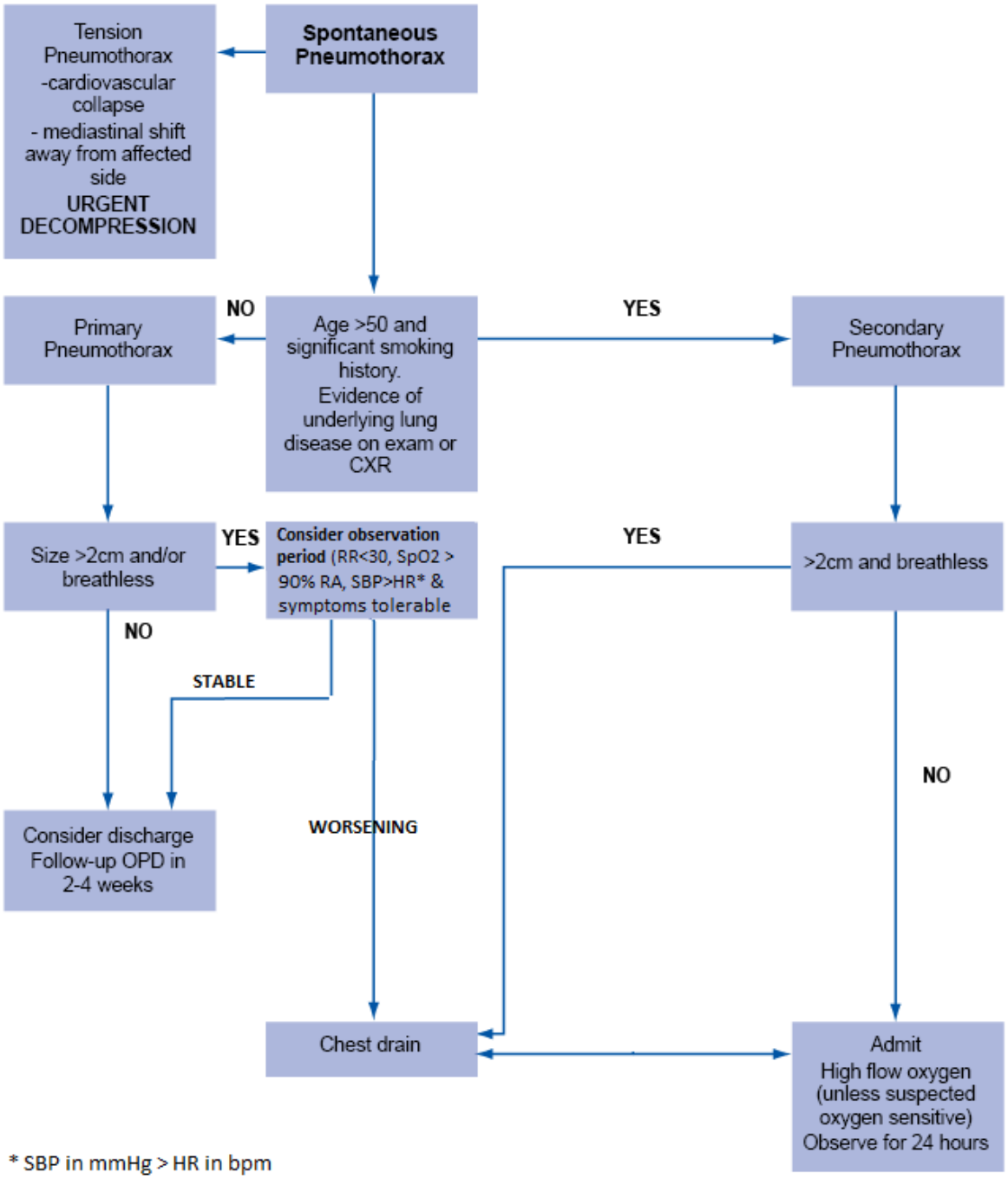
PRIMARY SPONTANEOUS PNEUMOTHORAX (PTX)

Contact Respiratory Services in all cases of pneumothorax.



A tension pneumothorax is a medical emergency.

The patient may:

- Be in severe respiratory distress
- Show signs of cardiovascular collapse:
  - Cyanosis
  - Peripheral shutdown
  - Hypotension and tachycardia

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- Have shift of mediastinum away from the affected side

Any patient showing these signs must be discussed urgently with a Registrar.

- Technical competence (+/- close supervision) is an absolute pre-requisite for the performance of pleural aspiration or ICT insertion.

A normal physical examination does not exclude a small pneumothorax.

Intercostal tube insertion

- For detailed information on aspiration (of PTX) and insertion of intercostal tubes (ICT), see British Thoracic Society guidelines.
- There is no evidence that large tubes (>20FR) are better than smaller tubes (8-14FR) in the management of PTX.
- Site of insertion is usually in the "safe triangle" (see BTS guidelines for description).

Management of ICTs

- Do not clamp chest drains during patient transfers e.g. between wards or hospitals. Development of a tension pneumothorax en-route may have disastrous consequences. Tube disconnection and redevelopment of pneumothorax while not desirable, is unlikely to have catastrophic consequences and tubing can be readily reconnected and subsequently low pressure suction applied.
- Whilst tubes may be withdrawn, tubes should never be advanced (pushed back in).
- An urgent CXR is indicated if the patient becomes increasingly short of breath or develops surgical emphysema.

Troubleshooting tips

- Ensure that intercostal tube (including tip of tube and all side-holes) is within the pleural cavity and has not "slipped out" into subcutaneous tissue.
- Ensure that all "plumbing" associated with intercostal tube, underwater seal drain (UWSD) and low pressure suction, along with all junctions, is appropriately arranged/connected and there are no leaks.
- Ensure that intercostal tube is patent: it may be necessary to check by flushing with 20-50 mL of sterile sodium chloride 0.9%.
- Suction is infrequently required and should be discussed with Respiratory Services before starting.

Subcutaneous emphysema

Any patients having this problem should be discussed with the Registrar.

- A minor degree of subcutaneous emphysema is of no consequence. If severe, it can be alarming to both doctor and patient but subcutaneous emphysema itself seldom causes serious problems.
- Possible contributing factors include:
    - Excessive skin incision and blunt dissection of intercostal space, particularly in very thin/malnourished patients.
    - Inadvertent withdrawal of tube so that side holes are aligned with intercostal space.
    - Blocked intercostal tube.
    - Inappropriate clamping of chest tube particularly in presence of ongoing air leak.

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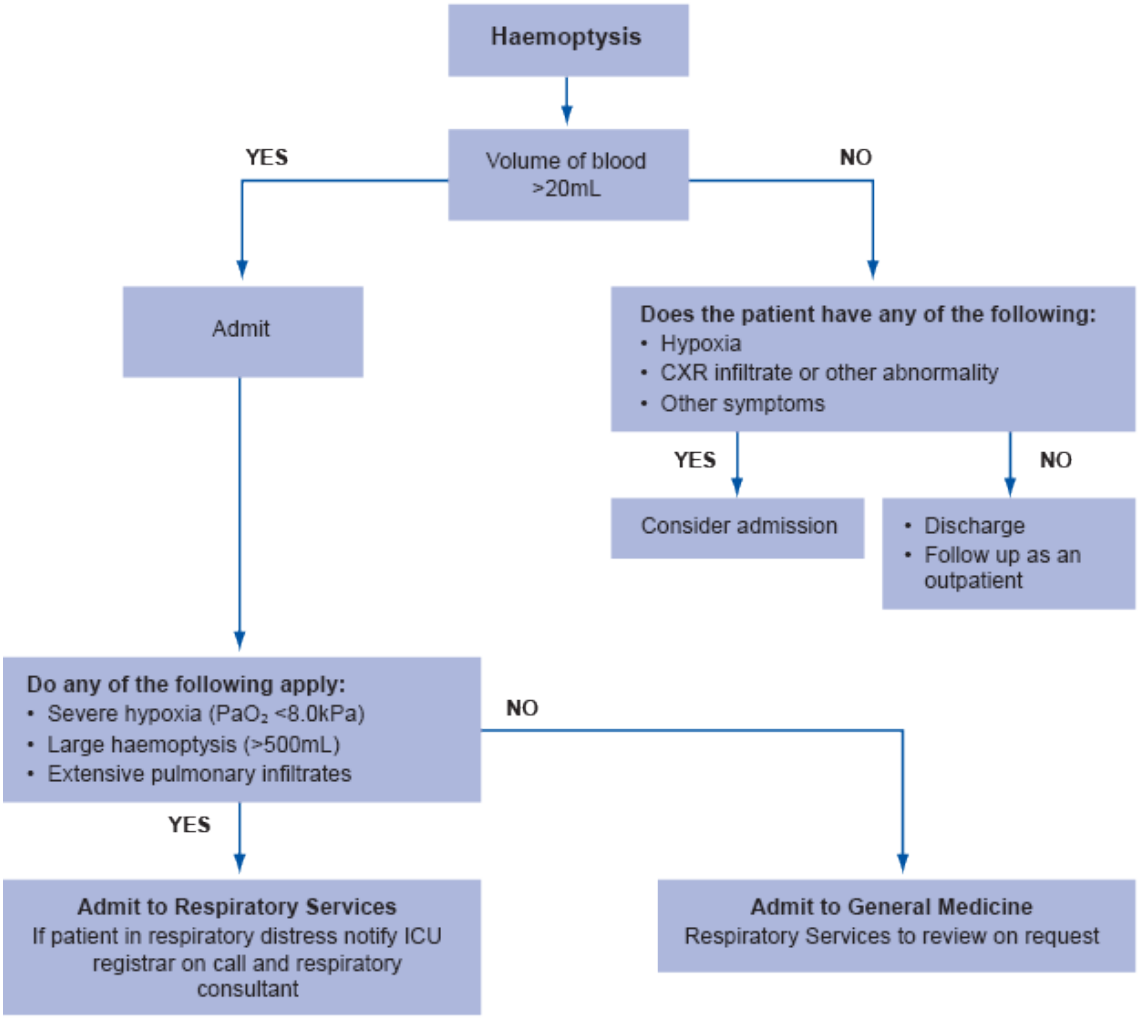
HAEMOPTYSIS

- Haemoptysis is an important symptom with a large number of causes.
- The volume of haemoptysis may not correlate with the severity or seriousness of the underlying condition.
- It is important to note that significant diffuse alveolar haemorrhage can occur with little overt haemoptysis.
- If the cause of haemoptysis is not known and TB remains in the differential then consideration should be given to respiratory isolation.
- The most important aspect of acute management of significant haemoptysis is to suppress cough and aim to protect the "good lung".
- The mode of death in acute haemoptysis is aspiration of blood and hypoxaemia (and not hypovolaemia).
- At times the patient is the best judge of the site of bleeding.
- If they can localize it to one side then the patient should lie with the affected side in a dependent position.
- IV morphine should be titrated to suppress cough.
- Care should be taken to ensure adequate oxygenation.



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PULMONARY EMBOLISM

(See Thrombosis and Anticoagulation chapter)

Severity of PE

Minor symptoms: Normal CXR Normal O_2 Sat and ECG Segmental clot only No comorbidity	• Consider outpatient therapy with enoxaparin + anticoagulation, in liaison with thrombosis services • Close DN/GP observation or admit to General Medicine
Moderate symptoms: Low clot burden can be life-threatening in patients with limited cardiorespiratory reserve Mild hypoxaemia Lobar clot Normal echo	• Admit to General Medicine and anticoagulate • Check NT-proBNP, TnT
Severe symptoms: Respiratory distress Marked hypoxaemia Systemic hypotension RV dysfunction on echo CTPA saddle embolus or RV/LV ratio ≥1.0 on CTPA	• Call CVICU/ICU • Call Respiratory Services • May need thrombolysis

Remember:

- **No symptoms/signs or ABG/CXR/ECG findings are sensitive or specific for PE**
- **The clinical utility of the D-Dimer assay lies in its negative predictive value**

Treatment for pulmonary embolism

(See Thrombosis and Anticoagulation chapter)

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THROMBOLYSIS

Always discuss with appropriate Specialist.

Indications for thrombolysis:

High risk: haemodynamic instability

- Systolic BP <90 mmHg for >15min
- BP fall by >40 mmHg for >15min despite resuscitation
- Cardiogenic shock
- Cardiac arrest secondary to PE

Intermediate-high risk: haemodynamically stable, considered on case by case basis

- RV dysfunction
- Raised NT-proBNP and/or raised TnT
- Hypoxia

Contraindications to thrombolysis:

These are all relative in a patient who has a life-threatening PE. Each case should be considered on a case by case basis.

- In case of **submassive PE**, there is no proven benefit in patients aged >75 (above this age, risk of bleeding is high, including ICH). For patients with massive PE, however, thrombolysis may still be appropriate.
- Patient is for palliative care only (irrespective of diagnosis)
- Significant uncontrolled hypertension (SBP >180 mm Hg **OR** DBP >110mmHg)
- History of recent head injury within 4 weeks
- Recent ischaemic stroke e.g. within 3 months
- Previous intracranial haemorrhage or known structural cerebral vascular lesion, or intracranial malignant neoplasm
- Suspected aortic dissection
- History of recent GI haemorrhage within 4 weeks
- Recent brain or spinal cord surgery
- Other major bleeding risk (e.g. active bleeding, active peptic ulcer disease, bleeding tendency, major surgery within 3 weeks, pregnancy, childbirth within previous 30 days)
- IVC filter or thrombectomy within last 4 days

Cautions

- Therapeutic doses of blood-thinning medications (may require reversal)

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- Hypersensitivity to gentamicin and other aminoglycosides (residue from manufacturing process)
- History of severe chronic poorly controlled hypertension
- Traumatic or prolonged (>10 min) CPR

Alteplase dose regimen (Consult SMO for dose)
Total maximum dose of 100 mg administered over 2 hours. 10 mg as an IV bolus over 1 - 2 minutes, immediately followed by 90 mg as an IV infusion over 2 hours
***Total maximum dose of 50 mg administered over 2 hours** 10 mg as an IV bolus over 1 – 2 minutes, immediately followed by The remaining dose as an IV infusion over 2 hours

*__Half dose (50 mg)__ thrombolysis may be considered in the frail, elderly or small patients, or those with relative contraindications to full dose thrombolysis such as increased risk of bleeding complications.

SLEEP DISORDERED BREATHING

- Patients with suspected OSA should be discussed with Respiratory Services and the majority will be investigated as outpatients following discharge if appropriate.
- Patients with hypercapnic respiratory failure and/or respiratory acidosis (on arterial blood gas) will require inpatient review.
- Referrals should include details of clinical features of sleep disordered breathing (snoring, witnessed apnoeas and/or choking arousals) and a history of sleepiness (either subjectively or objectively with an Epworth sleepiness score).
- Any history of motor vehicle accident or near miss due to sleepiness should be specifically mentioned in the referral. It is critically important to identify commercial drivers, machine operators or those who are at risk of losing their job.

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Rheumatology

WHO TO CALL

Inpatient consultations: contact the Rheumatology Registrar between 8am-5pm Mon-Fri.

After hours (5pm-8am) – there is an on-call Consultant Rheumatologist available via operator for urgent matters.

The Rheumatology Service is based at Greenlane Clinical Centre and only available for consultation service at Auckland Hospital for a few hours each day (time varies day-to-day). Consultant ward rounds for inpatient referrals occur twice per week (usually on a Monday afternoon and Thursday morning).

Outpatient referrals: please send an eReferral.

CONDITIONS DISCUSSED

RHEUMATOID ARTHRITIS

TEMPORAL ARTERITIS (GCA)

POLYMYALGIA RHEUMATICA (PMR)

VASCULITIS

SYSTEMIC LUPUS ERYTHEMATOSUS (SLE)

SPONDYLOARTHROPATHY

ACUTE MONOARTHRITIS

HAEMARTHROSIS

SEPTIC ARTHRITIS

GOUT

PSEUDOGOUT

FIBROMYALGIA

ESSENTIAL INFORMATION TO HAVE BEFORE REFERRING

- Examination of the affected joints/organ systems
- FBC, creatinine, LFTs
- CRP (or ESR)
- Joint aspirate if available
- Gram stain and culture (MC+S)
- Cell counts and differential
- Polarised light examination for crystals

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- X-ray joint (especially if history of trauma)
- X-ray of hands and feet if rheumatoid arthritis suspected
- When indicated from history:
- Tissue type – HLA-B27
- Serum urate level if concern for gout
- Swab throat, cervix, urethra, anus, MSU (*N. gonorrhoeae, Chlamydia trachomatis*)
- Culture faeces (*Yersinia, Salmonella, Campylobacter*)
- Ferritin and iron saturation if haemochromatosis suspected
- Serological testing for rheumatoid arthritis (rheumatoid factor and anti-CCP antibodies)
- Antinuclear antibodies/complement (if concern for SLE/another connective tissue disease)
- ANCA if concern for ANCA vasculitis
- MSU and urine P:Cr ratio if suspect connective tissue disease/vasculitis
- Blood culture if infection suspected: 2 sets
- If gonococcal infection is suspected, inform the laboratory as special cultures are required
- Coagulation profile if bleeding disorder suspected

RHEUMATOID ARTHRITIS

- Features suggestive of Rheumatoid Arthritis (RA)
- Arthritis affecting 3 or more joints
- Morning stiffness in joints >1 hour
- Symptom duration of >6 weeks
- Symmetrical arthritis
- Swelling of the wrist, MCP or PIP joints
- Positive Rheumatoid factor or anti-cyclic citrullinated peptide (CCP) antibody
- Subcutaneous nodules
- Radiographic erosions

INVESTIGATIONS

Blood tests

- Rheumatoid Factor (RF)
- Anti-CCP antibodies (high specificity for RA)
- Elevated CRP/ESR

Radiographs

- X-ray hands and feet for erosions

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TREATMENT OF RHEUMATOID ARTHRITIS (IN CONSULTATION WITH RHEUMATOLOGY TEAM)

1. Symptom control for flare/acute presentation

- NSAIDs if no contraindication e.g. naproxen 500 mg BD, with food, for 3 days, then reduce dose. Usual maintenance dose 250 mg BD, can be administered as 500 mg once daily. Beware of renal/liver impairment, heart failure, peptic ulceration and blood dyscrasias.
- Corticosteroids
- Intra-articular if 1-2 joints involved
- Intramuscular e.g. methylprednisolone (Depo-Medrol®) 80-120 mg
- Oral e.g. prednisone 15-20 mg once daily initially. For short courses taper by 2.5 mg or 5 mg every 2 to 4 days according to response.

2. Disease modifying anti-rheumatic drugs (DMARDS)

Non-biologic DMARDS

- Methotrexate
- Sulfasalazine
- Leflunomide
- Hydroxychloroquine – after 5 years of therapy, requires annual monitoring of potential retinal toxicity by Ophthalmologist.

All require regular monitoring of FBC, LFTs and renal function.

Beware bone marrow suppression, hepatotoxicity, pneumonitis and increased risk of infection.

Remember several are potentially teratogenic and should be avoided in women of child-bearing potential.

Biologic DMARDS

- Anti-TNFα agents; adalimumab, infliximab, etanercept
- B cell depleting therapy; rituximab
- Anti-IL-6; tocilizumab
- JAK-inhibitor; upadacitinib

When to refer in rheumatoid arthritis:

- All suspected new diagnoses of rheumatoid arthritis.
- Any patient admitted on biologic DMARDS should be discussed with the Rheumatology team. These patients have a high risk of infection and should be investigated for such and treated promptly as appropriate including blood cultures. They may not show clinical signs of infection such as fever.
- Reactivation of latent tuberculosis is a recognised complication of anti-TNFα therapy. Patients may present in an atypical fashion, and disease may be extra-pulmonary. The use of biologic DMARDS is restricted – refer to Medicines Management and Hospital Medicines List (HML) for details.

TEMPORAL ARTERITIS (GIANT CELL ARTERITIS)

Occurs in patients >50 years old

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Features suggestive of GCA

- New onset headache
- Scalp tenderness
- Jaw claudication
- Visual change
- Elevated inflammatory markers
- PMR symptoms; proximal limb girdle pain and stiffness

If suspicious of GCA

- Discuss with Rheumatology team urgently
- Commence prednisone 40-60 mg PO daily
- Temporal artery biopsy (TAB) vs. temporal artery Doppler ultrasound.

  Rheumatology Service will provide guidance around which of these tests to pursue.

  Note: During the COVID-19 pandemic, access to TABs was heavily restricted. A small number of TABs are currently being performed. A negative TAB does not exclude GCA given the presence of skip lesions. Temporal artery ultrasound is a specialised scan which is performed by a small number of Rheumatologists and is not usually performed by the Radiology Service.
- If any visual symptoms seek urgent Ophthalmology referral via the on-call Ophthalmology Registrar.

POLYMYALGIA RHEUMATICA (PMR)

Occurs in patients >50 years (average age ~70 years)

Insidious onset. Proximal hip/shoulder girdle pain and stiffness leading to impaired function. Typical history of difficulty standing up out of a low chair and difficulty raising their arms above their head. They should not be objectively weak but pain can limit movement.

Associated with elevated inflammatory markers. Ensure you exclude infection.

Rapid improvement with prednisone (note: this is not a specific feature for PMR but is unusual if absent).

On a spectrum with GCA. Ensure you screen for potential GCA.

Note: there is a wide differential for hip/shoulder girdle symptoms in this age group.

Consider

- **Mechanical**: rotator cuff dysfunction, adhesive capsulitis, trochanteric bursitis
- **Degenerative**: cervical/lumbar spondylosis, osteoarthritis
- **Inflammatory**: PMR-onset rheumatoid arthritis, spondyloarthropathy, myositis, GCA
- **Neoplastic**: solid organ or haematological. Ensure up to date for all age-related screening (mammograms, cervical smears, prostate check, bowel cancer screening). Full systems enquiry for any unexplained symptoms. CXR if smoking history.
- **Metabolic**: hypothyroidism, hyperparathyroidism, osteomalacia
- **Infection**: viral, bacterial (including TB), septic arthritis
- **Other**: chronic pain syndrome, drug-induced myalgia

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Treatment

- Unlike with GCA, urgent initiation of steroids is not necessary and can be delayed to allow full assessment.
- Check inflammatory markers (CRP/ESR) BEFORE starting steroids.
- British Society of Rheumatology (BSR) 2009 guidelines are comprehensive.
- Suggested regimen: 15 mg prednisone PO once daily for 2-4 weeks (until good symptomatic improvement). Then taper by 2.5 mg every 2-4 weeks until at 10 mg once daily. Then taper by 1 mg every 4-8 weeks until finished. Usually 1-2 years of treatment is needed.
- Other considerations: bone protection, gastro-protection

When to refer in PMR

- Doubt about the diagnosis
- Any concern of GCA
- Inability to taper prednisone
- Note that the majority of PMR cases are managed in the community. If the presentation/response to treatment is typical, this does not require rheumatology follow-up.

ANCA-ASSOCIATED VASCULITIS (AAV)

GRANULOMATOSIS WITH POLYANGIITIS (GPA)

MICROSCOPIC POLYANGIITIS (MPA)

EOSINOPHILIC GRANULOMATOSIS WITH POLYANGIITIS (EGPA)

Perform a full systems enquiry. AAV is a multi-system disease and can present in many ways.

Features suggestive of AAV:

- **Rash**: livedo reticularis, petechial/purpuric rash on trunk/limbs
- **Rhinosinusitis**: nasal ulcers, nasal crusting, epistaxis, nasal polyps, sinusitis
- **Arthritis**: synovitis (often lower limb joints)
- **Renal**: frank haematuria, hypertension, frothy urine, peripheral oedema, rapid progressive renal impairment on biochemistry, active urinary sediment on MSU
- **Respiratory**: haemoptysis, new cough, breathlessness, pulmonary nodules, pleural effusion
- **Ophthalmological**: uveitis, retinal vasculitis, optic neuropathy,
- **Neurological**: mononeuritis multiplex, peripheral neuropathy, cranial nerve palsy

Investigations

- FBC, creatinine, LFTs,
- CRP/ESR
- ANCA
- MSU/uPCR, casts

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- CXR
- Serology: hepatitis B and C
- Anti-GBM antibodies (if clinical picture of nephritis/pulmonary haemorrhage)
- The gold standard investigation to confirm the diagnosis of AAV is a biopsy of an affected organ Consider biopsy of skin, kidney, lymph node, lung, sural nerve, sinus (low yield).
- A positive ANCA can be supportive of the diagnosis

When to refer in AAV

- Any suspected new diagnosis of AAV
- Any patient with confirmed AAV who may be having a flare

SYSTEMIC LUPUS ERYTHEMATOSUS (SLE)

Perform a full systems enquiry. SLE is a multi-system disease and can present in many ways.

Features suggestive of SLE (often more than 1 present)

- Typical rash: malar (butterfly) rash, photosensitivity, discoid rash
- Mouth/nasal ulcers
- Alopecia
- Raynaud's phenomenon
- Arthralgia/arthritis
- Serositis: pericarditis or pleuritis (+/- effusions)
- Neurological symptoms; seizures, psychosis, cognitive dysfunction, peripheral and cranial neuropathies
- Cytopenias: anaemia, thrombocytopenia, neutropenia, lymphopenia
- Constitutional symptoms: unexplained weight loss, fatigue, drenching night sweats, lymphadenopathy
- Nephritis: frank haematuria, hypertension, frothy urine, peripheral oedema
- Ophthalmologic: keratoconjunctivitis sicca (dry eyes), scleritis, optic neuritis, retinal vasculitis

Investigations

- FBC, creatinine, LFTs
- C3/C4 (low in active lupus)
- CRP/ESR (may be elevated in active lupus)
- CXR/ECG
- MSU, casts and uPCR (looking for active urinary sediment)
- Positive ANA (note up to 10% of healthy subjects have positive ANA)
- Presence of antibodies to extractable nuclear antigens (ENA): anti-Ro, anti-La, anti-Sm, anti-dsDNA, (and many others)

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- If SLE confirmed, check the antiphospholipid antibodies (lupus anticoagulant, anticardiolipin antibodies, anti-B2-glycoprotein-1 antibodies)

When to refer in SLE

- All patients with suspected diagnosis of SLE
- All patients with a confirmed diagnosis of SLE who are felt to be having a disease flare
- If concern of renal disease, please discuss additionally with the renal department

SPONDYLOARTHROPATHIES

Spondylo = involvement of the spine **Arthropathy = joint disease**

There are several inflammatory arthritides which involve the spine and pelvis (+/- peripheral joints).

These include ankylosing spondylitis, psoriatic arthritis, enteropathic arthritis, reactive arthritis.

Potential clinical features

- Back pain and stiffness that is: worse in the morning, lasts >30 minutes and improves with movement
- If present, peripheral joint involvement can be asymmetric or symmetric
- Skin psoriasis
- Family history of skin psoriasis
- Dactylitis of fingers/toes
- Uveitis
- History of inflammatory bowel disease
- Preceding gastrointestinal/genitourinary infection
- Nail pitting or onycholysis (nails lifting off from nailbed without trauma)
- Enthesitis (inflammation of the tendon insertion points) – achilles, plantar fascia, lateral epicondyle “tennis elbow”, medial epicondyle “golfers elbow”, femoral condyle, greater trochanter etc

Investigations

- FBC, U&E, LFTs (guides appropriate treatment)
- HLA B27 – genetic predisposition seen in 90% of ankylosing spondylitis and 60% of psoriatic arthritis (but also in 5-10% of the healthy Caucasian population)
- Urinary culture for gonorrhoea and chlamydia if concern for reactive arthritis
- Stool specimen to look for gastrointestinal infection (if suggestive history)
- X-ray pelvis to look for sacro-iliitis – especially in ankylosing spondylitis

  (in early or mild disease this may initially be normal)

Treatment

- Depends on severity, location of disease and patient factors.

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- For peripheral disease, treatment is similar to other inflammatory arthritis with use of NSAIDs/steroids/DMARDs/bDMARDs as needed. DMARD use should be recommended and monitored by a rheumatologist.
- For spinal disease, conventional DMARDs are not effective. NSAIDs are first line therapy with escalation to biological DMARDs (bDMARDs) if needed.
- Physiotherapy guided spinal flexibility exercises are an important long-term treatment.

MONOARTHRITIS

Acute swelling of a single joint.

Possible causes

1. Trauma
2. Atraumatic haemarthrosis
3. Infection (septic arthritis signs may be modified if on steroids or in the elderly)
4. Crystal arthritis (gout and pseudogout)
5. Reactive arthritis
6. Rheumatoid arthritis
7. Other conditions e.g. psoriatic arthritis, enteropathic arthritis, palindromic rheumatism, osteoarthritis

Investigations

The most helpful investigation for unexplained monoarthritis is aspiration of the joint.

Other:

- FBC, creatinine, LFTs
- Coagulation profile (if haemarthrosis)
- Peripheral blood culture (if concern for infection/febrile)
- Serum urate (if possible gout)

HAEMARTHROSIS

- Immobilise joint
- If bleeding disorder suspected do not aspirate joint before seeking advice. However, if blood is found unexpectedly on a diagnostic tap, aspirate as much as possible.
- Traumatic haemarthrosis should be reviewed by Orthopaedics
- Unless trauma is clearly the cause, refer to Haematologist as a bleeding disorder is likely
- Rheumatology do not routinely get involved with haemarthroses

SEPTIC ARTHRITIS

- Consult Orthopaedics

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- Splint joint and give analgesia
- Arthroscopic washout often needed
- Ensure joint is aspirated and fluid sent for culture before starting antibiotics; consult with Orthopaedic Service
- Consult with ID regarding appropriate antibiotics
- If infection is excluded (with an aspiration of the joint), then consult Rheumatology

CRYSTAL ARTHRITIS

GOUT

Treatment of acute gout flares

- If a patient has been taking allopurinol at the time of developing an acute attack, **it should be continued at the same dose.**
- **NSAIDs**: beware of renal/liver impairment (avoid if eGFR <30 ml/min/1.73m^2), heart failure, peptic ulceration and blood dyscrasias. Initially naproxen 750 mg, followed by 500 mg after 8 hours, then reduce to 250 mg every 8 hours until attack has resolved.
- **Colchicine** can be a useful adjunct to NSAIDs in resistant cases, particularly when tophi are present, or can be used as monotherapy. Colchicine has a low benefit to toxicity ratio. Suggested regimen 1 mg STAT, then 0.5 mg q6h (maximum of 2.5 mg in first 24 hours then 1.5 mg per 24 hours). Do not repeat acute course within three days. Dose reduction is necessary in renal insufficiency (eGFR 10-50ml/min/1.73m^2). Reduce the initial dose by half and do not exceed 1.5 mg over three days. Reduce dose/discontinue if gastrointestinal side effects occur (nausea, vomiting, diarrhoea). Do not commence prophylaxis (very low dose colchicine) until 12 hours or more after acute dose is taken.
- **Oral corticosteroids** may be used to treat acute gout either in patients for whom NSAIDs are contraindicated or those who are unable to take colchicine, provided sepsis has been excluded. The initial dose is prednisone 15-40 mg daily (depending on age/body habitus/severity), gradually tapered over 10 days.
- Intra-articular corticosteroids are useful if monoarthritis is present, and to avoid systemic therapy.
- Check serum urate: aim for level ≤0.36mmol/L (note that serum urate appears falsely lowered during an acute gout flare and review of historical urate levels is recommended).

Gout prevention: urate lowering therapy

Indications:

- Multiple gout attacks (≥2 per year)
- Tophaceous gout
- Erosive changes on radiographs
- Young patient, family history, hyperuricaemia >0.6mmol/L
- Concomitant renal or cardiovascular disease
- Concomitant diuretic or patients at risk of developing tumor lysis syndrome

Treatment options

- Xanthine oxidase inhibitor (allopurinol)

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- Uricosuric agents (probenecid)

Allopurinol

- Should be started at 50-100 mg daily and increased by 50-100 mg increments at 3-4 weekly intervals aiming for target serum urate level ≤0.36 mmol/L (dose range: 50-900 mg daily).
- For those with significant disease burden (multiple joints affected or widespread tophi), the use of prophylactic colchicine (0.5-1 mg daily or alternate days, is recommended when initiating allopurinol and for at least 3 months following normalisation of urate (or longer if tophi are present). This is to avoid prolongation of attacks of acute gout. Monitor for neuromyopathy, especially in those with concomitant renal impairment and/or myopathic drugs like statins (HMG-CoA reductase inhibitors). Colchicine should not be used with macrolide antibiotics.
- Patients on treatment for chronic gout should have monitoring of serum urate levels at least 3 monthly.

Consider cardiovascular risk assessment and management in all patients presenting with gout.

PSEUDOGOUT

Acute pseudogout (calcium pyrophosphate dihydrate (CPPD) crystal arthritis)

Diagnosis: aspiration of an affected joint to confirm CPPD crystals

Treatment:

- If only 1 or 2 joints involved, the best treatment is intra articular injection of steroid (triamcinolone or methylprednisolone – dose dependent on size of joint(s) involved
- If more than 2 joints are involved, then the treatment algorithm is the same as for acute management of gout.

When to refer in crystal arthritides

- Doubt about diagnosis
- Failure to achieve prompt resolution of acute attack
- Recurrent acute attacks
- Development of progressive bone and joint damage on x-ray
- Difficulty normalising serum urate level ≤0.36 mmol/L

FIBROMYALGIA (FMG)

In Auckland hospital we do not have the capacity to follow-up probable FMG cases. This is largely managed in the community with involvement of the Pain Service.

When we do see FMG, it is to exclude other pathology.

Clues for diagnosis of FMG:

- Widespread pain throughout body not confined to the joints alone (often described as pain in the “whole body”)
- Hyperalgesia to non-painful stimuli

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- Myofascial pain – look up the typical FMG trigger points
- Absence of inflammatory features (morning pain, morning stiffness, objective synovitis)
- Poor quality sleep
- Numerous somatic symptoms: gastrointestinal disturbance, difficulty concentrating, poor memory, low mood etc.
- Unresolved psychological distress

Management

- Reassurance and patient education are the mainstay of treatment.
- Largely non-pharmacological. Avoid opiates. Consider a low dose tricyclic antidepressant.
- Referral to the community pain service for patient education

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SEXUAL HEALTH INTRANET SITE

WHO TO CALL AND REFERRALS

Referrals can be made via eReferral. Ring the on-call Sexual Health Registrar (available 9am-5pm) for clinical advice or if a referral is urgent.

If you are unable to make contact with the Sexual Health Registrar, call the triage nurse who can assist with enquiries.

We will assess urgently:

- New diagnoses or contacts of HIV or syphilis
- Acute or atypical genital ulceration
- Men who have sex with men (MSM) who develop acute proctitis symptoms
- STIs in pregnancy
- HIV nPEP (non-occupational post-exposure prophylaxis) if presents during normal clinic hours

Information to have when calling the Sexual Health Registrar

- Patient name, age and NHI
- Clinical issue
- Any specific risk factors?
- e.g. sex overseas, partner with STI/HIV, MSM, intravenous drug use, on HIV PrEP (pre-exposure prophylaxis)

Priority populations can self-refer, although a referral is preferable to ensure that the patient is followed up:

- People aged under 30
- Māori or Pacific Island
- MSM
- Trans or gender diverse people
- People living with HIV
- Contacts of HIV or syphilis
- People who inject drugs
- Sex workers
- Unemployed or people with a community services card

Non-priority populations require a referral to access the service

Services

- STI screening for priority populations only

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- Complex STI management including HIV and syphilis
- Syphilis contact tracing (email: STScontacttracing@adhb.govt.nz)
- HIV nPEP and HIV PrEP
- Management of chronic, recurrent vaginal discharge
- Management of chronic, recurrent urethritis in men
- Chronic genital pain
- Genital dermatology opinions
- Gender affirming treatment for trans and gender diverse people

SPECIFIC TREATMENT GUIDELINES

Guidelines for diagnosis and management of specific sexually transmitted infections can be found on either:

- Auckland Regional Health Pathways https://aucklandregion.healthpathways.org.nz/ (need to search under sexual health or specific infection)
- Aotearoa New Zealand STI Management Guidelines for Use in Primary Care www.sti.guidelines.org.nz

STI TESTING

Make sure you know the correct specimens to take. **Note: there is currently a syphilis outbreak in Auckland so serology for syphilis and HIV is recommended as part of a full STI screen for all patients.** All reactive serologic tests for syphilis will be forwarded by the laboratory to the sexual health contact tracers to follow up. Refer any suspected cases to the Sexual Health Service by ringing the Sexual Health Registrar on call.

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SPECIMEN COLLECTION

Males	Females
• Serology for HIV and syphilis. • First void urine (first 30mL of stream) for chlamydia and gonorrhoea testing. • Urethral culture swab for gonorrhoea if frank urethral discharge on examination. It is not necessary to insert the swab into the urethra. • MSM – will also need rectal and pharyngeal NAAT swabs for chlamydia and gonorrhoea testing. These swabs may be self-collected if asymptomatic. Discuss with or refer to Sexual Health if anorectal symptoms as proctoscopy may be required) **Note:** Throat and rectal infection with chlamydia and gonorrhoea is usually asymptomatic. • Insert swab 3-4cm into anal canal, gently rotate for 10 seconds, remove and put back in swab container (can also be self-collected by patient when going to toilet to collect urine specimen). • MSM who have anorectal symptoms e.g. discharge, tenesmus or bleeding need to be referred to the Sexual Health Clinic for assessment.	• Serology for HIV and syphilis. **Ideally all symptomatic females should have a speculum examination, visualization of the cervix and appropriate swabs taken.** • Take vulvovaginal NAAT swab for gonorrhoea, chlamydia and *Trichomonas vaginalis* **prior to insertion of speculum AND** endocervical culture swab for gonorrhoea if PID, or known contact of gonorrhoea. • Take vaginal culture swab for yeast and bacterial vaginosis **only if** vulvovaginal symptoms (e.g. vaginal discharge, itch, odour or irritation). **If a speculum examination is not possible then the patient or clinician can take blind swabs.** • Vaginal NAAT swab for chlamydia, gonorrhoea and trichomoniasis. • Vaginal culture swab for yeast and bacterial vaginosis if has vulvovaginal symptoms.

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1. Vulvovaginal NAAT swab for chlamydia, gonorrhoea and trichomonas
2. First void urine for chlamydia and gonorrhoea
3. Culture swab (endocervical or urethral for gonorrhoea, high vaginal for bacterial vaginosis and candida)
4. Viral swab for herpes

Note: Appearance of swabs may change depending on supply – check with Charge Nurse if unsure.

- HIV and syphilis serology is collected in the standard orange top tubes for serology

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MALE URETHRAL DISCHARGE AND/OR DYSURIA

Patient complains of urethral discharge and/or dysuria

Recommended tests:

- First catch urine (first 30 mL of stream) for chlamydia and gonorrhoea
- Urethral swab for gonorrhoea culture prior to passing urine if frank urethral discharge is present. It is not necessary to insert the swab into the urethra.

NOTE: if urinary symptoms predominate e.g. urgency/frequency/dysuria then evaluate also for possible UTI-MSU and urinalysis

Examination findings:

- Profuse purulent penile discharge?

Treat for presumptive gonorrhoea with:

- Ceftriaxone 1g STAT IV or 500 mg STAT IM (make up IM with 2 mL lignocaine 1% or as per data sheet) **PLUS**
- Azithromycin 1g po STAT

Treat for non-gonococcal urethritis with:

- Doxycycline 100 mg po twice daily for 7 days

Follow-up and partner notification:

- Advise the patient that all sexual contacts in the last 3 months should be informed so they can have a sexual health check and treatment at their GP, Sexual Health Clinic or Family Planning Clinic.
- Advise to use condoms or abstain from sex for 7 days after initiation of treatment or until 7 days after all sexual contacts have been treated.
- Gonorrhoea is a notifiable infection. The notification form is available here
- For printable patient information see here

This guideline is based on the Aotearoa New Zealand STI Management Guidelines for Use in Primary Care

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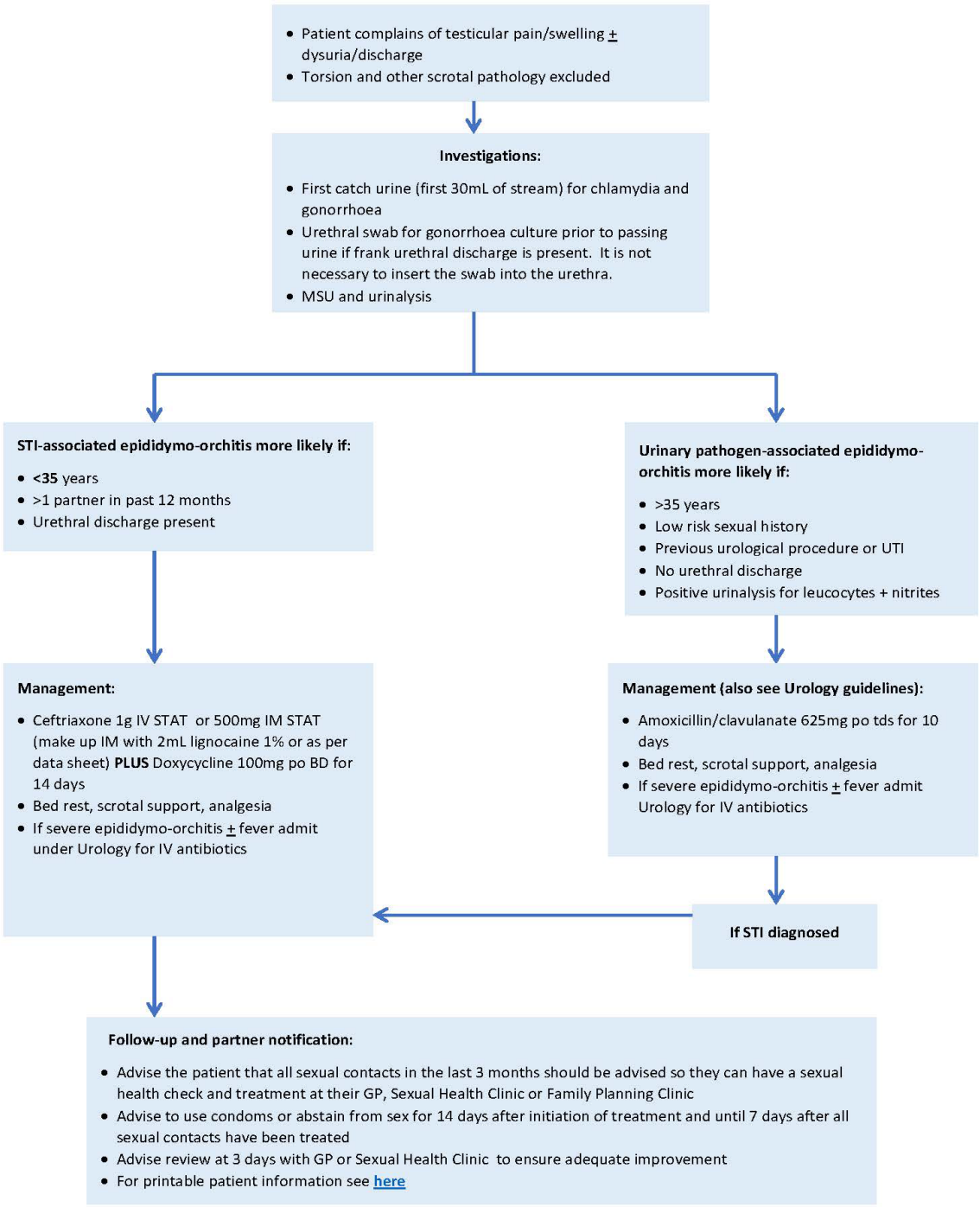
EPIDIDYMO-ORCHITIS



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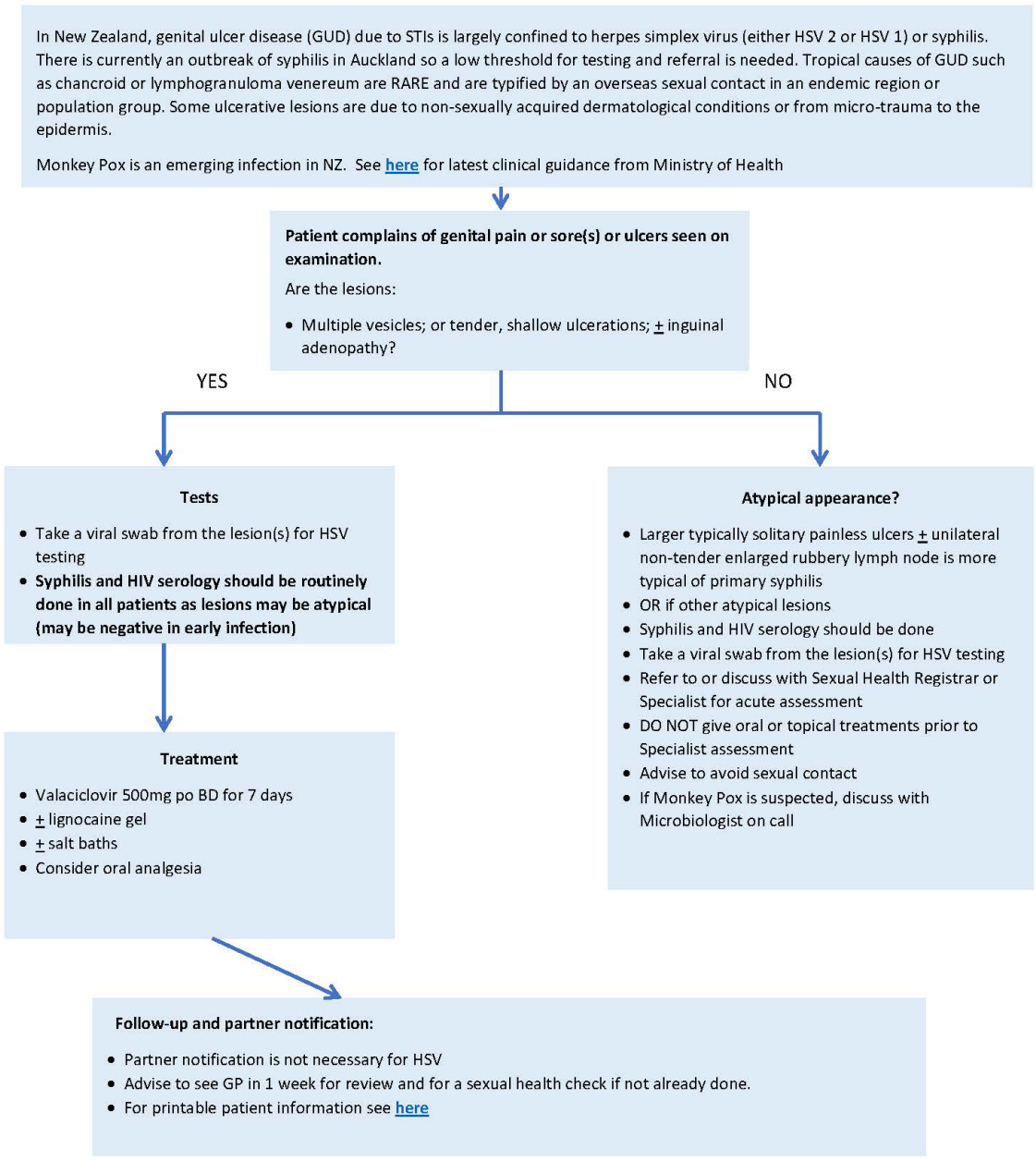
GENITAL ULCER DISEASE



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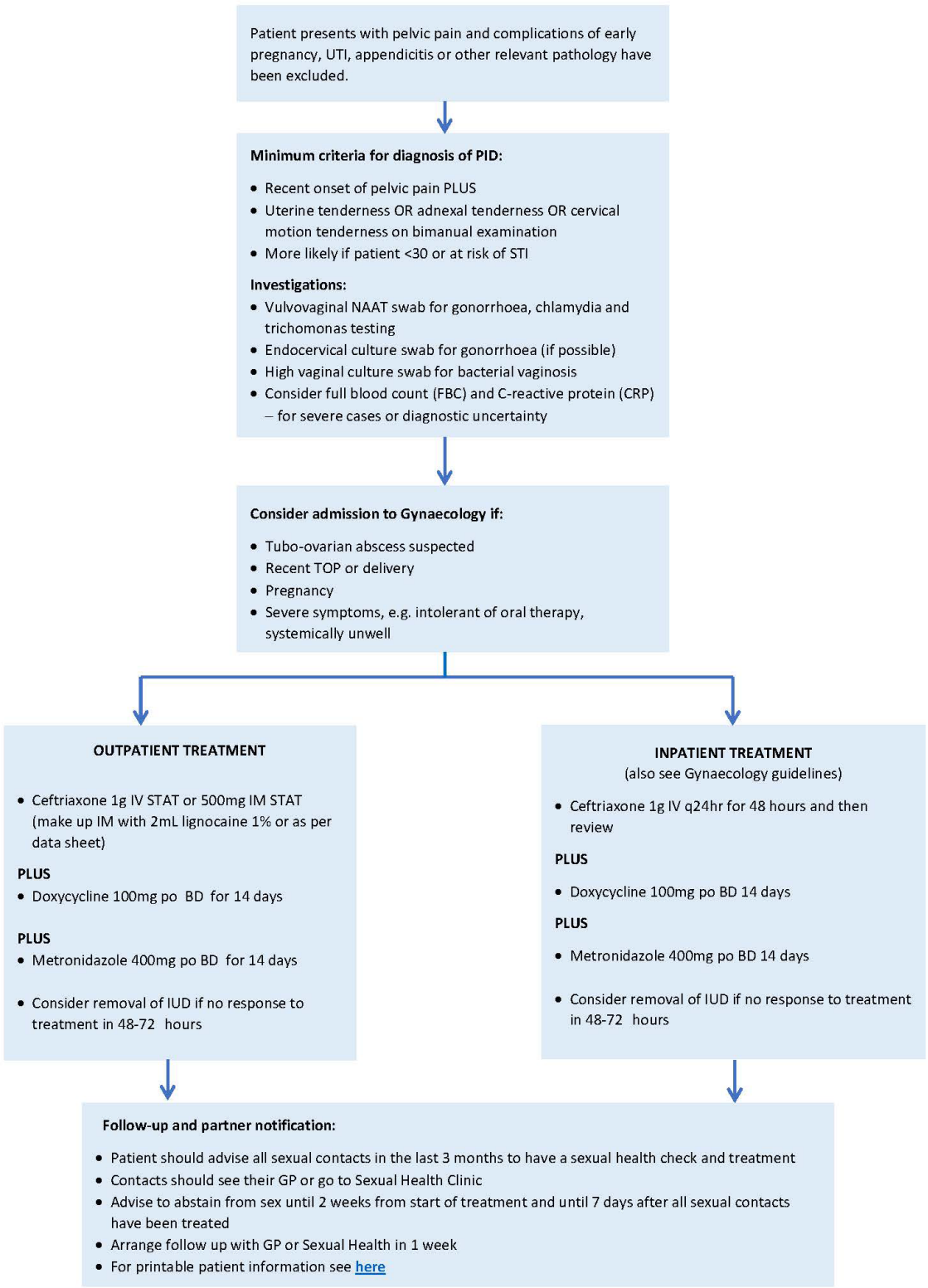
PELVIC INFLAMATORY DISEASE (PID)



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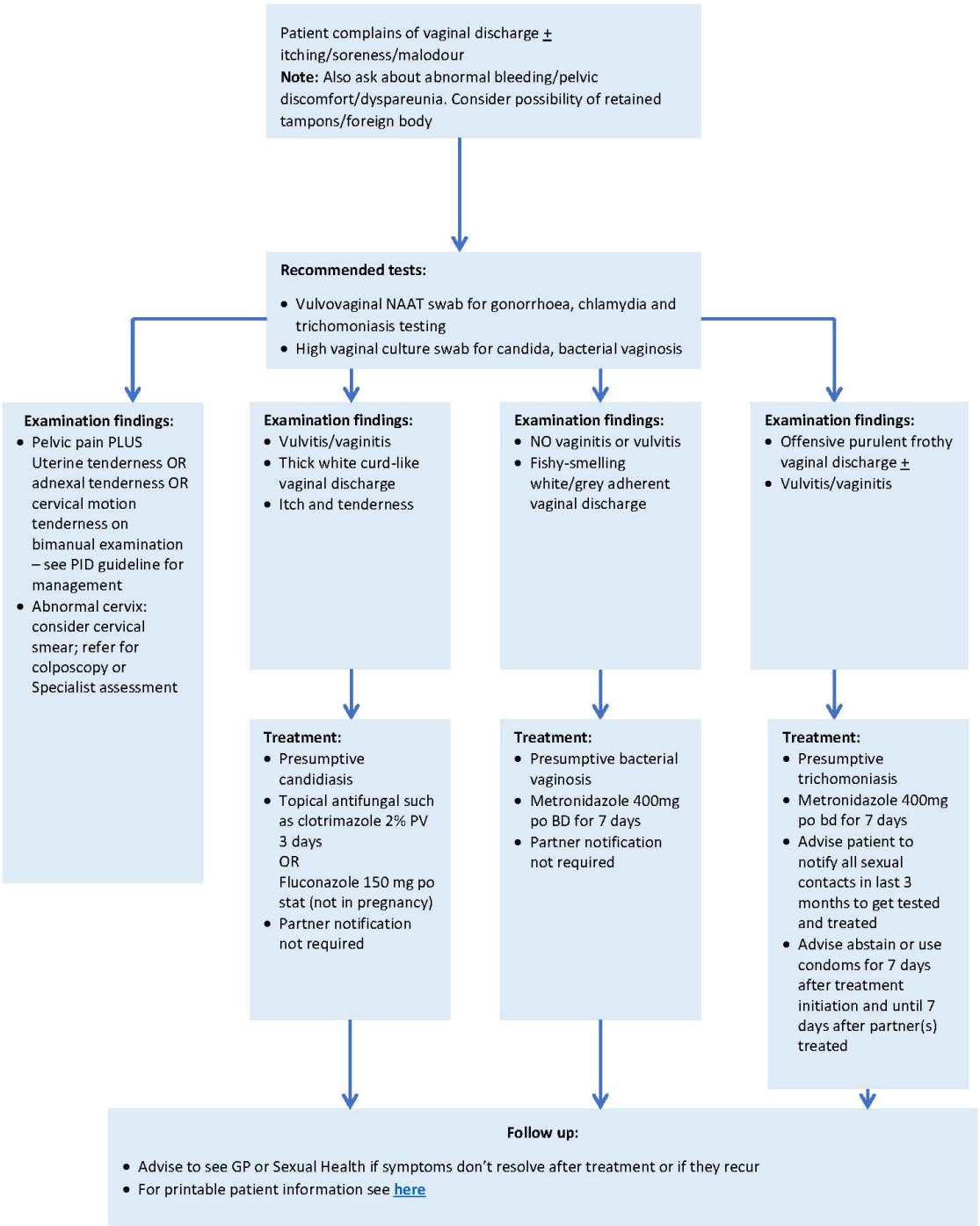
VAGINAL DISCHARGE



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CONTACT DETAILS

There are 4 clinical sites across the Auckland region for patient referrals. Bookings can be made via phone.

Auckland Sexual Health Service
Greenlane Clinical Centre
Level 3, Building 7
Greenlane Clinical Centre
Green Lane West

West Auckland Clinic
20 Sel Peacock Drive
Henderson

North Shore Clinic
418 Glenfield Road
Cnr Glenfield and Peach Rd
Glenfield

South Auckland Clinic
652 Great South Road
Manukau

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Stroke

WHO TO CALL

All patients with strokes and TIAs should be referred to the Stroke/Neurology Service.

Call the Acute Neurology Service via switchboard between 8am to 10pm. During nights call the Medical Specialties Registrar.

Patients who are within 24 hours of stroke onset should have urgent work up via the Hyperacute Stroke Pathway. Refer to the Stroke Service intranet site for more details.

Exceptions are patients with isolated numbness and tingling or isolated dizziness without other symptoms or signs. Acute intervention with IV alteplase or Percutaneous Stroke Intervention (PSI) is generally not indicated in these patients, as unlikely to have large vessel occlusion.

CAUSES OF STROKE

1. **Infarction (85%)**

- What is the arterial territory?
- Carotid circulation (large vessel occlusion involving the middle or anterior cerebral arteries)
- Posterior circulation (large vessel occlusion involving the vertebrobasilar system or posterior cerebral artery)
- What is the pathophysiology?
- Large artery atherosclerosis Cardioembolic
- Lacunar Other

2. **Haemorrhage (15%)**

- Think: hypertension, coagulopathy, cerebral amyloid angiopathy, arteriovenous malformation, berry aneurysm

INVESTIGATIONS

All patients should have:

- FBC, electrolytes, creatinine, glucose, lipids, CRP, coagulation screen.
- ECG (can be done after imaging in acute stroke calls if patient is cardiovascularly stable).
- Brain imaging: CT or MRI are the only reliable way to differentiate between cerebral infarction and haemorrhage and should be obtained ASAP. The initial imaging modality is usually CT. **Patients seen within 24 hours of symptom onset should usually have a CT head:**
- If no haemorrhage, then proceed with CT angiogram (including neck) and CT perfusion
- If parenchymal haemorrhage or subarachnoid haemorrhage, then proceed with CT angiogram (COW only).

Selected patients may need:

- MRI/MRA.
- Carotid ultrasound: reserved for patients with non-disabling carotid territory ischaemic stroke or TIA, who are fit for surgery. If indicated, it should be performed ASAP as the benefit from carotid

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endarterectomy is maximal when done early. If patients have already had a CT angiogram they do not need this.

- Echocardiography: should be performed in patients with suspected cardioembolic source, or stroke of unknown cause in a young patient.
- Blood cultures: in febrile patient (especially if abnormal cardiac valves).

ACUTE FOCAL NEUROLOGIC DEFICIT

There are many possible causes. Common causes include:

- Stroke – ischaemic or haemorrhagic
- Migraine with focal symptoms
- Seizure with postictal paresis
- Haemorrhage into a mass lesion
- Multiple sclerosis (usually subacute rather than acute)
- Compressive mono-neuropathy (e.g. foot drop, wrist drop)

TREATMENT OF ISCHAEMIC STROKE

Thrombolysis with IV alteplase

Thrombolysis should be considered in any previously independent patient presenting within 9 hours of symptom onset:

- 0 to 4.5 hours after stroke symptom onset: for people presenting in this time window, a non-contrast CT brain scan must meet the following criteria before thrombolysis can be considered:
    - No evidence of intracranial haemorrhage
    - No evidence of other non-stroke structural lesion causing symptoms
    - No evidence of a large acute or subacute established infarct (>1/3 of an MCA territory).

- 4.5 to 9 hours or “Wake-Up” after stroke symptom onset: CT perfusion imaging is not required in the 0 to 4.5 hour time window. However, if thrombolysis is being considered in the 4.5 to 9 hour time window, or for "Wake-Up" strokes, the patients also must meet the CT perfusion criteria (below) to be considered for thrombolysis.

  A "Wake-Up" stroke is where the person went to sleep well but awoke with stroke symptoms (occurs in approximately 30% of strokes). The mid-point of sleep needs to be calculated to ascertain whether a patient is within a treatment time window. For example, if a person went to sleep at midnight, and awoke at 8am with stroke symptoms, then the mid-point of sleep is 4am. If the person presents to hospital at 10am, they are 6 hours after the mid-point of sleep, and within 9 hours where thrombolysis could be considered if they met the following required radiological criteria:

  A non-contrast CT Brain scan must show:

    - No evidence of intracranial haemorrhage
    - No evidence of other non-stroke structural lesion causing symptoms
    - No evidence of a large acute or subacute established infarct (>1/3 of an MCA territory).

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In addition, a CT Perfusion must show:

- No or a small core infarct (<70 mL).
- A large ischaemic penumbra (ratio of ischaemic penumbra to core infarct >1.2).
- An absolute volume difference between core infarct and penumbra of >10 mL.

The HASU nurse carries a folder with relevant documents including inclusion/exclusion criteria, patient information and consent forms. Please review the inclusion/exclusion criteria checklist before proceeding with thrombolysis.

- Exclusion criteria include haemorrhage on head CT, coma, minor or rapidly resolving symptoms, BP >185/110, recent stroke (within 12 weeks), recent MI, surgery, or trauma (within 30 days), bleeding diathesis or INR >1.5, glucose <3.5 or >22, pregnancy. For more complete information see under Alteplase on Stroke Service intranet site.
- If you think a patient may be suitable for thrombolysis, contact the Stroke or Neurology Service immediately. Call the Acute Neurology Service via switchboard between 8am to 10pm. During nights call the Medical Specialties Registrar. **You will need to organise the following:**

    1. Urgent CT head, angiogram (head and neck) and perfusion scan (acute stroke protocol).
    2. FBC, electrolytes, glucose, APTT, INR (if there is no reason to suspect coagulopathy you do not need to wait for these results prior to administering alteplase).
    3. Do not give aspirin in first 24 hours if patient receives tPA, unless specifically instructed to in select cases, such as where patient has received stenting.

Percutaneous stroke intervention (PSI)

Patients with large vessel occlusions maybe eligible for PSI or clot retrieval if:

1. Within 6 hours of stroke onset for anterior circulation strokes OR
2. Within 24 hours of stroke onset + favourable CT perfusion scan. Patients with basilar occlusion maybe eligible up to 24-48 hours from stroke onset. Decision will be made in conjunction with the Neurology Service and the interventional Neuroradiologists.

Patients presenting within 4.5 hours of stroke onset, with no contraindications for IV alteplase, should still receive thrombolysis without delay. IV alteplase does not preclude patients from going forward for PSI.

- **Aspirin**: give as soon as CT has excluded haemorrhage, **if not for thrombolysis**. Initial loading dose is 300 mg followed by 100-150 mg daily, orally or via NGT. Initiation of aspirin for patients who receive thrombolysis should be delayed for 24 hours.
- **Heparin**: not routinely indicated but may be required in patients with recurrent TIA, stroke-in-evolution, extracranial arterial dissection, basilar artery thrombosis, or cerebral vein thrombosis. Boluses are usually avoided. Check this with the team/ Registrar (especially if asked to chart heparin after hours).
- **Hypertension**: cerebral autoregulation is impaired in acute stroke and lowering BP may reduce cerebral perfusion. In ischaemic stroke within the first 72 hours, do not lower BP unless consistently above 220 mmHg systolic and 120 mmHg diastolic. See Hypertension Section on Stroke Intranet site.
- **Fever**: is associated with worse outcome. Look for cause and treat, give paracetamol and take blood cultures
- **Hyperglycaemia**: is associated with worse outcome. Manage along conventional lines. Early aggressive approach to maintain euglycemia is not recommended.

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- **Supplemental O_2**: only if hypoxic (oxygen saturations <92%).
- **Decompressive craniectomy** may be considered in highly selected patients with malignant MCA infarction to allow the brain to swell and avoid brain herniation, contact Neurology team.
- **DVT prophylaxis**: early mobilisation, calf pumps.
- **Swallowing assessment:** on admission (bedside water swallow test).
- **Parenteral fluids**: (IV/subcut) for patients unable to swallow.
- **Cerebellar Infarcts**: infarcts in the posterior fossa may be associated with swelling leading to brainstem compression and hydrocephalus. These patients require close monitoring. If they go on to develop a decrease in level of consciousness, consider repeat CT and discuss with Neurosurgical Registrar.
- **Driving restrictions**: see "Medical Aspects of Fitness to Drive" – but minimum restriction of 1 month and then only cleared to drive if full recovery with no residual symptoms or signs.

SECONDARY PREVENTION OF ISCHAEMIC STROKE

- Stroke Service will advise but consider in all patients:
  - Clopidogrel 75 mg daily.
  - Antihypertensive treatment: continue usual anti-hypertensive medications. Delay starting new anti-hypertensive agents for 72 hours.
  - Statin (most patients).
- **Other antithrombotic treatment**: consider starting warfarin, dabigatran or rivaroxaban in patients with ischaemic stroke or TIA, if they have permanent or paroxysmal atrial fibrillation or other potential sources of cardiac emboli. In general, start anticoagulation therapy immediately with minor stroke or TIA and delay for 7-14 days with large infarcts.
- Smoking cessation.
- **Carotid endarterectomy:** Considered in non-disabling carotid distribution infarction or TIA with significant ipsilateral carotid stenosis.

TRANSIENT ISCHAEMIC ATTACK (TIA)

Patients with TIA are at increased risk of stroke and vascular death. TIA should be treated as a medical emergency. By definition, the symptoms associated with a TIA last less than 24 hours.

Diagnosis

Diagnosis of TIA can be problematic. TIA diagnosis is more likely to be correct if:

- Symptoms begin abruptly, with neurologic deficit maximal at onset.
- There is focal neurological deficit or monocular visual loss.
- Rapid recovery occurs. Most TIAs resolve within minutes and 60-70% within 1 hour. If symptoms or signs persist, then stroke is more likely.

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TIA symptoms and signs

Typical of TIA	Not typical of TIA
Unilateral weakness face/arm/leg	Isolated confusion (exclude dysphasia)
Unilateral altered sensation	Impaired consciousness or amnesia
Dysphasia or dysarthria	Isolated dizziness or vertigo
Monocular blindness	Diffuse weakness or sensory alteration
Hemianopia	Scintillating visual disturbance or bilateral blurred vision

Differential diagnosis of TIA

Includes migraine aura (+/- headache), syncope and hypotension, labyrinthine disorders (isolated vertigo +/- secondary nausea and ataxia), partial (focal) epileptic seizures, transient global amnesia, drop attacks, hypoglycaemia and hyperventilation.

ABCD^2 score and stroke risk following TIA

The risk of stroke following a TIA varies between individuals. An indication of stroke risk can be determined by calculating the ABCD^2 score.

Age	≥60 years	1
Blood Pressure	>140 mmHg systolic and/or diastolic ≥90 mmHg	1
Clinical features	Unilateral weakness	2
	Speech disturbance w/o weakness	1
	Other	0
Duration of symptoms	≥60 minutes	2
	10-59 minutes	1
	<10 minutes	0
Diabetes	Yes	1
	Total	1-7

7-day stroke risk

ABCD^2 score ≤3: 1%

ABCD^2 score 4-5: 6%

ABCD^2 score 6-7: 12%

Note: Half the strokes following a TIA occur in the first 48 hours.

- TIA patients with ABCD^2 scores ≤3 have a low 7-day stroke risk, and most may be seen as urgent outpatients in TIA clinic. Call the Acute Neurology mobile (see above).

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- TIA patients with ABCD^2 scores ≥4 have a higher 7-day stroke risk. Most should be admitted to the Stroke Unit for investigation.
- These recommendations are a guideline only and not a substitute for good clinical judgment. For example, patients with atrial fibrillation or crescendo TIAs or on anticoagulants need urgent assessment regardless of the ABCD^2 score.

PRIMARY INTRACEREBRAL HAEMORRHAGE (ICH)

If CT shows intracerebral haemorrhage, consider the following:

- Check the platelet count.
- Coagulation studies.
- Blood cultures if febrile.
- Further investigations (MRI/MRA, catheter angiography) in consultation with Stroke or Neurology or Neurosurgery services.

Treatment of ICH

- Stop any antithrombotic agents, including aspirin.
- Reverse anticoagulation with Prothrombinex-VF® (requires discussion with Haematology) and vitamin K if on warfarin or with idarucizumab if on dabigatran (guidelines on Stroke intranet site).
- Urgent neurosurgical referral for selected cases.
- For management of blood pressure after intracerebral haemorrhage (ICH), see below.

BLOOD PRESSURE MANAGEMENT FOR INTRACEREBRAL HAEMORRHAGE (ICH) – 2021 ACH GUIDELINES

Immediate (parenteral) management

- If systolic BP is 150-220 mmHg (within 6 hours of ICH) treat with labetalol and/or hydralazine, as described below. Aim is for acute lowering of systolic BP to 140 mmHg.
- If initial systolic BP is very high (>220 mmHg) or hypertension is resistant, combination therapy may be required, i.e. labetalol IV + hydralazine IV (or glyceryl trinitrate [GTN] infusion). Aim is for acute lowering of systolic BP to 140-160 mmHg.
- Labetalol:
    - IV 10-50 mg over at least 1 minute repeated after 5 minutes if necessary: maximum total dose 200 mg/24 hours
    - Contra-indications: asthma, heart failure, heart block or bradycardia – in these cases consider hydralazine IV or glyceryl trinitrate (GTN) IV
    - Monitor BP every 5 minutes during labetalol treatment and observe for hypotension
- Hydralazine:
    - By slow IV injection 5-10 mg; may be repeated after 20-30 minutes
    - Caution: reduce dose if hepatic impairment or renal impairment with creatinine clearance <30 mL/min
- Alternatives:
    - GTN infusion: as per cardiology guidelines – 10 mg in 50 mL sodium chloride 0.9%. Start at 5 micrograms/minute (1.5 mL/hour) and titrate in 5 micrograms/minute steps every 5 minutes. Do not use for more than 24 hours.
    - Topical GTN patch: 5-10 mg q24h, 16 hours on, 8 hours off

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- Topical clonidine patch: starting dose 100 micrograms/24 hours, patch is replaced weekly
- Insertion of nasogastric tube and administration of crushable anti-hypertensives: ACEi/ARB, metoprolol tartrate, amlodipine, thiazide diuretic, doxazosin

- Monitor BP frequently while initiating and titrating parenteral therapy:
  - q5minutes for 30 minutes
  - q15minutes for 1 hour
  - q30 minutes for 4 hours
  - q1h for 4 hours
  - then q4h until review
- If systolic BP <130 mmHg, cease parenteral therapy.
- Avoid hypotension – systolic BP <110 mmHg (may cause cerebral hypoperfusion).

Long term (oral) management

- Long term BP target is <130/80 mmHg.
- If able, patients should continue their usual oral medications.
- Other patients should be started on oral medications when they are stable and able to take medications by mouth.
- Potential oral options are:
  - Younger (<55 years): ACEi (e.g. perindopril/lisinopril) or ARB (e.g. candesartan)
  - Older (≥55 years): CCB (e.g. amlodipine can crush).

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Thrombosis and Anticoagulation

WHO TO CALL

0800-1600h:

- Thrombosis Unit referrals for DVT and PE
- For inpatients please call. Outpatient referrals can be sent via e-Referrals
- Haematology Registrar

1600-2200h: Haematology after-hours on-call Registrar

2200-0800h: Medical Specialties Registrar

VENOUS THROMBOEMBOLISM (VTE) INTRODUCTION

Deep Vein Thrombosis (DVT) and Pulmonary Embolism (PE) are common diagnoses in the adult population, affecting approximately 1:1000 adults with increasing frequency in older age. Roughly two-thirds of thrombotic events are precipitated and common triggers include:

- Active cancer (under treatment, especially in first few months of chemotherapy or metastatic disease)
- Pregnancy/hormone therapy
- Surgery
- Immobility e.g. leg in a cast
- Medical illness/admissions e.g. inflammatory bowel disease, systemic infection

For patients presenting to the Emergency Department, please refer to the following algorithms which guide further investigations based on a clinical score and D-dimer.

VTE prevention with prophylaxis e.g. subcutaneous enoxaparin 20 or 40 mg daily is important for at risk inpatients and risk assessment charts are included in the A to D planner.

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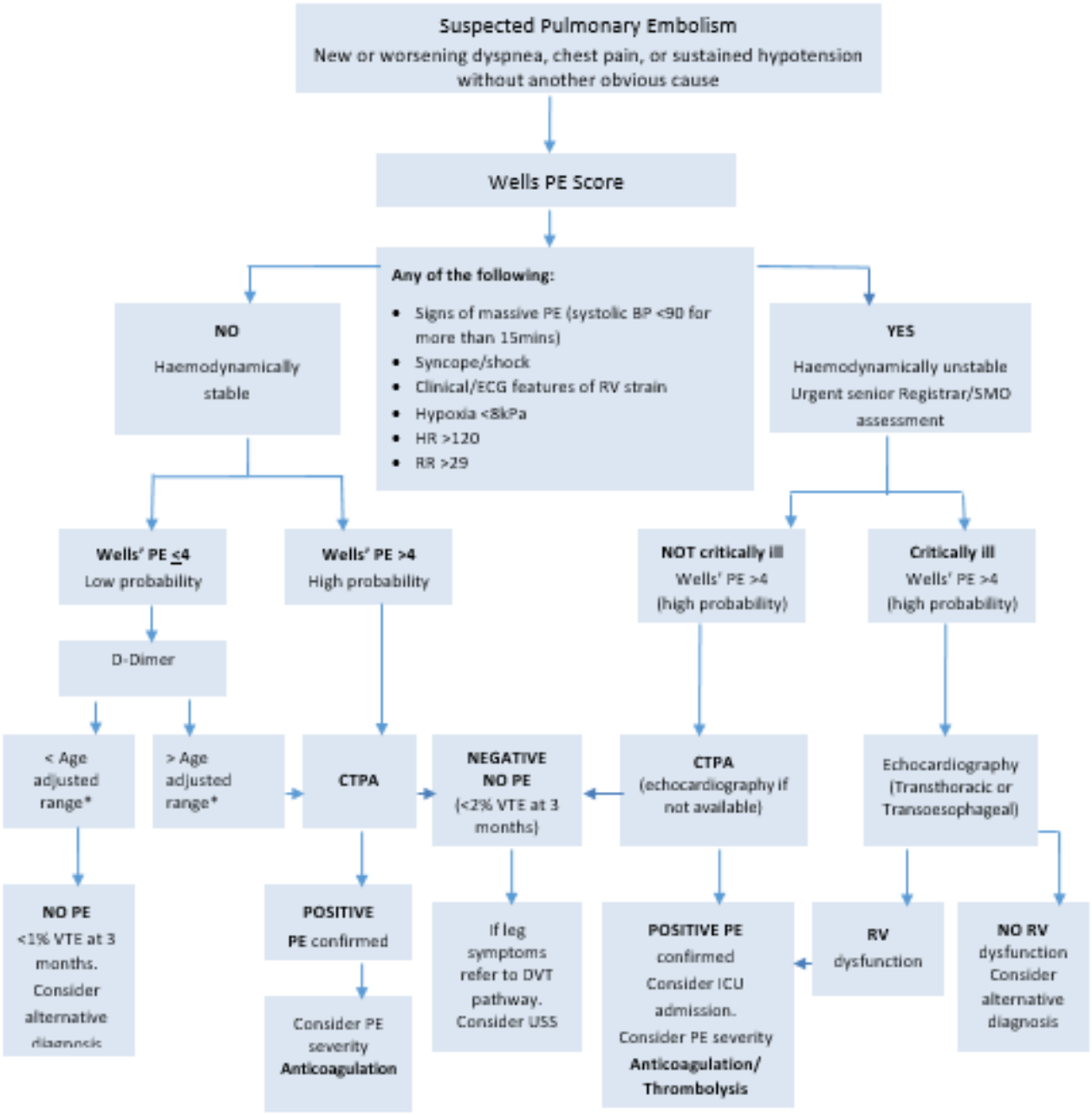
SUSPECTED PULMONARY EMBOLUS INVESTIGATION ALGORITHM



*AGE ADJUSTED D-DIMER
<50 years: >500 is HIGH
>50 years: >10 x age (years) is HIGH

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Wells Score for PE

A Score of >4 = probability of PE 41% (likely)

A Score of ≤4 = probability of PE 8% (unlikely)

Clinical Characteristic	Score
Clinical signs and symptoms of DVT (minimum of leg swelling and pain on palpation of deep veins)	3
Alternative diagnosis less likely than PE	3
Heart rate >100 bpm	1.5
Immobilisation or surgery in the previous 4 weeks	1.5
Previous documented DVT/PE	1.5
Haemoptysis	1
Malignancy (receiving treatment)	1

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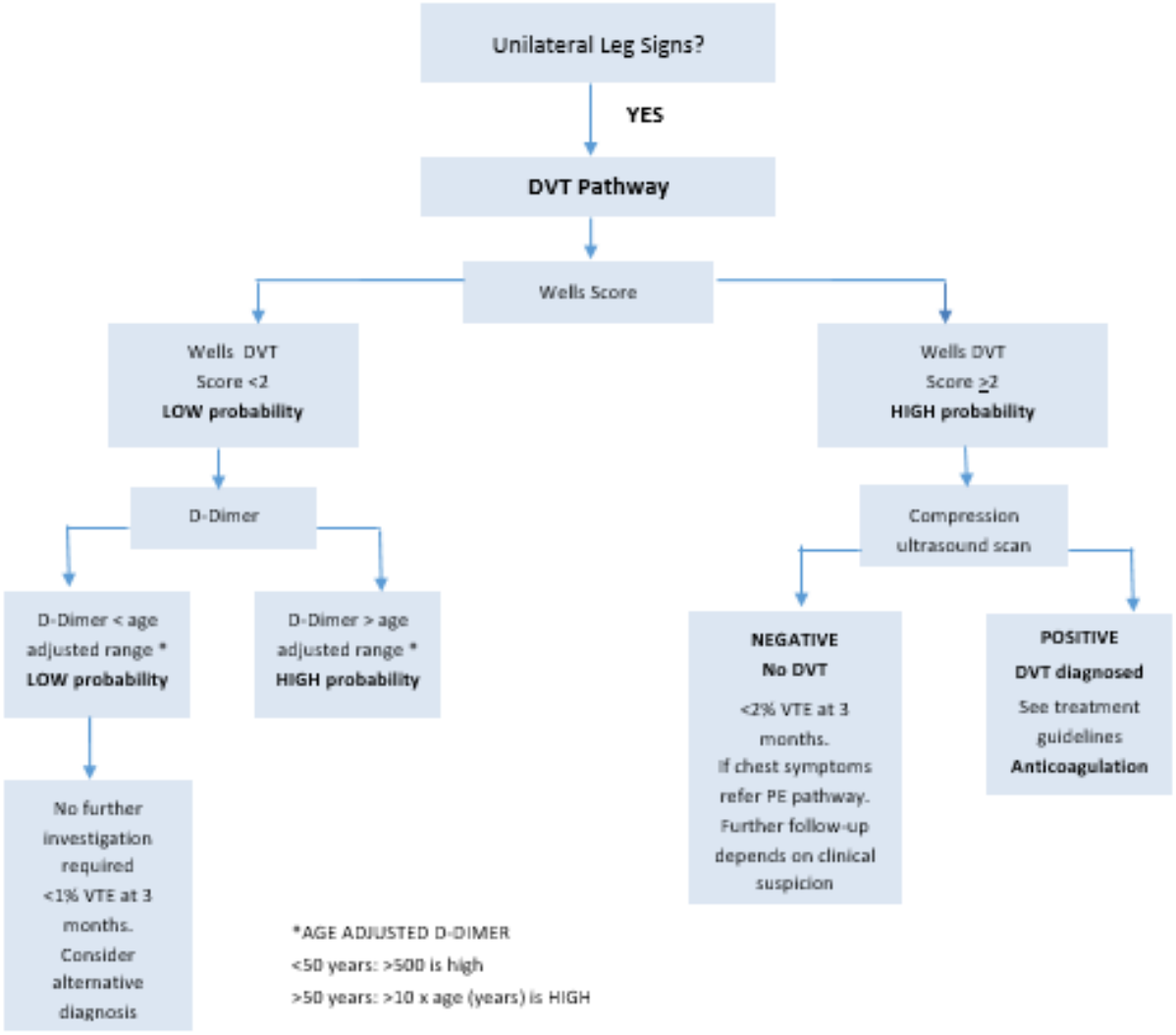
SUSPECTED DVT INVESTIGATION ALGORITHM



Wells Score for DVT

A score of ≥2 = probability of DVT 28% (likely)

A score of <2 = probability of DVT 5% (unlikely)

Clinical Characteristic	Score
Active cancer (receiving treatment within 6 months or palliation)	1
Paralysis, paresis or recent POP lower extremities	1
Bedridden for 3 or more days, major surgery within 12 weeks	1
Localised tenderness line of the deep veins	1
Entire leg swollen	1

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Calf swelling at least 3cm more than the other side (measured 10cm below tibial tuberosity)	1
Pitting oedema confined to the symptomatic leg	1
Collateral superficial veins (non-varicose)	1
Previous documented DVT	1
Alternative diagnosis at least as likely as DVT	-2

- The Wells DVT score is not intended to apply to **upper limb deep vein thrombosis**. Upper limb DVT may be spontaneous or provoked (e.g. in hospitalised patients, from indwelling lines such as PICC/pacemakers). Anticoagulation treatment is similar and can be discussed with the Thrombosis Unit. Ideally the line is removed, although this is not always essential particularly if other access options are limited.
- The algorithm also does not apply to **pregnant** patients. These women should be investigated and initially managed through /maternal medicine services.

INVESTIGATION AND MANAGEMENT OF VTE

Investigations

- **D-Dimer**

  This is an automated assay with a high negative predictive value and is used to help exclude a diagnosis of DVT in patients with a low probability of thromboembolic disease. The standard range has a cut-off of 500 micrograms/L; however an improvement in specificity without significant reduction in sensitivity is achieved with a higher threshold in older patients. Those above 50 years: threshold = age x 10 (micrograms/L).

- **Compression ultrasound**

  Compression ultrasound is highly sensitive for identifying proximal vein thrombosis. Serial compression ultrasound may be indicated in patients with continuing symptoms. Venography and magnetic resonance venography are rarely considered (specialist advice only).

- **CT pulmonary angiography (CTPA)**

  CTPA has a high sensitivity for the detection of PE. It is generally the investigation of choice.

- **Ventilation/perfusion (V/Q) scans**

  VQ scans are also used for PE diagnosis and may occasionally be used where the radiation dose to the patient is ideally lower e.g. young women (concern re breast irradiation) and pregnancy. V/Q scans are ordered through the Nuclear Medicine department.

Other baseline investigations

- Full blood count
- Coagulation screen (PR, APTT, fibrinogen) **before** starting anticoagulant therapy
- Creatinine and liver function tests including albumin

Note:

1. Thrombophilia screening tests will be organised by the Thrombosis Unit at a follow-up appointment after completing anticoagulation therapy if required (generally patients less than 40 years with

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significant thrombosis**). Measurement of antithrombin, protein C/S is not recommended at diagnosis as the levels may be low in the acute phase**. Note thrombophilia testing requires a lab form to be completed which is available on the LabPlus and haematology websites as clinical indications are limited.

2. All patients with VTE (but particularly spontaneous) should be examined in terms of the possibility of occult malignancy. Any unusual findings on examination or routine blood tests (e.g. anaemia, unexpectedly high markers of inflammation) should be investigated as per usual processes. CXR, mammography, cervical smear and PSA (if not recently done) are appropriate tests. Additional abdominal imaging for cancer is not routinely recommended on the basis of randomised trials which have shown approximately 4% rate of subsequent cancer over 12 months in both those who had and did not have extra imaging. In unusual situations (e.g. a very high d-dimer >10,000 but modest clot burden) this may be indicated on specialist advice.

3. Investigations for PE should be considered in DVT patients who have suspicious history or exam findings as the long-term therapy for a large PE may be different. Occasionally this may be indicated if a very high d-dimer is inconsistent with a minor/low clot burden DVT but this would be on specialist advice.

MANAGEMENT OF VTE

Referral to the Thrombosis Unit is recommended for all **confirmed cases of DVT or PE**. The medical and nursing staff of the unit will review the diagnosis, provide advice regarding anticoagulant choice and treatment duration, provide patient education and organise patient follow up.

While enoxaparin is frequently given initially during the diagnostic process, early transition to rivaroxaban is preferred for many patients.

ANTICOAGULATION

Heparin (intravenous, unfractionated)

This should only be required if patients have had very recent surgery, or are at a high risk of bleeding (e.g. a very recent bleed) or require thrombolysis. The standard heparin protocol (12 units/kg/hour) available on all adult wards is appropriate for most patients except those with life-threatening PE in Intensive Care (CVICU/DCCM) who may benefit from a higher dose protocol.

Low Molecular Weight Heparin (LMWH)

- The usual treatment dosage is enoxaparin 1 mg/kg subcut twice daily (BD) or 1.5 mg/kg once daily. Enoxaparin doses should be based on **actual body weight**. Data in obese patients are limited and optimal dosing is uncertain. In practice, doses greater than 150 mg twice daily are rarely used. For patients >120 kg, dosing should be discussed with the Thrombosis Unit or on-call Haematology. The 1.5 mg/kg once daily dose is not suitable for patients > 100 kg. Assessment of enoxaparin levels using Xa assay may be advised.

- Twice-daily dosing is used for patients with a high thrombotic load. Use twice daily dosing for all patients with pulmonary emboli and DVT more proximal than the superficial femoral vein; the thrombosis unit will review the dose.

- Once-daily dosing can be used for patients with a moderate or low thrombotic load.

- Doses should be rounded (either up or down) to the closest pre-filled syringe (20 mg/ 0.2 mL, 40 mg/ 0.4 mL, 60 mg/ 0.6 mL, 80 mg/ 0.8 mL, 100 mg/ 1 mL, 120 mg/ 0.8 mL or 150 mg/ 1 mL).

- Note that enoxaparin MONOTHERAPY is the preferred initial treatment for patients with active cancer, particularly if undergoing active treatment. Warfarin is less effective at preventing recurrent thrombosis in these patients. Rivaroxaban may be appropriate but most patients will start initially on enoxaparin.

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- Practical considerations: Enoxaparin is funded in the community via Special Authority SA2152 for a wide range of indications. Prior to discharging a patient with a prescription for enoxaparin the special authority application should be completed (ideally online). Contact the ward pharmacist if your patient does not fulfil the Special Authority requirements. Not all pharmacies hold stock of enoxaparin – either confirm that the patient's usual pharmacy has enoxaparin in stock or refer the patient to the Auckland City Hospital Retail Pharmacy (on level 5) or Greenlane Clinical Centre Retail Pharmacy.

Enoxaparin is renally excreted and can accumulate in renal failure. Reduced doses should be used in patients with creatinine clearance <30 mL/min (consult NZF Enoxaparin monograph via Reference Viewer for actual doses).

ORAL ANTICOAGULANTS

Direct oral anticoagulants (DOACs)

These are now preferred for most patients with VTE unless renal failure is present.

DOACs (rivaroxaban and dabigatran) must NEVER be co-administered with enoxaparin. This combination leads to a high risk of bleeding and has resulted in patient deaths.

1. Rivaroxaban

- Rivaroxaban is now fully funded without special authority. It can be used as initial treatment for both DVT and PE. The thrombosis unit staff or on call haematology should be consulted as some events such as PE with right heart strain may still be managed initially with enoxaparin 1 mg/kg BD.
- Rivaroxaban dosing is 15 mg BD for 3 weeks followed by 20 mg daily. At 6 months, a dose reduction to 10 mg daily may be considered in some patients for long-term use e.g. unprovoked VTE.
- Tablets can be crushed for administration if needed.
- Rivaroxaban should not be used in patients with CrCl < 15 mL/min.
- There is NO antidote for rivaroxaban available in NZ. See reversal section.

2. Dabigatran

- This direct thrombin inhibitor is equivalent to warfarin for VTE.
- A minimum of five days of therapeutic enoxaparin is followed sequentially by dabigatran 150 mg twice daily.
- The 110 mg twice daily dose (preferred for stroke prevention in AF in those >75 years or with renal impairment) has not been investigated for acute VTE but may be used in extended VTE therapy in these subgroups, or in those >75 years at prescriber discretion.
- Dabigatran has a reversal agent for immediate reversal if required (idarucizumab - Praxbind®) which may be an advantage in selected patients (see reversal section).
- Dabigatran capsules must be swallowed whole and capsules must never be opened due to significant increase in bioavailability.
- Dabigatran should not be used in patients with a CrCl <30 mL/min.
- **Starting dabigatran when converting from warfarin:** The INR must be <2 before dabigatran is started. In lower risk patients (including uncomplicated atrial fibrillation) wait 2-4 days after stopping warfarin and check the INR is <2 before starting dabigatran.

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Warfarin

- Start on the same day as heparin or LMWH therapy. Follow dosage recommendations on the Warfarin Chart.
- Loading doses of warfarin may not be needed in non-valvular atrial fibrillation. Doses on the Warfarin Chart may need to be modified in frail elderly. GPs should be contacted when patients are newly discharged on warfarin.
- Warfarin is required if CrCl is <15 mL/min as Rivaroxaban can be used if CrCl >15 mL/min. Discuss with Thrombosis Unit if CrCl <40 mL/min or if older, frail patient where these decisions are complex.
- Monitoring therapy
- Check baseline PR/INR, LFTs and eGFR
- Repeat INR daily when starting therapy
- Take extra care when reviewing INR in patients with abnormal liver function, cardiac failure, parenteral feeding or age >80 years
- The target INR for most patients on warfarin is 2.5 with a range of 2-3.
- Exceptions where the INR target is higher includes selected patients with recurrent thrombosis, antiphospholipid syndrome with prior treatment failures and some prosthetic valves. **The INR target for these patients should be decided by the supervising specialist.**

Duration of anticoagulation for VTE

Type of VTE		**Recommended treatment**	**Duration of anticoagulation**
Calf DVT	Unprovoked	Enoxaparin/warfarin **OR** enoxaparin alone **OR** dabigatran **OR** rivaroxaban	6 weeks to 6 months
	Precipitated		2 weeks to 3 months
Proximal DVT/PE	Unprovoked	Warfarin/enoxaparin **OR** enoxaparin/ dabigatran OR rivaroxaban	At least 6 months: frequently indefinite
	Precipitated		3 to 6 months
Recurrent DVT/PE		Warfarin/enoxaparin **OR** enoxaparin/ dabigatran **OR** rivaroxaban	Variable: 6 months to indefinite if spontaneous recurrences

THROMBOLYTIC THERAPY

- Indication: life-threatening PE or massive DVT after consultation with appropriate specialty services. Generally thrombolysis needs to be given with intensive monitoring, for example in Critical Care/Intensive Care.

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- Note that some cases of iliofemoral DVT and subclavian DVT (upper limb), may be suitable for catheter directed thrombolysis/mechanical thrombectomy. This can be undertaken by interventional radiology generally via the Vascular Surgical service.
- All patients who fit these criteria who are likely to be candidates for thrombolysis (<60 years, no major comorbidities) should be discussed with the on-call Vascular Registrar or Interventional Radiology.
- In general, most patients who have undergone catheter directed thrombolysis should have a minimum of three weeks of twice daily enoxaparin before transitioning to an oral agent.

INFERIOR VENA CAVA FILTERS

Indication

- New proximal DVT or PE and anticoagulation is contraindicated (this may be due to risk of haemorrhage or need for urgent surgery where anticoagulation needs to be interrupted)
- Recurrent PE despite therapeutic anticoagulation

IVC filters may also be considered in

- Those with pulmonary hypertension who are to undergo surgery
- Surgical prophylaxis if the patient is considered particularly high risk for VTE and management with anticoagulation alone is not possible, particularly PE within 3 months
- Very rarely patients with very large PE, proximal DVT and significant cardiorespiratory compromise (prevent mortality from further PE) – limited evidence base

Insertion of an IVC filter needs to be discussed with the team Consultant and relevant specialty services including the Thrombosis Unit. Many IVC filters are inserted on a temporary basis and removal needs to be planned from the time of insertion. Interventional Radiology Department Consultants who carry out this procedure also need to be involved in decision making.

SUPERFICIAL VEIN THROMBOSIS

- The superficial veins in the leg include the saphenous veins and muscular branch veins (soleus and gastrocnemius). In the upper limb, superficial veins include the cephalic vein and basilic vein.
- Upper limb events can be discussed with the Thrombosis Unit but will generally only require a short course of enoxaparin 1 mg/kg subcut once daily unless very extensive. Forearm clots may not need treatment.
- Patients with active cancer will generally require treatment for superficial thrombosis and should be discussed with the Thrombosis Unit. Pregnant patients should be discussed with obstetric or maternal medicine services.

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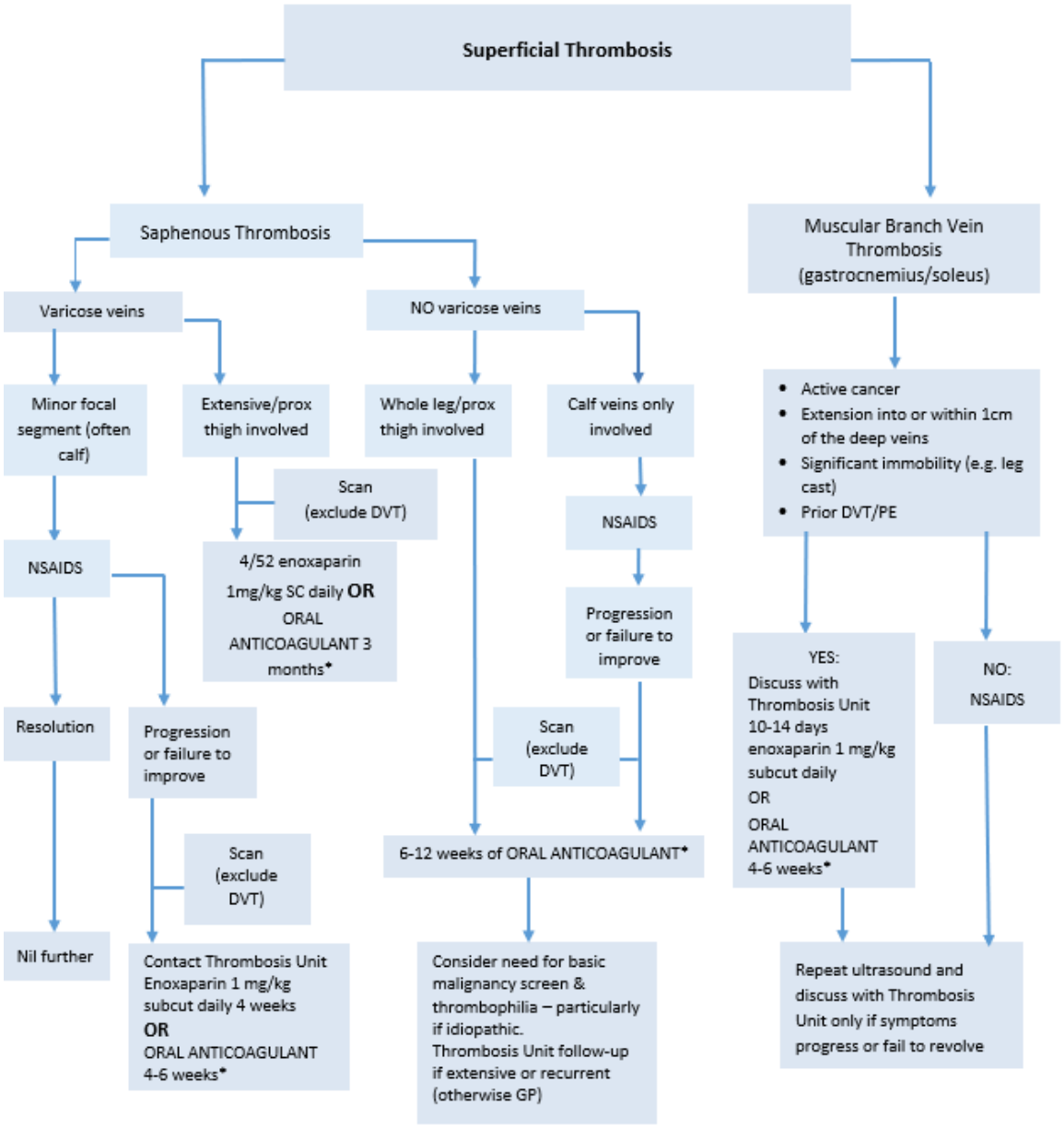

*Enoxaparin 40 mg daily – 1 mg/kg daily is usually adequate therapy for superficial thrombosis. If thrombosis is near saphenofemoral junction, a longer course of oral anticoagulant may be preferred. Any can be used; rivaroxaban 10-20 mg daily may be most convenient. In general, thrombophlebitis with known varicose veins can be managed with a shorter course until symptom resolution.

VENOUS THROMBOEMBOLISM PROPHYLAXIS

Surgical services

See General Surgery or Orthopaedics chapter

Medical services

- Venous thromboembolism prophylaxis is always given at the discretion of the Consultant.

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- The following algorithm is included in the A to D planner for the assessment of all medical patients. It includes risk factors for VTE and also relative and absolute contraindications due to bleeding risk. The evidence from both bleeding and thrombosis risk scores is included in this algorithm. In general, enoxaparin is preferred. In occasional patients (e.g. with significant renal impairment) subcutaneous unfractionated heparin (usually 5000 units q12h) can be considered.
- TED stockings are not well proven to be of benefit in non-surgical patients and in stroke patients these have been shown to increase skin breakdown. If available, intermittent calf compression could be considered in patients with significant risk factors and contraindications to enoxaparin.

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AUCKLAND DISTRICT HEALTH BOARD
Te Toka Tumai

VTE Risk Assessment

MUST ATTACH PATIENT LABEL HERE

SURNAME: _____ NHI: _____

FIRST NAMES: _____ DOB: _____

Please ensure you attach the correct visit patient label

VTE RISK ASSESSMENT - MEDICAL

MEDICAL VTE RISK ASSESSMENT

Please complete this form and VTE Prevention Box on medication chart for every patient on admission

Immobilisation anticipated for at least 72 hours (including prior to admission)*

☐ No → No Action No Prophylaxis required

☐ Yes

VTE Risk Factors

One of:
- ☐ History of DVT or PE
- ☐ Active malignancy
- ☐ Inflammatory bowel disease

Or at least 2 of:
- ☐ Uncontrolled heart failure
- ☐ Chronic respiratory disease
- ☐ Acute rheumatological illness
- ☐ Severe infection
- ☐ Ischaemic stroke**
- ☐ Thrombophilia
- ☐ Myocardial ischaemia /infarction
- ☐ BMI>30
- ☐ Recent surgery/trauma
- ☐ Oral contraceptive/HRT
- ☐ Prolonged immobility (>7 days)*
- ☐ Age >60 years

☐ No → No Action No Prophylaxis required

☐ Yes

BLEEDING Risk Factors

Considerations of enoxaparin use:
- ☐ Age ≥85 years
- ☐ Antiplatelet agents
- ☐ Moderate renal impairment
- ☐ Severe uncontrolled hypertension
- ☐ Ischaemic stroke within 4 weeks**
- ☐ Metastatic malignancy (particularly brain metatases)

Contraindications to enoxaprin use:
- ☐ Active bleeding
- ☐ Recent upper GI ulcer
- ☐ Thrombocytopaenia
- ☐ Other anticoagulant therapy
- ☐ HIT/herapin allergy
- ☐ Severe liver/renal impairment (eGFR < 30ml/min OR dialysis therapy)
- ☐ Bleeding Disorder
- ☐ Intracerebral haemorrhage**

☐ No → **Consider Enoxaparin if clinically appropriate** 40mg subcut daily (20mg if <50kg)

☐ Yes

Consider mechanical prophylaxis
Contraindictions include:
- ☐ Cellulitis
- ☐ Severe oedema
- ☐ Peripheral vascular disease
- ☐ Recent skin graft
- ☐ Peripheral neuropathy

** Immobilisation means bed bound +self toileting*
*** The stroke unit has a VTE guideline which can be reviewed on day 1 of admission; note TEDS are contraindicated in stroke patients*

Name _____ Signature _____ Date _____

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ANTICOAGULANT REVERSAL (IF BLEEDING COMPLICATION OR PRIOR TO SURGERY)

For advice around peri-operative anticoagulation reversal, please refer to: https://adhb.hanz.health.nz/site/Anaesthesia/DeptPoliciesGuidelines/Anticoagulants%20and%20Antiplatelet%20Agent%20-%20Elective%20Surgery%20Quick%20Guides.pdf

Reversal of Heparin (See also reversal guidelines on hospital intranet)

- Protamine sulphate will almost completely neutralise the anticoagulant effects of unfractionated heparin. It is less effective against low molecular weight heparin and will only reverse approximately 60% of the anti-Xa activity. **Protamine will only partially reverse enoxaparin. Discuss with a Haematologist.**
- Bleeding while on an unfractionated heparin infusion: give 1 mg of IV protamine for every 100 units of heparin given in the last 1-2 hours. As a guideline **25 mg** is a reasonable dose for standard infusions. DISCUSS WITH HAEMATOLOGY FOR FURTHER ADVICE
- Enoxaparin reversal: give 1 mg of protamine for every 1 mg of enoxaparin given within 8 hours; give 0.5 mg of protamine for every 1 mg of enoxaparin if 8-12 hours post enoxaparin dose. No protamine needed if >12 hours post enoxaparin dose. **Note the maximum protamine dose is 50 mg.**
- Protamine sulphate must be given by slow IV infusion (not exceeding 5 mg/min). It may cause allergic reactions.
- Protamine sulphate can be repeated if bleeding continues; discuss further management with a Haematologist.

Excess protamine sulphate may act as an anticoagulant itself.

Reversal of Warfarin

- The choice of therapy will depend on:
- INR result
- Presence of bleeding
- The need to continue anticoagulation
- If there is an unexpected high INR consider the following possible causes:
- New medication
- Concomitant illness
- Change in diet
- Change in activity
- Other causes of vitamin K deficiency e.g. liver disease, malabsorption
- The Blood Service has produced a phone app to guide warfarin reversal. This is adapted from the 2013 consensus guidelines for warfarin reversal from Australasian Society of Thrombosis and Haemostasis.
- iPhones: https://itunes.apple.com/nz/app/reversing-warfarin/id641461083
- Android: https://play.google.com/store/apps/details?id=appinventor.ai_paul.Warfarin
- https://adhb.hanz.health.nz/cancer-and-blood/Haematology/Pages/Warfarin.aspx
- https://www.clinicaldata.nzblood.co.nz/resourcefolder/prothrombinex.php?dhbid=1

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- Contact the Haematology Service for specific additional advice if required.

Reversal of Dabigatran

- Dabigatran (Pradaxa®) is a direct thrombin inhibitor with a half-life of 12-14 hours and this is significantly prolonged with renal impairment.
- The reversal agent for dabigatran is called idarucizumab and it is available at Auckland Hospital for patients with recent dabigatran intake who have major bleeding or require emergency surgery. The algorithm is available online on the Haematology home page.

  Dabigatran reversal agent:

  https://adhb.hanz.health.nz/cancer-and-blood/Haematology/_layouts/15/WopiFrame.aspx?sourcedoc=/cancer-and-blood/Haematology/Dept%20Resources/Idarucizumab%2003.2020.pdf&action=default
- The Medication Administration Guideline for Idarucizumab can be found here https://adhb.hanz.health.nz/Pharmacy/Medicines-Information/Pages/Medication-Administration-Guidelines.aspx
- Note that all cases require specific approval as outlined.
- Dialysis for high dabigatran levels in the setting of renal impairment is unlikely to be required as idarucizumab can be used.
- Patients should be monitored for rebound of dabigatran with APTT/TCT levels at 24 and 48 hours post idarucizumab. Occasionally further reversal may be required if there is still an indication as per the algorithm.
- A phone app for dabigatran use is available.
- iPhones: https://apps.apple.com/nz/app/managing-dabigatran/id498413737
- Android: https://play.google.com/store/apps/details?id=com.healthobs.harper.dabigatran

Reversal of Rivaroxaban

- There is NO specific antidote for rivaroxaban available in New Zealand. In emergency situations, prothrombinex **EITHER** empiric 2000 units (4 vials) **OR** 25-50 units/kg may be beneficial but the evidence is limited. This should be discussed with a haematologist.
- Rivaroxaban levels can be assessed with a specific assay. If the prothrombin ratio at ACH is normal (<1.2), the levels are not high and reversal strategies are not required. Surgery is likely to be relatively safe. However, neuraxial anaesthesia should NOT be given unless the rivaroxaban level has been measured and is below the limit of detection and the time period after the last dose is appropriate.
- A phone app for rivaroxaban use is available.
- iPhone: https://apps.apple.com/nz/app/managing-rivaroxaban/id705081504
- Android: https://play.google.com/store/apps/details?id=com.healthobs.harper.rivaroxaban

ANTICOAGULANT SWITCHING TABLE

Note: This guide only covers straight-forward situations; for more complex ones, e.g. high risk of bleeding, renal impairment, etc., please seek advice

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		SWITCHING TO:			
		Warfarin	**Enoxaparin (treatment dose)**	**Heparin (IV continuous infusion)**	**DOACs: Dabigatran or Rivaroxaban (NB these can elevate INR – caution when overlapping with warfarin)**
SWITCHING FROM:	**Warfarin**		Stop warfarin Start enoxaparin when INR <2	Stop warfarin Start heparin when INR <2	Stop warfarin Start DOAC when INR is <2 (for rivaroxaban, <2.5-3.0 depending on embolism risk)
	Enoxaparin (treatment dose)	Start warfarin. Continue enoxaparin until INR ≥2 for 24 hours, then stop.		Stop enoxaparin. Start heparin infusion 1-2 hours before the next dose of enoxaparin is due.	Stop enoxaparin Start DOAC at the time the next enoxaparin dose is due (may overlap ≤2 hours)
	Heparin (IV continuous infusion)	Start warfarin. Continue heparin infusion until INR ≥2 for 24 hours, then stop	Stop heparin, start enoxaparin within 1 hour. *If a more conservative strategy is preferred, start enoxaparin 2 hours after stopping heparin infusion		Start DOAC at time of heparin discontinuation
	DOACs: (Dabigatran or Rivaroxaban)	Start warfarin. Stop DOAC once INR therapeutic (if severe reaction to DOAC, stop DOAC and bridge with enoxaparin)	Start enoxaparin when next DOAC dose would have been due	Start heparin when next DOAC dose would have been due.	Start new DOAC when previous one would have been due (may overlap ≤2 hours)

Interpretation of laboratory tests in patients on Dabigatran

- This is NOT straightforward as there is no clear linear correlation between test results and bleeding risk, unlike warfarin and INR levels. The therapeutic range is uncertain and thought to be wide.
- **APTT**: moderately sensitive but levels in the range of 50 to 80 can mean acceptable or high levels. Some evidence that APTT>80 has higher risk of bleeding.
- **PR**: less sensitive. PR prolongation >1.5 suggests higher levels of dabigatran. Note potential for warfarin effect if soon after transition, or possible vitamin K deficiency.
- **dTCT**: very sensitive. Significantly prolonged in any patient on dabigatran, therefore levels >80s seen with low or high levels. If normal, then no dabigatran is present. **Note the dTCT needs to be specifically requested on the lab form as it is not done automatically if the APTT is normal.**
- If APTT and PR are normal: levels likely to be low; however some drug may still be present.
- If APTT <50, PR<1.5 then levels probably low OR moderate.
- The laboratory has a dabigatran assay which should not be performed for routine monitoring but may be used as a guide as part of the management of unplanned surgery/procedures or bleeding. This needs to be interpreted in the context of the time of last dose. There is no clear therapeutic range. Peak levels with chronic therapy are on average 0.18 micrograms/mL (range 0.06-0.4) and trough levels are on average 0.09 micrograms/mL (range 0.03-0.2).

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Surgery

Anaesthesia Services

Anaesthesia and the Perioperative Period

- Starship, Auckland City and Greenlane Hospitals have 4 completely separate Anaesthetic Departments that provide services to acute and elective patients.
- They are Starship, Level 4 (Cardiac/ENT), Level 9 (O&G), Level 8 (everything else + GSU).
- During the daytime, there is a **Specialist Anaesthesia Consultant (SMO) holding the 'Coordinator' phone**. Afterhours, this is usually held by a Registrar. They are your first port of call for any anaesthesia related questions.

1. CALLING ANAESTHESIA SERVICES

Why do you need to call us?

- It is important that all **elective** and **acute** patients arrive in the operating rooms ready to be anaesthetised (fasted, co-morbidities optimised as best as possible).
- You need to call us about **every** acute patient that is booked, so we can help you figure out if the patient is ready for theatre, or if there are issues that need optimising, or if DCCM/CVICU/PICU needs to be involved. Some of these issues can be optimised by you and your surgical team, e.g. referral to haematology for help with warfarin bridging.
- Most acute patients are able to be seen and assessed by the anaesthetist in the pre-op area. If they are medically or surgically complex, they may need a face to face anaesthesia review on the ward prior to being formally booked for surgery.
- All adult **elective** patients are seen or phoned by the Pre-Assessment Clinic, contact: https://adhb.hanz.health.nz/site/Anaesthesia/SitePages/Anaesthesia%20Preoperative%20Assessment%20Services%20Contacts.aspx

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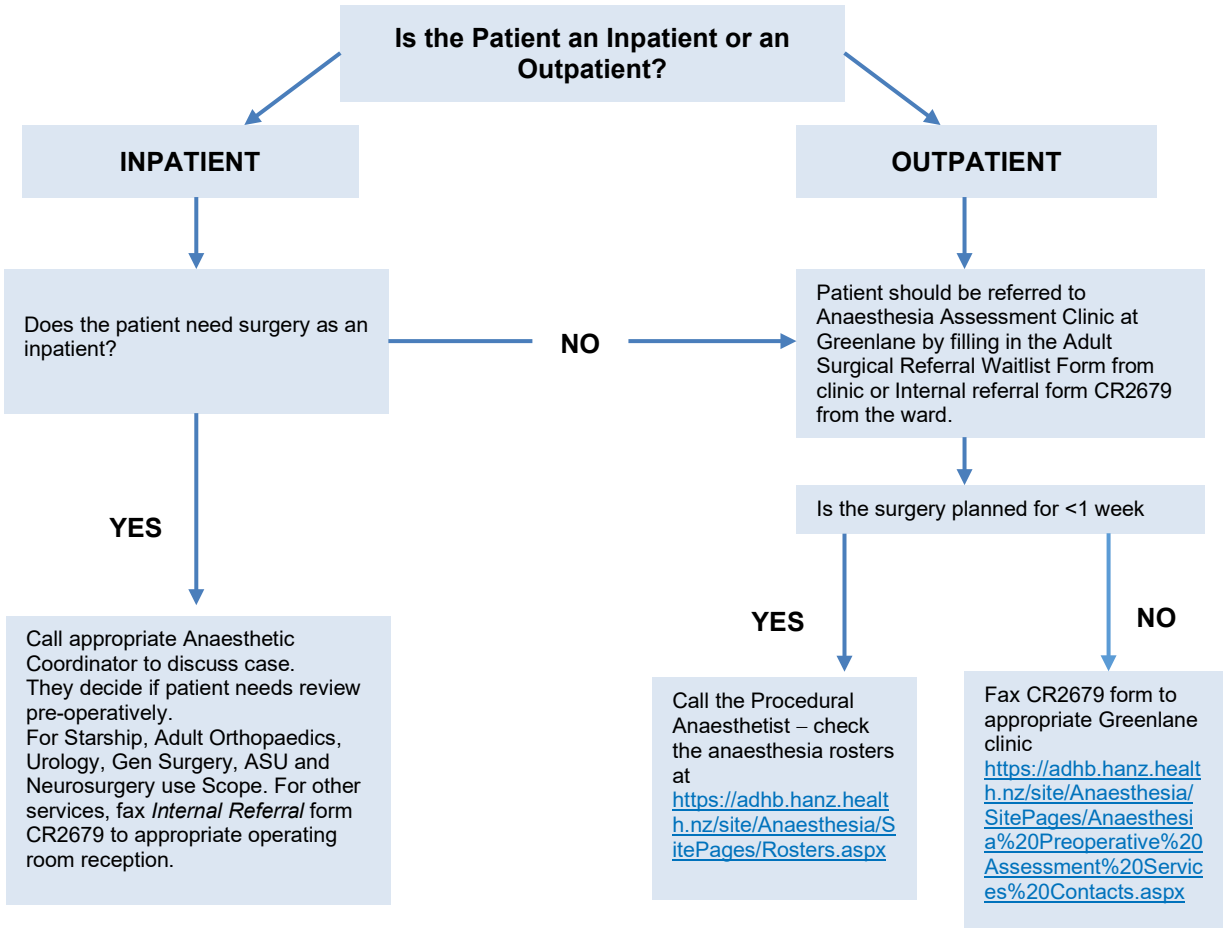
Anaesthetic Assessment Algorithm



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When should you call Anaesthesia?

- When you need to book **ANY** acute case. Overnight, if the case is straightforward and the patient is well, there is no need to call the overnight Registrar – you or the morning team can call after 0700.
- When you have a patient who may need surgery, but needs an anaesthesia review first (high risk patients or high risk surgery – or complex decision making MDT needed).
- When you need advice about medications or investigations outside of what is available in this chapter.
- When you need help with IV access and you have already escalated this through your team, i.e. a Registrar has made an unsuccessful attempt or the patient is known to have difficult IV access. See IV access requests, below.

What do you need to know before you call?

- The proposed procedure – open/laparoscopic/endoluminal
- Likely time of surgery – today/tomorrow/future elective list
- Fasting status, COVID/RAT status
- Co-morbidities (see section 5 for further information)
- List of current medications and allergies, especially anticoagulants
- Results of relevant recent investigations, e.g. echo/spirometry
- Outcomes of any recent anaesthetics/surgeries (e.g. difficult airway)
- List of specific questions you would like answered

How do you book a patient acutely?

- If the procedure is to be done in Starship or Level 8 Theatres (or would require anaesthesia assistance from either of these departments) – book using scOPe. This includes haemodialysis line insertion for the Renal Service and acute radiology and gastroenterology procedures requiring anaesthesia assistance. Make sure to select correct Facility and Specialty for your personal login in scOPe at the start of each rotation.
- If your service does not use scOPe (those services using GSU, Level 4 and Level 9 Theatres for their acute cases), then complete an acute booking form (CR2789) and fax or take to the appropriate operating rooms reception.
- Ensure the following details are legible:
- Patients Name and NHI
- Responsible Consultant surgeon's details
- Your name and contact number
- Date and time of form completion
- Call the relevant Anaesthesia Coordinator **AND** the relevant Nursing 'Floor' Coordinator.

Relevant contacts

Starship Children's Health	Anaesthesia Coordinator 24h Nursing Floor Coordinator 24h Theatre Reception (fax)
Level 4 Cardiac/ORL	Anaesthesia Coordinator 24h Nursing Floor Coordinator (Cardiac) Nursing Floor Coordinator (ORL)

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	Theatre reception (fax)
Level 8 Adults	Anaesthesia Coordinator 24h Nursing Floor Coordinator Theatre reception (fax)
GSU	Anaesthesia Coordinator 0800-1630 Ophthalmology on-call nurse
Level 9 Women's Health	Anaesthesia Coordinator 0800-1800 Anaesthesia Registrar 24h Nursing Floor Coordinator Acute Bookings fax Pain and Anaesthesia Assessments fax

IV access requests

- For adult PICC lines, call the Adult radiology PICC line service. Make a referral via ROERS under angio/Interventional. If PICC service unavailable, call Anaesthesia; Level 4 for Cardiology and CTSU patients, Level 8 for other patients.
- Anaesthesia may be able to help with difficult IV lines (where appropriate attempts by RMOs have been unsuccessful), CVLs or PICCs. These need to be discussed with the relevant Anaesthesia Coordinator and booked as for an acute surgical case. Due to other acute work, we are not always available to assist, but we try hard to help.
- Patients needing IV access for radiological procedures, e.g. angiograms can have these done by the Radiology team. If needed for investigations (CT/MRI), then Anaesthesia may assist if needed.

Fasting information for planned (acute or elective) surgery

Clear fluids (i.e. water, black tea, black coffee) until 2 hours pre-anaesthesia for all patients.

AM or All Day list

- No food from: 6 hours before expected arrival time to hospital. This includes milk, lollies and chewing gum.
- Water: should have a glass of water before leaving the house on the day of operation and then nothing else (unless instructed) after that.
- Pre-op carbohydrate drink available when list order confirmed and patient waits longer than 2 hours.

PM list

- Light breakfast (e.g. cereal, toast) with tea/coffee/milk prior to 0700h. Should have a glass of water when leaving home and can have water until leaving to go to hospital.
- A small drink of water with medication does not contravene the NBM guideline.

Special notes

Unless a patient is to be exposed to a significant dose of contrast during surgery, they do not require IV fluids overnight prior to surgery. It is better for patients to remain orally hydrated by sipping water for thirst throughout the night. Small sips of water (<100 mL in an hour) until they are called for surgery is safe with regards to proceeding with anaesthesia.

https://adhb.hanz.health.nz/_layouts/15/WopiFrame.aspx?sourcedoc=/Policy/Fasting%20for%20anaesthesia%20or%20parenteral%20sedation.pdf&action=default

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2. PERI-OPERATIVE MEDICATION MANAGEMENT

- Most regular medications should be continued pre-operatively. Any questions relating to the continuation of usual medications in the pre-operative period should be discussed with the Anaesthetist.
- General consensus is as detailed below but please refer to this guideline for information around when to stop and start most medications (not Diabetes meds or anticoagulants):
- Perioperative Medication Management – except Diabetes & Anticoagulants (hanz.health.nz)
- If the patient has come in to hospital and has not had time to receive peri-operative medicine advice or has deviated from the advice, document this clearly in the medication chart so that it is easy for the Anaesthesia team to identify. If you suspect that this may delay surgery, contact the Anaesthetic Coordinator or case Anaesthetist for advice.

Diabetes medications (day of surgery is Day Zero)

Patients with diabetes

Refer to Diabetes Care for an Adult Having Surgery (hanz.health.nz) for up-to-date guideline:

- Refer any patient with an HbA1c >70 mmol/mol to a Diabetologist/Diabetes Nurse.
- An acceptable range for capillary blood glucose (CBG) is 4-14mmol/L. If hyperglycaemic (CBG >17mmol/L), surgery will not be undertaken unless the condition is serious or life-threatening.
- Starvation starts at the point when the patient would have had a meal e.g. 0800 on morning of surgery.
- Patients with diabetes **do not need to be brought in the day before** just for Variable Rate IV Insulin Infusions (VRIII) as they can start on the day of surgery.
- For patients with type 1 diabetes: NEVER STOP the subcutaneous basal insulin (e.g. Lantus®, Protaphane® or Humulin NPH®). The dose may need adjusting in some population groups e.g. "grazers".
- Hypoglycaemia (CBG <4 mmol/L) is a medical emergency – GET HELP.
- Refer to the new Diabetes Insulin Prescription and Blood Glucose Record (CR9194) for management of both hypoglycaemia and hyperglycaemia.

Oral Hypoglycaemic Agents (OHA)

Drug	Pre-operative	Post-operative	Rationale
Biguanides, e.g Metformin	Continue - if they will eat within 6 hours - no renal failure Otherwise withhold on day zero (including history of PONV)	Restart once eating and drinking normally	Increased risk of lactic acidosis in volume deplete patient, especially with impaired renal function
SGLT2 inhibitors 'flozins, e.g. empagliflozin, dapagliflozin *see below*	Minor day-stay surgery -last dose on day 2 All other surgery -last dose on day 3 Emergency – withhold on admission. Check ketones	Only start again when patient eating and drinking normally	Risk of euglycaemic ketoacidosis, electrolyte disturbances. Check blood ketones daily, if >1, take VBG
Sulphonylureas, e.g. Gliclazide, glipizide	Omit on day zero or when fasting. If taken, then monitor BSL	Restart once eating and drinking normally	Avoid hypoglycaemia

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DPP4 inhibitors, Gliptins	Continue unless patient is on a Variable Rate IV Insulin Infusion (VRIII)	Restart once eating and drinking normally	
GLP1 Receptor agonists, e.g. Dulaglutide	Continue if weekly unless dehydrated or vomiting Continue even if on VRIII		May exacerbate dehydration if patient volume deplete
Pioglitazone	Continue		
Meglitidines	Omit on day zero if am surgery Give morning dose if pm surgery	Restart once eating and drinking normally	Avoid hypoglycaemia

*If the patient has been prescribed dapagliflozin for heart failure, there is the potential for exacerbation of symptoms when the medication is withheld. Seek specialist advice.

Insulin management

The requirement for insulin peri-operatively is determined by prior treatment schedule, degree of control and expected fast. It is rare for a patient who is not usually on insulin to require peri-operative insulin.

Refer to Diabetes Care for an Adult Having Surgery (hanz.health.nz) for:

1. Implementation of Variable Rate IV Insulin Infusions (VRIII) in patients with diabetes undergoing surgery
2. Treatment plan for patients with diabetes on day of surgery

Anticoagulants and Antiplatelets (AC/AP medications)

Patients are on AC/AP medications for a variety of reasons and there are multiple regimens. Please refer to the Thrombosis and Anticoagulation section for details on assessing thrombosis and bleeding risk, cessation, reversal or bridging of anticoagulants.

Also see:

https://adhb.hanz.health.nz/cancer-and-blood/Haematology/Pages/default.aspx

https://adhb.hanz.health.nz/site/Anaesthesia/DeptPoliciesGuidelines/Anticoagulation%20and%20Regional%20Anaesthesia.pdf

Important points:

- It is important to identify the **indication** for the medication e.g. AF or valve disease.
- Patients who are likely to have neuraxial (spinal/epidural) or regional anaesthesia need specific guidance around AC/AP medications – discuss with the Anaesthesia Coordinator.
- It is essential to have a plan for restarting these medications postoperatively to prevent ongoing omission.
- Specific reversal agents exist for:
    i. Warfarin - prothrombin complex concentrate (PCC) and vitamin K
    ii. Heparin – see below
    iii. Dabigatran – idarucizumab (Praxbind®) – go to Haematology intranet site
    iv. Rivaroxaban (Xalreto®)/Apixaban – PCC (antidote in the pipeline)
    v. Clopidogrel/Ticagrelor, other antiplatelets – need discussion with Anaesthetist/Haematology

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Warfarin

https://adhb.hanz.health.nz/cancer-and-blood/Haematology/Pages/Warfarin.aspx

- In order to know if warfarin should be stopped, the risk of bleeding vs. thrombosis must be assessed.
- If the risk of bleeding is low, then it may not be necessary to stop warfarin.
- In other acute cases, stop on admission and consult on the need for reversal.
- In elective cases, stop 5 days before surgery and check INR on admission.
- **Note**: If baseline thrombosis risk is high, stopping may not be safe and bridging is needed. Discuss with relevant on-call Haematologist/Cardiologist/Anaesthetist.
- Surgery is generally safe to perform with INR <1.5.

Risk of thrombosis or thromboembolism

Initial indication for anticoagulation:	**Patients are at relatively LOW risk of thrombosis if they have had:**	**Patients are at relatively HIGH risk of thrombosis if they have had:**
Stroke prophylaxis due to AF	No stroke/TIA in the past 6 months	Stroke/TIA in the past 6 months
DVT/PE	Index event requiring anticoagulation occurred >3 months ago	Acute thrombosis in the past 3 months (consider IVC filter if VTE within the last 2 weeks). Recurrent VTEs
Mechanical heart value	Lower risk valves − discuss management with Cardiologist; some individuals need to be managed as HIGH risk	Higher risk situations = Mitral position prosthetic valves, more than 1 prosthetic valve, ball in cage or tilting disc valve, or AF+ rheumatic heart disease and LVEF <40%.

Heparins (Low Molecular Weight Heparin (LMWH) & Unfractionated heparin (UFH))

Heparins	**Pre op**	**Post op**
Prophylactic LMWH – e.g. enoxaparin/ Clexane® 20-40 mg daily	Do not start routinely last dose should be at least 12 hours prior to surgery	Start minimum 6 hours after surgery complete
Therapeutic LMWH e.g. enoxaparin/Clexane® • **1-1.5 mg/kg daily or** • **1 mg/kg BD**	Elective – last dose >24 hours prior to surgery	Resume 24 hours after minor procedures if adequate haemostasis
	Emergency – if <12 hours since LWMH then manage as if anticoagulated with IV heparin, call haematology as may need protamine	If major surgery, or high bleeding risk surgery then either use: IV unfractionated heparin OR Restart LMWH after 48-72 hours
IV heparin infusion (UFH)	Stop infusion 4 hours pre surgery Send URGENT APTT 1 hour pre surgery	Infusion can be restarted once haemostasis secure. Use standard ward heparin protocol without the loading dose

CAUTION: If a patient is on long-term therapeutic dose LMWH discuss management with Thrombosis Unit Specialist or Haematologist. It is NOT safe practice to assume this can be stopped the evening before surgery.

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Direct thrombin inhibitors

Dabigatran (Pradaxa®) is a direct thrombin inhibitor with a half-life of 12-14 hours that is significantly prolonged with renal impairment. Usual indications include VTE prophylaxis/treatment and stroke prophylaxis in atrial fibrillation. It is not used for valvular disease.

Factor Xa inhibitors

Rivaroxaban (Xarelto®) and apixaban (Eliquis® not funded by Pharmac) are Factor Xa inhibitors taken orally. Usual indications are VTE prophylaxis/treatment and stroke prophylaxis in atrial fibrillation. They should be avoided in severe renal or hepatic disease.

CrCl (mL/min)	**Stop dabigatran pre-op**		**Stop Rivaroxaban pre-op**	
	High risk bleeding or major surgery	Standard risk	High risk bleeding or major surgery	Standard risk
≥80	2 days prior	24 hours prior	2 days prior	24 hours prior
≥50-<80	2-3 days	1-2 days	2 days	24 hours
≥30-<50	4 days	2-3 days	60 hours	36 hours
<30			3 days	2 days
Reversal agent available?	Yes, Idarucizumab/Praxbind®. To access: https://adhb.hanz.health.nz/cancer-and-blood/Haematology/_layouts/15/WopiFrame2.aspx?sourcedoc=/cancer-and-blood/Haematology/Dept%20Resources/Idarucizumab%2003.2020.pdf&action=default		No, direct reversal agents for these medications are not available as yet. Bleeding patients should be discussed with a Haematologist https://adhb.hanz.health.nz/cancer-and-blood/Haematology/Pages/Anticoagulants.aspx	
Restarting	Once haemostasis has been achieved, usually >6 hours after surgery or the next morning			

Also see:
https://adhb.hanz.health.nz/site/Anaesthesia/DeptPoliciesGuidelines/Anticoagulants%20and%20Antiplatelet%20Agent%20-%20Elective%20Surgery%20Quick%20Guides.pdf

Antiplatelet Therapy (e.g. aspirin, clopidogrel, ticagrelor)

Patients are on antiplatelet medications for either cardiovascular or cerebrovascular disease. Management of these medications depends on how long ago their disease event was.

Antiplatelets	**Indication**	**Ceasing advice**
Aspirin	Primary prevention only	7 days prior (elective)
	Primary prevention with diabetes **OR** Secondary prevention	Continue unless • Neuro/spinal surgery or • Urology surgery
Special consideration	If CVA in last 9 months or ACS/PCI in last 3 months, risk of stopping aspirin increases- discuss with Neurology/Cardiology/Anaesthesia and surgical team	
Clopidogrel/ticagrelor	Dual antiplatelet therapy (DAPT)	Can stop 2nd agent and continue with aspirin only, except for neuro/spinal/urology* as above
	Monotherapy	Consider swapping to aspirin*
		Stop 5-7 days pre op (elective)
Dipyridamole	Usually continue DAPT with aspirin	48 hours*

*Seek senior specialist advice before stopping or swapping

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Cardiac medications

	Pre-op	Post-op	Rationale
Betablockers	Continue unless bradycardic or hypotensive	Resume ASAP. Reintroduce first c.f. other antihypertensives*	Stopping betablockers increases risk of peri-op ACS/arrhythmia
ACE-I/ARB	Withhold day of surgery	Recommence when patient exceeds their BP target	Avoid significant post-op hypotension
Diuretics	If for heart failure; continue	Continue and monitor electrolytes and volume status	Avoid exacerbating heart failure
	If for HTN, can stop	Restart once BP target achieved	Avoid hypotension

*If unable to recommence PO, consult cardiology for IV alternative

- Most other anti-hypertensive medications including calcium channel blockers (e.g. amlodipine, diltiazem), and antiarrhythmic medications (e.g. digoxin, amiodarone) should be continued in the perioperative period.
- Be vigilant for combination medications which contain diuretic and ACE-I/ARB e.g. losartan with hydrochlorothiazide.

Herbal medications (e.g. ginger, ginkgo, St John's Wort)

- Pre-op: Stop two weeks prior to surgery where possible.
- Post-op: It is usually safe to restart these on discharge from hospital. Be mindful of medication interactions.
- Rationale: Herbal products may have unpredictable additive effects when combined with prescription medications. Please document in the admission notes and medication chart if a patient is taking these medications.

Analgesia

NSAIDs

- Pre-op: NSAIDs should generally be withheld in systemically unwell patients. In the absence of systemic illness, short acting NSAIDs should be withheld on the morning of surgery e.g. ibuprofen, diclofenac. All other NSAIDs should be stopped 72 hours prior to surgery where able.
- Post-op: If and when to re-start NSAIDs is a challenging decision. Cardiac, renal and GI risks should be balanced against optimal analgesia. If uncertain, seek senior advice.

Long term opioids
(e.g. methadone, buprenorphine, naltrexone, controlled release opioids)

- Pre-op: long-term opioids should be continued at their regular dose.
- Post-op: management is guided by the case Anaesthetist and the Acute Pain Service.
- Refer to the Pain Service guidelines for patients on advanced opioids (e.g. methadone, buprenorphine, naltrexone). If you anticipate the patient's analgesic requirements changing during their admission, seek help from the pain service.
- Do not start patients on controlled release opioids in the perioperative period.

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Steroids, Immunosuppressants and DMARDs

Steroids

- Pre-op: patients who are taking >5 mg of prednisone/day or an equivalent steroid dose will generally require stress dosing of steroids for acute illness.
- Post-op: continue stress dosing of steroids as per post-op instructions until the patient can resume their usual regime.
- Rationale: higher concentrations of cortisol are required in periods of stress. The patient may not be able to mount this response themselves if they are immunosuppressed.

DMARDs and Immunosuppressants
e.g. methotrexate, leflunomide, tacrolimus

General points: these medications require advice tailored to the patient and their current condition. Seek senior Specialist advice.

3. PRE-OPERATIVE INVESTIGATIONS

Blood tests

- Routine testing of all patients undergoing surgery is not required.
- Complexity of surgery and comorbidity (or ASA) is a better indicator of the benefit of screening than age.
- Invasive/high risk and acute procedures are more likely to need testing.
- Bloods <6 months old and ECGs <1 year old are acceptable if stable health and medications.

These are guidelines only and the final decision on appropriate pre-operative testing is a clinical decision. Discuss any concerns with the Anaesthesia Coordinator or Procedural Anaesthetist.

ASA Grade (American Society of Anaesthesiologists Physical States Classification System)	
ASA 1	A normal healthy patient
ASA 2	A patient with mild systemic disease, e.g. HTN, pregnancy, smoker, obesity
ASA 3	A patient with severe systemic disease, e.g. T2DM, IHD, liver disease, cancer
ASA 4	A patient with severe systemic disease that is a constant threat to life e.g. active cardiac failure, on dialysis

Guideline for blood testing

Test	**ASA 1**	**ASA 2**	**ASA 3 or 4**
Minor surgery (e.g. excision of skin lesion, drainage of abscess)			
FBC	Not routine	Not routine	Consider in patients with CVS or renal disease or any symptoms not recently investigated, e.g. PR bleeding
Coags	Not routine	Not routine	Not routine
Kidney function	Not routine	Not routine	Consider if at risk of Acute Kidney Injury (AKI)

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Intermediate surgery (e.g. inguinal hernia repair, varicose veins, tonsillectomy, knee arthroscopy)			
FBC	Not routine	Not routine	As for minor surgery
Coags	Not routine	Not routine	Consider if: • Chronic liver disease, alcohol abuse • Thrombocytopaenia • On anticoagulation
Kidney function	Not routine	Consider in patients at risk of AKI or on HTN treatment	Yes
Major or complex surgery (e.g. intra-cavity procedures, TURP, spine surgery, total joint replacement, lung operations, colonic resection)			
FBC	Yes	Yes	Yes
Coags	Not routine	Not routine	Yes
Kidney function	Consider in patients at risk of AKI	Yes	Yes

Risks of acute kidney injury include chronic kidney disease, age >65, diabetes, nephrotoxic medication use, heart failure, hypovolaemia, severe sepsis

Test	
Urine	Not routine. Yes, if symptomatic or for implant surgery. Where surgically indicated (e.g. urology).
Chest X-ray	Not routine. Yes, if has advanced or acute cardio-respiratory disease, known malignancy, severe scoliosis.
Pregnancy test	Child bearing age where status uncertain.
Group + Hold	See reverse of cross-match form.

National Institute for Health and Care Excellence (2016), Adapted from NG45 Routine preoperative tests for elective surgery. Reproduced with permission.

ECG

- If <65, do an ECG if there is history of cardiac disease* or cardiac risk factors**, Cr >150, or poor functional capacity (METS <4)
- If >65, do an ECG if there hasn't been one done in the last 12 months

*Cardiac disease = arrhythmia, cardiac failure, coronary artery disease, valvular heart disease, congenital heart disease, cardiomyopathy

**Cardiac risk factors = diabetes mellitus, hypertension

1 MET = metabolic equivalent (oxygen consumption at rest)	**MET rating**	**Equivalent activity**
Poor functional tolerance	<4 METS	<2 flights of stairs
Good functional tolerance	>4METS	2 flights of stairs and continue

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Echo guidelines for patients prior to non-cardiac surgery

- Pre-operative transthoracic echocardiography (TTE) is not indicated for routine evaluation of ventricular or valvular function when there are no symptoms or signs of cardiovascular disease.
- Please see full guidelines:

  https://adhb.hanz.health.nz/Policy/Perioperative%20Echocardiography%20(Non-Cardiac%20Surgery).pdf
- A TTE is indicated for:
- A new murmur with symptoms or a suspicious murmur with poor functional capacity.
- A murmur and no prior TTE where an **epidural or spinal** is likely to be needed.
- No murmur but signs of valvular dysfunction, unstable cardiac symptoms, pulmonary hypertension, new AF, significant ECG abnormalities (e.g. evidence of LV strain).
- Prosthetic valves, if function is a concern or no TTE in >3 years.

If a TTE was done within the last 1 year and symptoms are stable then a repeat is not indicated. Please call the appropriate Anaesthesia Coordinator to discuss.

4. MANAGEMENT OF COMMON POST OPERATIVE ISSUES

On-going *significant* somnolence after general anaesthesia

- Straightforward patients spend about 60 minutes in the recovery room after an anaesthetic.
- Recovery from GA is often almost complete by the time patients leave the recovery/Post Anaesthesia Care Unit (PACU).
- On-going significant somnolence is uncommon and requires medical assessment, particularly if the patient has been alert and responsive and then acutely becomes drowsy.
- Assessment includes ruling out hypoglycaemia, hypercapnia, excessive analgesic use, low sodium, stroke or considering potential hypoactive delirium.

Abnormal neurological assessment after regional anaesthesia (RA)

Patients who have had spinals, epidurals or arm or leg blocks often return to the ward with insensate limbs. Frequent neuro nursing observations will be made throughout the duration of the block (e.g. whilst epidural in situ).

Urgent referral to the anaesthesia coordinator is required if:

- A spinal (alone or with epidural) has not started to regress 4 hours after placement or has not significantly receded after 6 hours.
- There is back pain with fever, onset of deepening lower limb weakness/numbness or development of incontinence.
- Numbness or weakness fails to regress at 24 hours or recurs after resolution post placement of a regional block.

For further information on neuro-axial anaesthesia and LMWH dose timing, see the epidural section of the Pain Services chapter.

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Pain – the Analgesic Ladder

The amount of pain relief a patient needs post operatively varies widely and is affected by the type of operation, pre-operative analgesia needs, presence of regional anaesthesia etc.

Please see the pain section of the handbook for more information, but generally the analgesia ladder suggests (if not contraindicated):

1. Regular paracetamol 4 x per day (not on the PRN part of the drug chart).
2. Anti-inflammatories (Celecoxib can be given on an empty stomach).
3. Weak opioids, e.g. tramadol, PO or IV.
4. Short acting opioids, e.g. morphine (Sevredol®), oxycodone (Oxynorm®). It is uncommon to chart long acting oral opioids for acute surgical patients.
5. Sophisticated analgesics, e.g. PCA, ketamine infusion – requires pain team involvement.

For advice on discharging patients on opioids, see the relevant Pain sub-section

Post-Operative Nausea and Vomiting (PONV)

- This occurs in approximately 30% of all patients, but the incidence can be much higher in those with risk factors, like previous PONV, laparoscopic surgery.
- Most patients will have received prophylaxis in the operating room; please check the anaesthetic record and PACU chart to ensure there is no overdosing.
- See Post Anaesthesia Care Unit (PACU) Care and Discharge/Transfer (hanz.health.nz)

In essence, the order of PONV treatment is:

1. Ondansetron (4 mg PO/IV q8h)
2. Cyclizine (12.5-50 mg PO/IV q8h) or droperidol (0.625 mg IV q8h)
3. Scopolamine (hyoscine hydrobromide) patch

Venous thromboembolism (DVT and PE)

- All patients should be assessed on admission for their risk of DVT and PE.
- All patients should have a plan for VTE prophylaxis (chemical or mechanical or both).
- Please see the General Surgery or Orthopaedic sections for further details on risk assessment and thromboprophylaxis.
- Have a high index of suspicion for PE in patients with SOB, tachycardia or fever post-op.

Cardiac concerns (also see Cardiology section)

Peri-operative myocardial ischaemia/infarction may present atypically e.g. absent chest pain.

Post-operative chest pain

Note: Many post-op MIs are missed. High index of suspicion needed if there is a history of:

- Past MI (history repeats itself)
- Past CVA (many patients with stroke die of MI)
- Peripheral vascular disease (they are all similar vessels)
- Diabetes mellitus (often the infarct is silent)
- Previous heart failure (?underlying IHD, HTN or AS)
- The patient is undergoing "body cavity" surgery

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- Multiple risk factors, especially in the older patient

Suspect MI if the above risk factors are present and the patient:

- is haemodynamically unstable
- has any chest pain
- is tachycardic
- is dyspnoeic or appears to be in heart failure
- is just looking crook or failing to thrive
- has had their oral β-blocker stopped

Post-op atrial fibrillation

New or uncontrolled atrial fibrillation (AF) in a post-op patient should provoke a thorough search for a cause as it is usually associated with other post-op complications. Assessment should include a review of the history, full examination and appropriate investigations.

The pertinent points include:

- When did the problem start?
- Have rate controlling medicines been stopped?
- Is there chest pain or dyspnoea?
- What is haemodynamic status – HR, BP, JVP, perfusion, urine output, fluid status
- Are there symptoms/signs of cardiac failure

Actively rule out possible precipitants

- Cessation of usual medication (e.g. β -blocker)
- Infective complications of surgery (seek these)
- Myocardial infarction or ischaemia
- Fluid overload or hypovolaemia
- Electrolyte disturbances
- Poor control of pain
- Pulmonary embolism

Rate control is very important

- Chemical or electrical cardioversion must be considered if the onset is known to be within the previous 24 hours.
- Discuss with a senior team member about cautiously initiating beta-blocker, amiodarone or other agents such as diltiazem.
- Medications may need to be delivered intravenously in patients in whom absorption via the enteric route may be unreliable.

If you suspect an acute cardiac event, then do:

- Serial 12 lead ECGs

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- FBC, creatinine and electrolytes including Mg2+, Serial Troponin T, blood cultures (if febrile)

All patients should be discussed with the on-call Cardiology or Medical Registrar.

If a cause is found, ensure that treatment is initiated. e.g. K or Mg replacement if low K/Mg.

5. IMPORTANT CO-MORBIDITIES & INVESTIGATIONS TO CONSIDER PRE-OP

Ischaemic heart disease	• Previous acute events (e.g. STEMI, NSTEMI). When and what treatment (PCI vs. CABG vs. medical management) • Residual angina symptoms. Exercise tolerance • Most recent echo – LV/RV size and function. Regional wall motion abnormalities
Valvular disease	• What type of valve lesion? • Echo to quantify severity • Symptoms
Rhythm issues	• ECG, rate control • Do they have a PPM or ICD?
Heart failure	• BNP • PND/orthopnea? Can they lie flat?
Asthma/COPD	• Have they had previous hospital or ICU admissions? • Severity • Lung function tests
OSA/OHS	• STOPBANG score • Have they been started on CPAP/BiPAP? • Do they have their machine with them?
Previous lung resections/Cancer	• Lung function tests
Liver disease	• Aetiology • Is synthetic function affected? (albumin, coags, etc)
Kidney disease	• Are they on dialysis? How often are they dialysed? When did they last get dialysed? • Potassium levels
Diabetes	• T1DM vs. T2DM • How well are their sugars controlled • Diabetes medications
Pregnancy	• Inform patient's LMC and seek obstetric opinion, especially if >20/40

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Retained items after surgery

SURGICAL COUNT RESPONSIBILITIES

The Count Policy for Surgical Procedures must be adhered to for all surgical procedures performed in an Operating Room in Te Whatu Ora | Te Toka Tumai Auckland. All personnel participating in a surgical count must be aware of their professional responsibilities, understand policy and procedure and be able to recognize and identify accountable items.

Surgeon/Surgical Assistant

- Maintains an awareness of all surgical items and their location when on the surgical field.
- Communicates the placement of items in the wound so this can be written on the count board where all team members can visualise.
- Performs a methodical wound exploration before closing the wound or handover to another surgeon or team. This is communicated to the team.
- Acknowledges the count process had begun and removes all non-essential items from the surgical field at this time.
- Communicates items intentionally left in the wound e.g. packing.
- Acknowledges the completed count at each closure.
- Participates in count reconciliation procedures.
- Documents actions taken to resolve count discrepancies in clinical notes and follows up on x-rays taken for this purpose.
- Communicates non-resolved count discrepancies and intentionally left items to the patient/family and plan for items.
- Makes the decision about whether an item will be retained internally in the wound and takes responsibility for follow-up of all retained items prior to discharge and communicates with ward/ICU nursing teams.
- Surgeon to ensure accurate completion of all details on Action Required Prior to Discharge form (CR0118).
- Responsible for deciding on x-ray to locate possible retained item, appropriate and timely follow-up on x-ray and if not located ensures a referral for radiologist review has been completed.
- Full disclosure to patient and family/whanau of any incident involving retained items in the OR, intentionally retained items post operatively and plan for removal of items.

Anaesthetic Professionals

- Plans anaesthesia in support of unpressured counting process.
- Avoids using countable items.
- Communicates countable items used e.g. bite blocks, throat packs, upon insertion and removal.
- When using sutures/sharps communicates the use and witnessed discarding of these items into a sharp receptacle.

All team members

- Ensures minimal noise and helps plan to prevent interruptions during the count process.
- Notifies circulating nurse who conducted count if countable item used by anaesthesia or added to the sterile field.
- Notifies circulating nurse if countable items falls from field and ensures placement under scrub trolley.

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Cardiothoracic Surgery

WHO TO CALL

- On-call Registrar
- Consultant responsible for the patient, and if they are not available/contactable:
- On-call Consultant
- The phone numbers for each Consultant as well as the Consultant on-call are displayed in the nursing stations on ward 42 or can be contacted via the hospital operator

Escalation of concerns

Many post-op cardiothoracic patients in the ward have had complex cardiac or thoracic procedures, where any delay in diagnosis or treatment can adversely affect outcome. Prompt review and discussion with senior staff and treatment are vital.

- Attend to calls immediately.
- Bring the problem to the attention of the Registrar or Consultant.
- If you are unable to contact the Registrar, contact the Consultant responsible for the patient or the on-call Consultant directly.
- Follow the EWS (Early Warning Score) documentation on the ward as to what to do for each score and when to call a code.
- If you have concerns regarding a cardiothoracic patient, do not rest until you have spoken to a Registrar or Consultant directly; leaving either a voice or text message is not sufficient.

Resources

"The House Officer Orientation Booklet" and "Ward 42 Management Guidelines – for House Officers and Registrars" available at the staff base in ward 42 ACH, provide a comprehensive outline of procedures and protocols.

CLERKING OF PRE-OPERATIVE PATIENTS

- The Cardiothoracic Service at Auckland Hospital operates on patients who present both electively (from home) and those presenting with an acute cardiothoracic concern. Patients who present electively usually present to ward 42 the day prior to, or early on the morning of surgery. These patients are clerked in by the Cardiothoracic House Officers.

  For patients coming in from home, take a complete history and examine thoroughly. Fill out the Thoracic or Cardiac Surgery Pathway booklet for each admission.

- Chart all regular and any other pre-operative medications as advised by the Registrar, Consultant and case Anaesthetist.

- Ensure all pre-operative investigations are completed as per the checklist

- Ensure patients have been cross-matched appropriately (see guidelines available in ward 42 staff base)

- The cardio-surgical summary and MDM notes provide a lot of useful information. In particular note anything that has happened to the patient since the cardio-surgical summary or thoracic MDM discussion and escalate any concerns to the relevant team Registrar in a timely fashion prior to the planned operation date.

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- Patients requiring acute cardiac surgery are usually admitted preoperatively to ward 31 or 34 under the care of the Cardiology team. These inpatients will already be fully admitted by the Cardiology Service and the job then is to check that the relevant parts of the surgery clinical pathway document are completed and are correct. Use the “Cardiac Surgery Pre-op checklist” stickers to do so. Escalate any concerns to the operating team in a timely manner.

- Occasionally, patients will be acutely transferred to ward 42 under the care of the on-call cardiothoracic surgeon for acute thoracic surgery. These patients require full admission, medication charting and standard preoperative investigations including a valid Group and Hold. Clarify with the admitting Registrar regarding timing of surgery so medications can be withheld and any relevant urgent investigations can be obtained. Consent and surgical booking are usually completed by the responsible registrar.

- Medications to be withheld will be indicated by the Anaesthetic team as part of their pre-operative assessment. Beta blockers should be continued on the morning of surgery but ACE inhibitors and ARBs should be withheld. SGLT2 inhibitors (e.g. empaglifozin) should be withheld five days prior to the scheduled operation. Check the Anaesthetic Assessment document found in the patient’s clinical notes for any other preoperative instructions when clerking patients in.

- Anticoagulants and antiplatelets (excluding aspirin which can be continued) are usually withheld prior to elective theatre (see below “anticoagulation in CTSU patients”). A copy of this table can also be found in the house officer orientation booklet.

- Clinical urgency may necessitate proceeding to operation despite these medications having been taken within the time periods noted above – the timing of the most recent dosing should be noted and the Registrar informed.

- Make sure that the relevant investigation results are available: CXRs/ECHOs/coronary angiograms/CT scans, etc. Occasionally these investigations occur in private or happen outside Auckland (e.g. adult congenital patients). A summary of pertinent findings can usually be found within the patient’s notes or in either the cardiosurgical summary/thoracic MDM; otherwise notes may need to be obtained from the relevant hospital.

- Consent for procedures will be completed by the Registrar or Consultant.

- Bring any concerns to the attention of the Registrar or Consultant immediately. It is easier to sort issues out and obtain necessary investigations during regular working hours.

- Decisions about stopping anticoagulation and who should have bridging should already have been made at the time of admission and patients coming in for bridging will be identified. Ask the Registrar if you are not sure.

REVIEWING PATIENTS TRANSFERRING FROM CVICU TO THE WARD

- The time following transfer from CVICU is a critical period in a patient’s admission. **Careful review is required to ensure deterioration is detected early and that any outstanding investigations/management plans from their ICU stay are actioned**. The most common reasons for needing to return to CVICU are increasing inotropic requirements, need for respiratory support and arrhythmias with haemodynamic compromise.

- Patients being stepped down from CVICU require formal admission to the ward. A template for this specific purpose is available on the ward 42 computers. A summary of the surgery and ICU admission is made in the notes followed by a thorough review of the patient’s respiratory and cardiac function. Admission includes a head-to-toe examination, including documentation of any residual access lines/drains/pacing wires/suction dressings, wounds and weight. The admitting House Officer should also review the patient’s pertinent postop investigations including imaging, blood tests,

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microbiology, ECGs and echo. Carefully chart medications on stepdown – taking care to note any new additions/alterations to the patient's usual medications. Ensure any diuretics are dosed appropriately for the patient's degree of fluid overload and renal function. Ensure patients have pain relief and antiemetics charted. Thoracic patients should have nebulisers charted. Reintroduction of diabetes medications, antihypertensives and antiplatelets/anticoagulants must be discussed with either the ward or team Registrar.

- For transplant patients, please note that there is a separate transplant medication chart that should be used. Please clarify dosing and timing of therapeutic drug monitoring with the transplant team when the patient is stepped down to the ward and double check medication charting to ensure medications are not inadvertently missed following stepdown.

- **Warfarin charting for patients under our service is Registrar-led. Do not chart warfarin** for patients unless specifically advised to do so by the responsible Consultant or team Registrar.

- Patients who have had an acute coronary syndrome preceding their admission for cardiac surgery are usually commenced on DAPT prior to discharge (after pacing wires have been removed). Please clarify this with the team registrar or consultant, especially if patients are also anticoagulated.

- If you have any concerns please discuss them with the Registrar/Consultant responsible.

BIOCHEMICAL ABNORMALITIES

- Potassium – maintain potassium levels above 4.5 mmol/L in the first three days for patients having undergone cardiac surgery. Replacements can be given orally as per the following:

Patients with creatinine of up to 150 micromol/L	
Potassium level	Dose
3 – 3.5 mmol\L	**STAT:** 3 tab Chlorvescent® and 2 tab Span K® Followed by: 2 tab Span K® TDS, maximum of 3 doses then review
3.6 – 3.9 mmol\L	2 tab Span K® TDS, maximum of 6 doses then review

Patients with creatinine of up to 150 - 250 micromol/L	
Potassium level	Dose
3 – 3.5 mmol\L	**STAT:** 1 tab Chlorvescent® and 1 tab Span K® Followed by: 1 tab Span K® TDS, maximum of 3 doses then review
3.6 – 3.9 mmol\L	1 tab Span K® TDS, maximum of 6 doses then review

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or via a CENTRAL VENOUS LINE if the patient has one:

- K+ <4.0 mmol/L: give potassium chloride 20 mmol IV over 1 hour and repeat serum K+ level
- K+ 4.1-4.5 mmol/L: give potassium chloride 10 mmol IV over 1 hour
- Max rate of KCL potassium chloride administration is 20 mmol/hour
- Magnesium – maintain magnesium >1.0 mmol/L in the first 3 days
- Mg2+ <0.75 mmol/L: give 20 mmol magnesium sulphate over 1 hour
- Mg2+ 0.75-0.9 mmol/L: give 10 mmol magnesium sulphate over 1 hour
- Elevated creatinine – assess urine output and fluid balance, stop nephrotoxic drugs. Maintain a reasonable blood pressure (more than 120 mmHg) to ensure good renal perfusion. Assess for low cardiac output state and fluid status. Discuss management with Registrar or Consultant.
- Blood sugar – Aim BSL >5 and <10 mmol/L (sliding scales available on ward)
- **We use Actrapid sliding scales on the ward** – the full scale is available in the House Officer Orientation Booklet. Contact the Diabetes Nurse Specialist if patient has persistent suboptimal glycaemic control.
- Post-operative anaemia is not unexpected for cardiac surgical patients. Assess degree of fluid overload and exclude active bleeding. Discuss Hb <80 g/L with the responsible Registrar or Consultant; however it is uncommon to require a transfusion unless Hb <70 g/L.

PAIN MANAGEMENT

- Patients having undergone cardiothoracic surgery require adequate pain management to aid recovery.
- Thoracic patients are frequently commenced on an opioid PCA and may have an extrapleural catheter after thoracotomy. These patients are reviewed daily by the Acute Pain Service. It is important to check adequate oral analgesia has been prescribed after the PCA/extrapleural has been stopped. We commonly use short acting oral opioids such as sevredol (morphine) and oxynorm (oxycodone). Long acting opioids such as oxycontin (oxycodone) and m-Eslon (morphine) are occasionally used, but are generally avoided. Avoid NSAIDs following pleurodesis, in impaired renal function and in those with risk of GI bleeding.
- A sudden increase in analgesic requirement, which is persistent, is uncommon for post-operative patients who have otherwise been progressing routinely along the surgical pathway and may signal early deterioration. Review the patient clinically and escalate any concerns to the Registrar as needed.

REVIEWING CXRS

- For patients having undergone cardiac surgery, chest x-rays are usually done on days 1 and 3 and after removal of intercostal drains. Some surgeons will repeat the chest x-ray at days 1 and 4 – check with the responsible Surgeon/Registrar. More frequent x-rays may be required in thoracic patients – check with the team Registrar.
- For thoracic patients, drains are occasionally clamped prior to removal at the direction of the Registrar/Consultant. Patients who have drains clamped require a chest x-ray at the 4 hour mark

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before the decision can be made to remove the drain. Patients also require a chest x-ray after drain removal – this should be done at the earliest after the drain is removed.

- Look specifically for subcutaneous emphysema, pleural effusions, pneumothoraces, intercostal drain and central line position, pulmonary oedema, consolidation/atelectasis and enlarging heart size. Concerns should be escalated to the responsible Registrar.

MANAGEMENT OF CHEST DRAINS

- Review the patient.
- Assess the nature and quantity of drainage – serous/blood/pus/chyle.
- Swing/fluctuance of the fluid column confirms a patent drain in the pleural cavity. Assess for bubbling – both at rest and on coughing.
- Check for air leak if drains are bubbling. In case of an air leak, check the drain tubing from where it exits the skin to the bottle, making sure that all connections are secure and that there is no air sucked into the tube.
- Remove drains only on the direction of a Registrar or a Consultant.

Chest drain removal

- Get another person to help you, usually the patient's nurse (one person pulls the drain while the other ties the suture).
- Collect the necessary equipment (clamp, dressing set, blade, sterile gloves, povidone-iodine antiseptic solution (Betadine®), eye protection and apron).
- Explain the procedure to the patient and make sure that they are comfortable. Checking they recently have had pain relief is advisable.
- Get the patient to practice doing a valsalva manoeuvre (breathing against a closed mouth and nose), a few times.
- Clean and drape the drain site.
- Ensure that there is no air leak and then clamp the drain (do not remove if there is an air leak).
- Ensure there is a suture for closure of the drain site after drain removal, if there is no suture this should be placed prior to drain removal (2-0 silk is usually sufficient).
- Cut the securing knot and keep the suture ready to tie down.
- Ask the patient to perform a valsalva manoeuvre and hold (this brings the lung in opposition to the chest wall and raises the intra thoracic pressure, reducing the chances of a pneumothorax) when you pull out the drain and the other person ties down the suture.
- Request a chest x-ray following drain removal to rule out an iatrogenic pneumothorax – this should be done at the earliest after the drain has been removed.

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ATRIAL FIBRILLATION

- Occurs in one-third of patients post cardiac surgery. Ensure adequate electrolyte management.
- Most surgeons will commence patients on prophylactic amiodarone following cardiac surgery, however this is surgeon specific. Please refer to **individual surgeon's protocols for management of AF and if in doubt consult the team Registrar.**
- Standard prophylaxis: PO amiodarone 400 mg TDS for 2 days followed by 200 mg PO BD until discharge. This is then stopped at the time of discharge if there has not been any AF during the admission, or as otherwise directed by the operating surgeon.
- Escalate concern immediately if there is haemodynamic instability related to fast AF
- Follow the EWS advice and call code as necessary
- The patient may require urgent synchronised cardioversion.
- Check and replace potassium (aim >4.5 mmol/L) and magnesium (>1.0mmol/L).
- Prior to initiating additional anti-arrhythmic medications, discuss the patient with the on-call Registrar.
- Thromboprophylaxis: commence warfarin (or new oral anticoagulants for non-valvular AF if appropriate) in recurrent episodes of paroxysmal AF or if AF has persisted post-operatively for >48 hours. These patients may also require discussion with the cardiology service at the direction of the responsible cardiac Surgeon/Registrar.
- Note that warfarin charting within our service is Registrar-led.

ANTICOAGULATION AND CARDIOTHORACIC SURGICAL PROCEDURES

Pre-op

- Anticoagulants and antiplatelets (excluding aspirin and dipyridamole which can be continued) are withheld for a time period prior to elective surgery:

Tirofiban/eptifibatide	6 hours pre-op
Enoxaparin (Clexane®)	2 days pre-op
Warfarin/clopidogrel/ticagrelor	5 days pre-op
Prasugrel	7 days pre-op
Dabigatran (renal function dependent)	CrCl 50-80 mL/min 2-3 days pre-op CrCl 30-50 mL/min 4 days pre-op CrCl <30 mL/min >5 days pre-op
Apixaban/rivaroxaban	3 days pre-op unless otherwise advised

- Check with the Registrar/Consultant prior to stopping a patient's heparin infusion – these can be continued until the time of theatre in certain patients.

Post-op

- Cardiac patients receive heparin 5000 units subcut BD until INR is 2 or until discharge.

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- Thoracic patients receive enoxaparin 0.5 mg/kg subcut daily until discharge.
- Coronary patients receive oral aspirin 100 mg post-op.
- Patients who have had an acute coronary syndrome preceding their admission are usually commenced on DAPT prior to discharge (after pacing wires have been removed). Please clarify with this with the team Registrar or Consultant, especially if patients are also anticoagulated.
- Refer to medication protocols/guidelines for specific surgeons regarding anticoagulation in valve patients – **Registrars only** must chart warfarin.

Guidelines to post-op anticoagulation	Aspirin EC 75-100 mg	Warfarin Target INR 2.5	Warfarin Target INR 3.0
Mechanical MVR	Long term		Long term
Mechanical AVR with risk factors	Long term		Long term
Mechanical AVR no risk factors	Long term	Long term	
Bioprosthetic MVR	Long term	First 3 months	
Bioprosthetic AVR	Long term		
MV repair	Long term	First 3 months	
TAVR	Long term + confirm additional antiplatelet with SMO		

HYPOTENSION IN CARDIOTHORACIC PATIENTS

- This may be the sign of a serious underlying problem – review immediately
- Heart rate, cardiac rhythm, manual blood pressure, heart and lung auscultation
- Fluid status with JVP, peripheral oedema and weight
- End organ perfusion with urine output, confusion, peripheries
- Sources of blood loss including intercostal drains, surgical wounds, pleural spaces
- Tests: haemoglobin, creatinine and electrolytes, Coags, G+H, CXR, ECG
- Possible causes: Hypovolaemia, low cardiac output state, arrhythmia (inappropriate or lack of pacing), sepsis, bleeding, tamponade, iatrogenic (antihypertensives/diuretics)
- Low cardiac output state – low BP, low urine output, cool and poorly perfused peripheries, causes (hypovolaemia, cardiac tamponade, decreased contractility [myocardial stunning], arrhythmias, tension pneumothorax, etc) must be identified

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- Patients with low cardiac output may require additional inotropic support necessitating return to CVICU
- Patients suspected of having a large pericardial effusion may require an urgent echo for further evaluation
- Patients with ongoing bleeding or cardiac tamponade may need to return to theatre
- Inform the Registrar or Consultant
- Avoid indiscriminate use of IV fluids for low blood pressure, especially after lung resections as this can precipitate pulmonary oedema

LOW URINE OUT-PUT IN CARDIOTHORACIC PATIENTS

- Assess volume status, creatinine and electrolytes, ECG if hyperkalaemic
- Consider pre-renal, renal and post-renal causes
- Pre-renal – hypovolaemia, low cardiac output status (tamponade)
- Renal – acute interstitial nephritis (NSAIDs/antibiotics/diuretics), acute tubular necrosis (hypotension, nephrotoxic drugs), vascular complications (emboli, renal artery thrombosis)
- Post-renal – bladder outlet obstruction (urinary retention, blocked IDC)
- Diuretic therapy is reasonable in a patient who is clinically fluid overloaded with no other features of a low cardiac output state or acute renal failure
- If a patient appears dehydrated encourage PO fluids or consider cautious IV fluid administration
- Renal failure − indications for dialysis are hyperkalaemia, severe heart failure, metabolic acidosis (pH<7.2), severe uraemia (urea >35 mmol/L)
- If a patient is post removal of IDC and has not passed urine in >8 hours, the IDC should be re-introduced – antibiotic prophylaxis should be administered in patients who have had a valve replacement after liaising with the Registrar

PROBLEMS WITH PACING

- If there are issues with pacing the Registrar will need to be notified who will possibly review the patient. There are however simple steps that can be taken to avoid serious problems prior to the Registrar review.
- The nurses on ward 42 have a lot of experience with pacing and can be very helpful when trouble-shooting pacing issues
- Bradycardia with haemodynamic instability (call a code)
- Ask the nursing staff to contact the Registrar immediately
- Ensure the pacing box is connected to the patient and turned on

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- Ask the nurses to place the patient on emergency pacing (Red emergency button – **do pacing at maximum output)**
- If this does not result in an improved rhythm or haemodynamics the patient will require additional procedures by the Registrar urgently

- Inappropriate pacing
- This can cause a serious problem by generating life-threatening arrhythmias
- This can often occur if the patient's own rhythm is starting to come back post-operatively
- With the nurse, assess the underlying rhythm. Note this requires pacing to be turned off temporarily. If this is sinus and the blood pressure is sufficient in the patient's own rhythm the pacing can be set as back-up at a rate of 60, or turned off (if there is still concern regarding inappropriate pacing at this lower rate) until Registrar review.

DISCHARGE FROM A STERNOTOMY WOUND

- This can be the first sign of a serious post-operative complication – deep sternal wound infection/mediastinitis. Thoroughly assess the wound looking for features of infection
- Assess if the sternum is stable; note if the patient has any pain from the wound
- Swab the discharge and send for culture
- If the patient is febrile, ensure blood cultures are sent prior to commencing any antibiotics. Do not start antibiotics until directed by the Registrar/Consultant
- Inform the Registrar/Consultant immediately, as the patient may require further investigation (e.g. CT scan) and may need to return to theatre in the near future

We have a low threshold for escalating concerns and for patients to be reviewed and potentially sent back to CVICU for closer monitoring.

WHEN IN DOUBT, PLEASE ASK

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General Surgery

USEFUL CONTACTS

- During working hours: contact the registrar or the fellow of the team caring for the patient
- The on-call surgical registrar should also be contacted for any acute deterioration in a patient
- After hours: contact the on-call surgical registrar
- 24/7 Acute Pain Service
- Level 8 Theatre Co-ordinator **(acute booking forms via SCOPE App on R.C.P.)**
- Level 8 Anaesthetic Co-ordinator **(discuss before booking via SCOPE App)**

Algorithm for management of pain in patients with rib fracture: See RIB FRACTURE PAIN MANAGEMENT

INTRODUCTION

The Department of General Surgery at Auckland Hospital comprises 5 subspecialty units:

- Head/Neck, Breast, Endocrine
- Colorectal
- Hepatopancreaticobiliary (HPB), Upper Gastrointestinal (UGI)
- Acute Surgical Unit (ASU)
- Trauma Service (independent service)

These notes relate primarily to "core" general surgical patients common to all 5 units. These notes are to be considered along with specific information given to you at orientation to the department.

POST-OPERATIVE CARE

POST-OPERATIVE BLOOD TESTS

- Vary with surgical procedure (registrar will provide guidance)
- Standard tests on 1st post-operative day for those patients who have undergone major surgery:
    - FBC
    - Electrolytes and renal function tests
    - Liver function tests - especially in UGI and HPB patients; consider coagulation profile and other markers of synthetic function (albumin, prealbumin, prothrombin ratio) in patients with liver disease.
    - CRP – particularly relevant post-operative day 3 onwards in patients with anastomoses, as you would be looking out for anastomotic leak

Other tests depend upon the procedure – refer to team handbook or discuss with the registrar. The majority of patients do not require daily bloods. Select only those that will influence patient management.

POST-OPERATIVE NAUSEA AND VOMITING (PONV)

- Multifactorial and multiple receptors involved
- Basic principle is that multiple sites may need to be blocked to get effective antiemetic effect
- Allow 15min to assess effect of one antiemetic and if not effective, give another medication with a different mechanism of action
- Remember gastric stasis and distension causes nausea. Insertion of an NG tube may be helpful in these cases.

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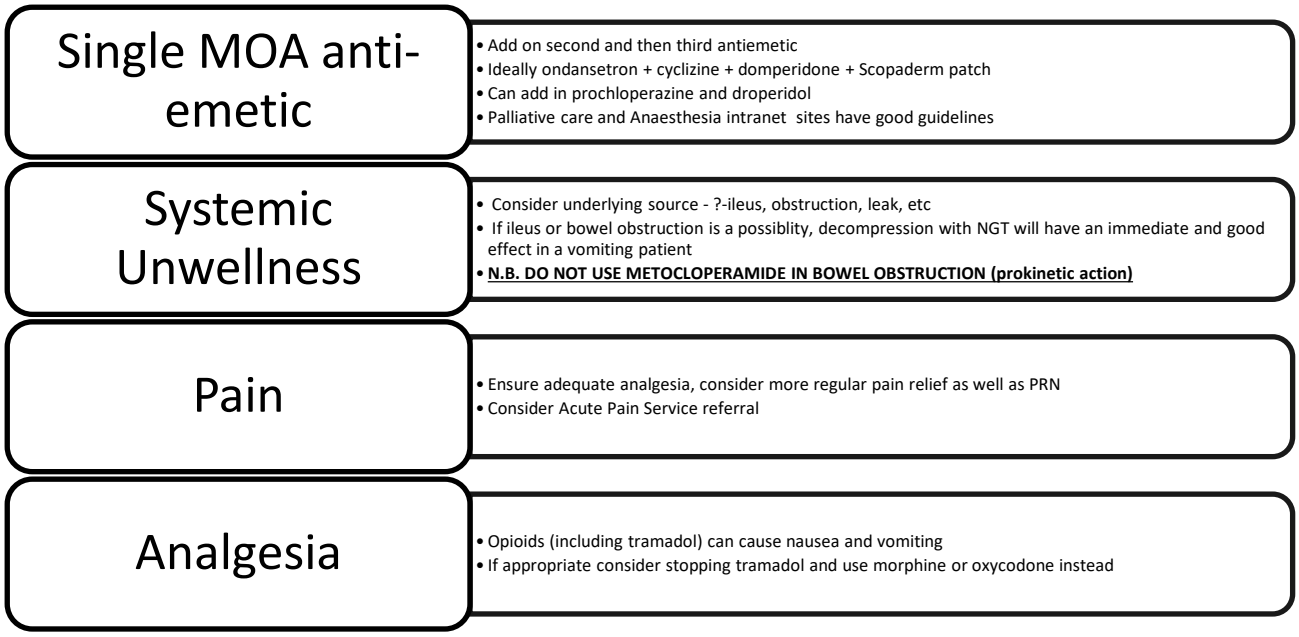
- Review the patient's medication chart for potential precipitants (opioids, antibiotics, iron supplements)
- There are PONV stickers that can be attached to medication charts that detail the different medications to be used. Note: there is a separate PONV sticker for older patients
- Acute Pain Service can give advice, if required



For further detail on antiemetic use see Palliative Care chapter or Postoperative Nausea & Vomiting (PONV) in an Adult in PACU.

POST-OPERATIVE ABDOMINAL PAIN (ALSO SEE CHART BELOW)

Considerations:

- When assessing a patient with post-operative abdominal pain, your main objective is to determine if the patient is well or unwell (i.e. has the patient had a complication requiring acute intervention or return to theatre)
- Always consider in relation to surgery performed (e.g. intestinal anastomoses, biliary surgery)
- Associated signs and symptoms of systemic inflammatory response (fever, tachycardia, respiratory rate, blood results) are a red flag sign
- Peritonism is a red flag sign
- Check adequacy of post-operative pain relief
- Consider site of pain

Abdominal pain should be categorised as either being:

1. Non-tender
2. Tender
3. Localised peritonism
4. Generalised peritonism

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The onset of peritonitis in a post-operative patient is a surgical emergency and the Registrar should be contacted immediately. Anastomotic leak/breakdown occurs most commonly between 5-10 days post-operatively.

HYPONATRAEMIA

See HYPONATRAEMIA section in Electrolytes chapter.

APPROACH TO CELLULITIS

- Please refer to the Infectious Diseases Service Cellulitis Pathway: https://adhb.hanz.health.nz/Toolkit/Te%20Toka%20Tumai%20Cellulitis%20Pathway.pdf
- Mark edges of cellulitis using skin-marking pen. Include date/time of marking so progression or regression can be tracked. This is very helpful if considering necrotizing soft tissue infections (necrotizing fasciitis).
- Use Auckland Hospital *Script App* (by Infectious Diseases team) for guidance on antimicrobial treatment
    - Be sure to check prior history of MRO or MRO screening
- IF SYSTEMICALLY UNWELL, RAPIDLY WORSENING OR CONCERNED FOR NECROTISING FASCIITIS, **INFORM THE ON-CALL GENERAL SURGICAL REGISTRAR IMMEDIATELY.**
    - Keep patient NBM, ensure appropriate IV antibiotics given, and adequate IVF resuscitation running
    - Note: The LRINEC score is not a substitute for early clinical suspicion

APPROACH TO ABDOMINAL PAIN

Note: Many surgeons no longer rely on the presence or absence of bowel sounds to influence their assessment of the acute abdomen.

When assessing a patient with abdominal pain it is important to consider:

- Is this patient well or unwell?
- What is the underlying pathology?
- Has this patient recently had surgery? If so, what was the procedure and were there intra-operative or post-operative complications?
- Do you need to do any investigations – bloods, x-rays, other imaging?
- Immediate management – ?-NBM, IV fluids, empiric antibiotics, NGT
- Update your Registrar
- Do other specialties need to be involved – DCCM, Anaesthesia, O&G, Gastroenterology?

	History	Examination	Further Investigations	Management
Perforation	Rapid onset, very severe abdominal pain	Peritonism, absent bowel sounds	Free air under diaphragm on plain film, acidosis on ABG, consider CT with oral/rectal contrast if suspicion of anastomotic leak.	• NBM, IVF • Up-to-date bloods including Group+Hold and Coag screen

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				• Urgent Registrar review
Bowel obstruction	Distended abdomen, nausea and vomiting, constipation/obstipation. Abdominal pain	Distended abdomen, tender to palpation, absent or 'tinkling' bowel sounds. **Check for hernias**	Dilated loops of bowel on plain film (>3cm small bowel, >6cm large bowel, >9cm caecum)	• NBM, IVF, NGT • Up-to-date bloods including Group+Hold and Coag screen, electrolytes including Mg^{2+}, Ca^{2+}, K^{+}, Na^{+}, Phos • Correct electrolyte disturbances • Discuss with Registrar
Ischaemic bowel / bowel infarction	Sudden onset of pain, very severe pain, history of arterial disease	Shock, generalised abdominal tenderness	Raised WCC, lactic acidosis on ABG, AF on ECG	• NBM, IVF • Up-to-date bloods including Group+Hold and Coag screen • Urgent Registrar review
Strangulated hernia	Rapid onset of pain, history of previous hernia	Shock, tender hernial mass	Abdominal x-ray or CT to identify contents of hernia	• NBM, IVF, NGT if obstructed • Up-to-date bloods including Group+Hold and Coag screen • Urgent Registrar review
Appendicitis	Migratory RIF pain, nausea, vomiting, fever	Raised temp, RIF tenderness/peritonism	Raised WCC, raised CRP	• Registrar review for OT • Consider Alvarado score

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Gastroenteritis	Vomiting, nausea, diarrhoea, rapid onset, sick contacts or high-risk food	Raised temp, epigastric tenderness, NO peritonism, dehydrated	Raised WCC, raised CRP, stool spec	• IVF • Rule out alternate diagnosis such as ischaemic colitis/partial small bowel obstruction
Inflammatory bowel disease	Weight loss, mouth ulceration, PR bleeding, vomiting, diarrhoea, family history	Distended abdomen, tenderness, can have peritonism	Raised WCC and CRP, dilated loops of bowel on plain film, colonoscopy	• Gastro review • Symptomatic management
Diverticulitis	Pain, change in bowel habit, previous colonoscopy/CT (diverticulae noted)	Abdominal tenderness	Raised WCC and CRP, CT scan to confirm diagnosis	• IV antibiotics • NBM • Analgesia
Acute pancreatitis	Epigastric pain radiating to back, vomiting, nausea, increased alcohol intake, history of gallstones	Shock, epigastric tenderness, decreased bowel sounds	Raised lipase, raised WCC and CRP, raised glucose, decreased calcium	• NBM, IVF, analgesia **CRITERIA - see Modified Glasgow score below** If severe consider • DCCM review • Strict fluid balance • Consider IDC • Discuss with Registrar
Ruptured abdominal aortic aneurysm	Abdomen and back pain, collapse, cardiac risk factors	Expansile mass, hypotension, decreased leg pulses	CT abdomen OR bedside ultrasound (POCUSS)	• Immediate Registrar review. • Check old notes to see if a Vascular plan exists for any patient with a known AAA

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Renal colic	Sudden and severe onset of flank pain. Pain radiates to groin, nausea, vomiting	Sweating, restless, tender in flank and loins	CTKUB	• Check urate, calcium and phosphate • Analgesia • Urology review
Hepatobiliary disease	Constant or colicky RUQ pain, nausea, vomiting, related to meal times	RUQ tenderness, jaundice	LFTs and coags USS Biliary tree	• If cholecystitis, IVABs ± OT • If cholangitis, Gastro review ± urgent ERCP
Obstetrics and gynaecology	Lower abdominal pain, PV bleeding, menstrual cycle irregularities	Lower abdominal tenderness, PV bleeding/discharge, abnormal PV exam	β-HCG, raised WCC, USS	• D/W O&G Registrar
Testicular torsion	Sudden onset of severe unilateral testicular pain	Tender scrotum, scrotal swelling	Urgent surgery; consider urgent Doppler USS if equivocal	• Urgent Registrar review

Adapted from the Oxford Handbook for the Foundation Programme; Sanders S, Dawson J, Datta S, Eccles S; Oxford University Press, second edition, 2006

Modified Glasgow criteria for pancreatitis

- Both on admission and after 48hrs
- Mortality if score <2 = 1%, 3-4 = 15%, >6 = almost 100%
- Scoring:
  - $p0_2$ <8 kpa
  - Age >55
  - WCC >15
  - Calcium <2 mmol/L
  - Renal: Urea >16 mmol/L
  - Enzymes: AST/ALT>200 IU/l, LDH > 600 IU/l
  - Albumin <32 g/dl
  - Sugar: Glucose >10 mmol/L

POST-OPERATIVE ILEUS

- Intestinal hypo-motility occurs in response to handling of the abdominal viscera, circulating catecholamines, opiate analgesia and electrolyte disturbances (especially low potassium, low sodium, low magnesium)
- Resumption of enteric motility is heralded by abdominal cramps, passage of flatus and presence of bowel sounds
- If vomiting is present, consider NG tube for symptomatic relief, withhold oral intake and accurately monitor fluid input and output. Replace NG losses >500mL parenterally with ml:ml replacement using sodium chloride 0.9% + 20 mmol KCl (i.e. if 680ml vomit, replace 180ml of fluid)
- Consider underlying sepsis

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- Correct electrolyte abnormalities (K^+, Na^+, Ca2+, Phos and Mg^{2+})
    - Remember oral replacement will not be absorbed, so use IV replacement
- Discontinue opioid analgesia and medications with anti-cholinergic effects if possible
- Liaise with nutritional services. Consider post-pyloric enteral tube feeding (i.e. NJ tube feeding) to promote enteric motility. If persisting >5 days, or prolonged inability to eat prior to admission, consider for TPN
- **If a patient is progressing well and SUDDENLY develops an ileus – consider other causes such as intra-abdominal sepsis (leak/collection) – review/repeat inflammatory markers and get Registrar to review**

SMALL BOWEL OBSTRUCTION

- Most commonly caused by post-operative adhesions
- **Exclude hernias, including internal hernias (this can only be done by cross-sectional abdominal imaging)**
- The presence of SIRS, peritonism, or closed loop obstruction on CT mandates urgent senior review, ?-need for theatre
- Large bowel obstruction is a surgical emergency, and also mandates senior review
- Many cases of small bowel obstruction will settle with NGT, IDC, IV replacement and gut rest
- Avoid prokinetics such as metoclopramide, domperidone and erythromycin
- Gastrografin® (GGF) may be given to expedite clinical course
    - Complete ROERS request for plain film of the abdomen
    - Discuss with Radiology registrar on-call
    - Discuss with the radiographers who will provide you with the GGF
    - Administer GGF orally or via NGT (usual dose 100 mL)
    - AXR in 4-6 hours – this can be repeated at 24 hours if no progress at 6 hours

PSEUDO-OBSTRUCTION

- Limited to the colon alone
- Classically seen in older bed-ridden patients, patients with extra-intestinal illness, post orthopaedic procedures, patients on psychotropic medications or trauma patients
- Worsened by certain medications, sepsis, electrolyte abnormalities
- Typically presents with painless, abdominal distension
- Check for previous surgical procedures/hernias
- X-rays – assess for diameter of R) colon/caecum. Colonic distension can lead to perforation of the caecum, especially if >12 cm
- Arrange a CT to exclude a mechanical obstruction
- Management – NBM, IVF, NGT if nauseated/vomiting. Correct electrolyte disturbances
- Discontinue medications that hinder bowel motility. Liaise with pharmacist if unsure

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- Discuss with Acute Surgical Unit for guidance (via the general surgical registrar on call)
- After ruling out a mechanical obstruction consider colonoscopic decompression or neostigmine (has to be given under monitoring e.g. ICU/HDU)

MEDICATIONS AND NG/NJ TUBES

- Weigh risk vs benefit of medication administration via enteral tubes i.e. Does the patient critically require this medication?
- NJ tubes block more easily than NG tubes- avoid administration via NJ if possible
- Medications that are formulated to be slow, extended or modified release should NOT be crushed e.g. Metoprolol CR, potassium chloride SR (Span-K®)
- See Medicines Information bulletin on medication administration via feeding tubes for further information
- Contact your team/ward pharmacist, or Medicines Information. For after-hours, contact the on-call pharmacist team via switchboard

URINARY RETENTION

- Presents with anuria, abdominal distension and abdominal pain
- Common in older men due to immobilisation and abdominal pain preventing the development of sufficient pressure to initiate micturition. Suspect in young males requiring opioid analgesia which can potentiate internal sphincter spasm
- More common following pelvic and lower abdominal operations and post anal or groin procedures (especially hernia repairs)
- Confirm diagnosis by palpation/percussion and bedside bladder scan
- Treat by insertion of a urinary catheter under sterile conditions

HYPOTENSION

- As always, use the DRS ABCDE approach, review fluid status and medication chart
- Surgical considerations include: dehiscence, sepsis, bleeding and large 3rd space losses
- Consider cardiac causes for hypotension, including Acute Coronary Syndromes
- If an epidural is in situ, this may be a contributor. Follow Pain Service guidelines or request a review by Pain Registrar as required
- If hypotension does not respond to simple measures, do not continue administering fluid boluses without seeking Registrar review

POST-OPERATIVE BLEEDING

- Suspect bleeding if acute or sustained hypotension requiring intravenous fluid to maintain BP, HR and urine output
- Assess the patient with an ABCDE approach
- Assess for severity and source of bleeding

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- Measure any blood loss. If present, monitor drains and weigh dressings or packing that are soaked in blood before discarding
- If haemodynamically unstable – call Registrar immediately, consider 777 code
- Estimate volume of blood on the basis of the patient's status and document carefully (see table below)
- Ensure patient has adequate IV access (at least two large bore IV cannulas, preferably in the ACF) and bloods are taken for FBC, coagulation profile, and Cross-Match/Group+Hold for possible transfusion
- For patients with signs of shock, notify the team or on-call Registrar. Administer 1-2 L of IV **Crystalloids**
- fluid and assess response to fluid bolus. Patients with on-going blood loss or no response to fluid resuscitation will require urgent blood transfusion
- Withhold and consider reversing any anticoagulants, treat coagulopathy if possible

Class	I	II	III	IV
Blood loss (%)	15	15-30	30-40	>40
HR (/min)	<100	>100	>120	>140
BP (mmHg)	NAD	NAD	Decreased	Decreased
Pulse pressure	NAD	NAD	Decreased	Decreased
RR (/min)	14-20	20-30	30-40	>35
Urine output (mL/h)	>30	20-30	5-15	Anuric
Mental status	Slightly anxious	Mildly anxious	Confused	Confused/ lethargic

Adapted from ATLS guidelines

POST-OPERATIVE FEVER

Potential Causes

Line infection	Pneumonia	UTI
DVT/PE	Intra-abdominal abscess	Wound infection
Malignant hyperthermia	Drugs	Thyroid storm

See Common Ward Calls chapter for initial investigations.

The most common cause of a fever within 24 hours of surgery is the systemic response to tissue injury.

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Management involves:

- Cooling cares
- Regular paracetamol
- IV antibiotics if site of infection is apparent after discussion with senior

Antibiotics

Tailor to likely pathogens;

- Chest – confirm clinically and radiologically. Empiric treatment as per SCRIPT App
- Skin – swab suspected site. Empiric treatment with flucloxacillin or Co-Amoxiclav if perineal/perianal
- Gastrointestinal – Triple antibiotics with amoxicillin, metronidazole and gentamicin if critically unwell
- Check patient allergies

For detailed guidance, refer to Infectious Diseases chapter or the ADHB Script App.

PROTOCOL FOR DVT PROPHYLAXIS IN ELECTIVE GENERAL SURGICAL PATIENTS

This is a guideline for general surgical patients. Each team has specific preferences and **you should consult with the appropriate Consultant or Registrar** if it is not specified in the patient's notes.

For acute cases, liver surgery, vascular surgery and for patients with epidural catheters, heparin is given at the discretion of the surgeon.

Group 1 Patients	**Risk of DVT**	**Risk of PE**
	1-5%	0.01%
If no group two or three factors present and either of the following:		
<30min operation (e.g. incision and drainage abscess, open appendix) regardless of age		
>30min operation and <40 years		
No prophylaxis required / early mobilisation		

Group 2 Patients	**Risk of DVT**	**Risk of PE**
	10-15%	0.1-1%
All patients with an epidural or any 1 of the following:		
High-dose oestrogen therapy		
>30min operation and >40 years		
Presence of cancer		
Laparoscopy		

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TED stockings (if no history of PVD), enoxaparin 40 mg subcut daily commenced the night before surgery at 2000h and continued until fully mobilising		
Group 3 Patients	**Risk of DVT**	**Risk of PE**
	20-40%	1-10%
No epidural and any of the following:		
Previous DVT/PE		
Pelvic surgery		
Known thrombophilia		
>2h surgery anticipated		
TED stockings (if no history of PVD), intra-operative pneumatic calf compression, enoxaparin 40 mg subcut daily commenced the night before surgery at 2000h and continued until fully mobilising		

The use of **spinal or epidural anaesthesia** introduces the potential risk of spinal haematoma.

The following precautions are **recommended**:

- **Single-dose spinal needle:** placement >10 hours after last dose (if any) of LMWH. Subsequent dose of LMWH at least 2 hours after needle placement
- **Continuous catheter epidural**: pre-operative LMWH is not recommended.
    - Prophylactic LMWH: removal of catheter should be at least 12 hours after last dose. Subsequent prophylactic doses should not be administered for at least 4 hours.
    - Therapeutic doses of LMWH: remove catheter at least 24 hours after the last dose. Give subsequent dose of LMWH at least 4 hours after catheter removal.
- All patients should be monitored for signs of early paraplegia or spinal cord compression

GENERAL TIPS FOR ADMISSION OF SURGICAL PATIENTS

Always have a plan for analgesia:

- Regular paracetamol
- PRN Tramadol 50-100 mg PO qid (avoid in epilepsy and head trauma)
- PRN Sevredol 10-20 mg PO q1h (note lower starting doses are recommended in older adults)
    - Consider oxycodone in older adults, or those with renal impairment
- IV morphine as per adult IV protocol
    - Consider oxycodone or fentanyl in older adults or those with renal impairment
- NSAIDS may be appropriate in **select**, young patients without GI involvement, and no history of renal, gastric or cardiac problems

Consider antiemetics:

- Metoclopramide (not to be used if bowel obstruction suspected, monitor for extrapyramidal side-effects)
- Domperidone (not to be used if bowel obstruction suspected)

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- Ondansetron
- Cyclizine

Consider antibiotics:

- See Infectious Diseases chapter
- Cefuroxime and metronidazole for most intra-abdominal sources
- Flucloxacillin or cefazolin (if penicillin allergy) should be used for skin sources and lactational breast infections
- Co-amoxiclav for perianal/anal abscess and non-lactational breast infections

Consider oral intake and IVF requirement:

- Consider need for maintenance and replacement IVF
- Maintenance IVF: glucose 4% + sodium chloride 0.18% + 20 mmol/L KCl at 80-100 mL/h
- Replacement IVF: sodium chloride 0.9% OR Plasma-Lyte® +/- KCl
- Patients with diabetes may be best served with a Variable Rate Intravenous Insulin Infusion - see Diabetes Insulin Prescription chart and 'Diabetes in Adults' policy/guideline (see Diabetes chapter)

Thromboprophylaxis – use the VTE assessment tool

If for theatre:

- Book via Scope App on R.C.P. (you must contact the Theatre AND Anaesthetic Coordinators)
- Mark ± consent (only if comfortable consenting)
- Group and hold for all cases more complex than a lap appendix (if in doubt, do it)

DRAINS

- Record amount (usually over 24 hours) and type of fluid (e.g. serous, haemoserous, haem, purulent, bile, enteric etc)
- Most closed circuit abdominal drains are either Blake's or Redivac
- Some drains are passive/open circuit e.g. Penrose or Yates
- Radiologically placed drains are usually 'Pigtail' – it is critical you recognize this before you attempt to remove a pigtail drain
    - Will have a central 'thread' which holds the pigtail in shape
    - This needs to be unwound or cut to allow the drain to straighten before removal
- Any chest drain should be treated as if an underwater seal drain +/- suction (please check with Registrar)
- Never raise a chest drain above the entry point of the drain or it will drain into the thorax
- Chest drains should swing unless on suction. If they do not, they may be blocked (including if the lung is fully expanded again, meaning the drain may not be required anymore)
- Chest drains only bubble if there is a 'leak' in the circuit, most commonly from a lung injury causing an air leak

REMEMBER IT IS MUCH HARDER TO PUT A DRAIN BACK IN THAN IT IS TO REMOVE IT!

- If in doubt call a senior, or if un-contactable leave the drain in
- As a general rule, do not remove drains late in the day, or immediately before a weekend or holiday
- See "Chest drain removal" section in Cardiothoracic surgery chapter

FLUIDS

See ADHB policy

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Normal daily fluid losses

- Urinary: 1000 mL
- Stool: 300 mL
- Respiratory tract: 200 mL
- Sweat: 500 mL

Total = 2000 mL of fluid per day

Normal daily electrolyte requirement

- Approximately 75 mmol of Na^+ (~ 1 mmol/kg)
- Approximately 50 mmol of K^+ (~ 0.5 mmol/kg)

Reasons for increased fluid and electrolyte requirements

- Bleeding
- Vomiting or NG tube losses: high in Cl-, H+ and K+
- Diarrhoea or high output stoma e.g. ileostomy
- Diuresis
- Hyperventilation
- Pyrexia: 200 mL increase/day for every degree increase in temperature
- Sweating: contains large amounts of sodium

TYPES OF FLUIDS

If the patient is on TPN (Total Parenteral Nutrition) please take this into consideration prior to prescribing IV fluids and consult with the Nutrition Support Team or SMO.

1. **Crystalloids**

- Sodium chloride 0.9% *(154 mmol/L Na^+, 154 mmol/L Cl^-)*
- Plasma-like solutions: Plasma-Lyte® (*140 mmol/L Na^+, 5mmol/L K^+),* Ringer's lactate, Hartmann's
- Glucose 4% + sodium chloride 0.18% *(31 mmol/L Na^+, 31 mmol/L Cl^-)*
- Glucose 4% + sodium chloride 0.18% + 20mmol KCl *(30 mmol/L Na^+, 50mmol/L Cl^-, 20mmol/L K^+)*
- Glucose 5%
- When used as a Replacement fluid: replace total losses>500 mL, mL for mL
    - For gastric losses use Sodium chloride 0.9% + 20 mmol KCl
    - For all other losses use Plasma-Lyte® 148
- For Maintenance fluid: prescribe Glucose 4% + sodium chloride 0.18% (+/- 20 mmol KCL) at a rate of 1 mL/kg/hour using the patient's normal well weight

2. **Colloids**

Not to be used without senior advice.

- Albumin (20% or 4%)

3. **Blood products**

- RBC, Platelets, Fresh Frozen Plasma (FFP), Albumin, Cryoprecipitate

HOW FAST TO GIVE MAINTENANCE FLUIDS:

1-1.5 mL/kg/hr

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50kg female 50 mL/hr

120kg male 120 mL/hr

180kg male 150 mL/hr (fat is not metabolically active)

Notes:

Sodium chloride 0.9% is not ideal as the body retains extra sodium in response to the trauma or illness, causing oedematous tissues, and delaying recovery.

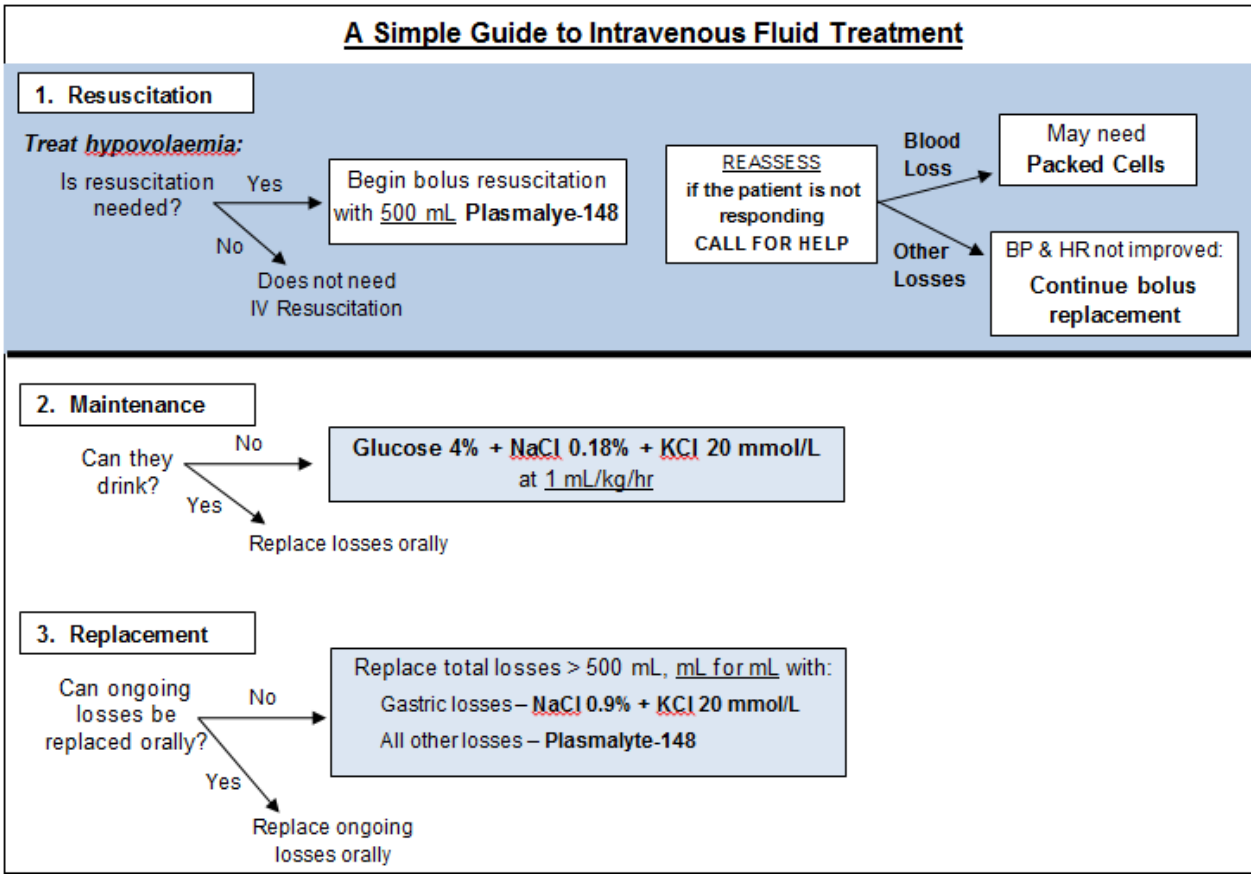
Replace like with like:

- Water losses with glucose or glucose/sodium chloride
- Protein-rich fluids with colloids
- ECF with sodium chloride 0.9% or Plasma-Lyte®
- Blood with blood

GENERAL RULES FOR IV FLUIDS

The elderly, people with renal, liver failure or cardiac failure cannot excrete salt (sodium) easily. It is critical to limit the IV infusion of sodium chloride 0.9% or Plasma-Lyte® in these people unless they have obvious large losses.

A simple guide to intravenous fluid treatment



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TIPS FOR TPN (TOTAL PARENTERAL NUTRITION)

COMMON INDICATIONS FOR PARENTERAL NUTRITION (PN):

- Non-functioning gut e.g. prolonged paralytic ileus (≥5 days)
- Malnourished patients in whom the use of the intestine is not anticipated for ≥5 days post abdominal surgery
- Post-op complications such as anastomotic leaks in patients required to be NBM for a prolonged period
- Patients with specific conditions severely affecting the GI tract, such as upper GI strictures, fistulae, or severe mucositis and/or neutropenic colitis following chemotherapy
- Major resection of the small intestine (short bowel syndrome) before compensatory adaptation occurs

NUTRITION SUPPORT TEAM (NST)

The NST team consists of Surgeons, Dieticians, Pharmacists, and Nurse Specialists. Please ensure this team is contacted as soon as possible when there is a potential patient for intravenous nutrition (IVN) as there is a cut-off time for IVN ordering. Each patient needs to be assessed and approved by the NST team (in consultation with the NST Consultant) before commencing IVN.

If a patient is on TPN, all electrolyte replacement or changes to these must be run past the NST team.

ESSENTIAL BLOODS TO BE CHECKED PRIOR TO STARTING PN:

Creatinine + electrolytes (Na^+, K^+, Mg^{2+}, PO_4)	LFTs	Full blood count
Glucose	Lipid profile	Fe^{3+} studies
Albumin	Coagulation (INR, APTT)	Vit B_{12}, folate

VENOUS ACCESS FOR PN:

- PICC – can be used for months, ask for dedicated lumen for PN (dual lumen line)
- Jugular CVL – often placed in theatre, ask for dedicated lumen for PN (dual lumen line)
- Femoral CVL – not recommended due to high risk of line sepsis
- Groshong/Hickmans – useful for long-term PN patients (more than 3 months)
- Portacath – long-term use

REFEEDING SYNDROME

- The fluid and electrolyte shifts, and metabolic and hormonal changes that may occur when initiating nutritional intake in individuals who are severely malnourished, or who have had little or no food intake for protracted periods.
- Key biochemical features of Refeeding Syndrome include hypophosphataemia, hypokalaemia, hypomagnesaemia and thiamine deficiency, all of which may result in serious, potentially fatal, clinical complications.

IDENTIFICATION OF PATIENTS AT RISK FOR RE-FEEDING SYNDROME

- Weight loss of >15% in last 3-6 months (consider in those post bariatric surgery, but expect up to 40% total weight loss in first 12 months (70% excess body weight, based on 'ideal' BMI of 25)
- BMI <18.5 kg/m2
- Little or no nutritional intake for more than 5 days

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- Persistent vomiting with poor oral intake for more than 5 days
- Low levels of potassium, phosphate or magnesium prior to feeding (check for signs of dehydration – may mask low levels)
- Anorexia nervosa
- Chronic alcoholism
- Long-term use of antacids
- Long-term use of diuretics

ELECTROLYTE ABNORMALITIES

FLUID AND SODIUM

Use cautiously in those at risk for the Refeeding Syndrome given the risk of fluid and sodium retention.

POTASSIUM

Mild to moderate hypokalaemia (2.5 – 3.4 mmol/L)	Oral: • Potassium chloride LA (Span K®) 1-2 tablets 3 times a day **OR** • Effervescent potassium (Chlorvescent®) 1 tablet 3 times daily If patient is unable to take oral/poor absorption: IV replacement.
Severe hypokalaemia (<2.5 mmol/L)	IV replacement, acquire ECG: consider cardiac monitoring, consider DCCM involvement if significant cardiac or skeletal muscle dysfunction.

Notes:

Patients with renal insufficiency can be at greater risk of developing hyperkalaemia

- For more information see linked hypokalaemia medicines information bulletin and Auckland Hospital medication administration guideline

MAGNESIUM

Mild to moderate hypomagnesaemia (0.5 - 0.7 mmol/L)	Oral: Go Magnesium 800 capsules (14.8 mmol per caps) 2-3 capsules daily in divided doses. If patient is unable to take orally or poor absorption: Magnesium IV infusion.
Severe hypomagnesaemia (<0.5 mmol/L)	Magnesium IV infusion. Repeat after 4 hours if necessary according to serum magnesium levels.

Notes:

- When charting IV magnesium note that 10 to 20 mmol of IV magnesium sulphate can be added to 100mL of either 5% glucose or 0.9% sodium chloride and administered at a rate of 5 mmol/hr
- See Te Toka Tumai magnesium sulphate MAG for more detail
- Dose adjustments are needed in patients with impaired renal function. Administer with caution as there is an increased risk of hypermagnesaemia
- Oral magnesium supplementation commonly causes diarrhoea

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PHOSPHATE

Mild hypophosphataemia (0.6 – 0.85 mmol/L)	Oral: Phosphate effervescent 2-4 tablets daily in divided doses. If patient is unable to take oral / poor absorption: IV potassium dihydrogen phosphate (see below).
Moderate hypophosphataemia (0.3 – 0.6 mmoL)	10-20 mmol IV potassium dihydrogen phosphate in 1L of suitable fluid over 6-12 hours. Repeat at 6-12 hour intervals if necessary according to serum phosphate levels.
Severe hypophosphataemia (<0.3 mmol/L)	Seek expert advice.

Notes:

- Dose adjustments are needed in patients with impaired renal function. Seek expert advice or consult your Ward Pharmacist
- Oral phosphate supplementation commonly causes diarrhoea
- Phosphate Effervescent – each tablet contains 16.1 mmol of phosphate
- Potassium dihydrogen phosphate – each mL of solution contains 1mmol of phosphate and 1mmol of potassium
- Maximum concentration of 40 mmol/L of potassium dihydrogen phosphate infused IV over 6-12 hours (not exceeding 10 mmol/h), please see Auckland Hospital hypophosphatemia bulletin for more detail

PABRINEX®

Prior to the initiation of feeding: Inject 1 **pair** of Pabrinex® ampoules daily for five days.
Ongoing: Thiamine 50-100 mg oral daily and multivitamin oral daily for 4 weeks.

Notes:

- Should the enteral route not be available after day 6, thiamine requirements will be met by the thiamine component of multivitamin preparation added to parenteral nutrition preparations

OTHER MICRONUTRIENTS

Complete micronutrient supplementation is recommended. Daily supplementation of other micronutrients with recommended dietary intake (RDI) orally, enterally or parenterally should be considered until RDI provided by food, oral nutritional supplement, enteral formula or parenteral solution (or any combination).

Notes:

Consider dietarian review for adequate daily supplementation.

CONSENT FOR COMMON PROCEDURES

Note: When in doubt ask your seniors for advice. If you are not comfortable, do not do the consent but advise seniors that consent is yet to be done.

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Consents are best done by the operating surgeon, although for minor or high throughput operations (e.g. abscesses, minor skin lesions etc.), this is not always practical. A thorough understanding of the procedure itself and potential pitfalls and complications is essential.

1. **Incision and drainage of abscess**

Complications: Bleeding, poor wound healing, need for further surgery if the abscess recurs.

Note: For perianal abscess – check with the Registrar regarding consent for sigmoidoscopy/other procedures and complications.

2. **Appendicectomy**

Laparoscopic: Consent should usually be for a diagnostic laparoscopy ± appendicectomy ± open ± proceed.

Complications: Consent for bleeding, infection, damage to other structures particularly bowel, on-going pain, need for further treatment based on findings such as treatment for ovarian cysts / endometriosis / adhesions / Meckel's Diverticulum / Crohn's, conversion to open procedure, incisional hernias.

Open: Bleeding, infection, damage to other structures particularly bowel, failure to find cause of pain, incisional hernias.

3. **Laparoscopic cholecystectomy** ± IOC ± open **(usually Registrar level)**

Complications: Bleeding (+ need for transfusion), infection, damage to bowel, liver, other and CBD injury, bile leak, conversion to open, incisional hernia

4. **Laparotomy ± proceed (definitely Registrar level)**

Complications depends on pathology but should cover the following:

Bleeding, infection, damage to bowel/vessels/nerves, need for bowel resection ± stoma, incisional hernias, wound problems, pneumonia, DVT, PE.

5. **Open inguinal hernia repair**

Consent changes depending on if the case is being done for a reducible/non reducible hernia and depending on signs and symptoms of patients, particularly signs of obstruction;

Bleeding, haematoma, seroma, damage to nerves / vessels / vas, loss of testicle, recurrence of hernia, need for bowel resection / laparotomy / stoma.

See Consent for Procedures and Gastroenterology chapters.

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Neurosurgery

Please see Neurosurgical Guidelines for further details (found on desktop of Ward 83 computers)

WHO TO CALL

Neurosurgery on-call Registrar

Information to have when calling the Registrar

1. Name and age
2. Brief history
3. GCS (broken down into 3 parts) – refer Emergency Medicine chapter
4. Focal neurological deficit
5. Basic observations (BP, HR, oxygen saturation)
6. Significant medical comorbidities
7. Medications (especially those with anticoagulant and antiplatelet properties)
8. Blood results (especially Na+ and coagulation)
9. ECG (acute ischaemic changes often present in SAH)
10. CXR
11. Imaging results

General points

- There is a folder of guidelines kept in the Neurosurgical Intensive Care (NIC) office outlining management of common problems
- Patients who deteriorate acutely in the NIC should be urgently assessed by the House Officer and immediately discussed with either the Registrar for the team or the on-call Registrar

- **Do not give glucose + sodium chloride as it may exacerbate cerebral oedema; use sodium chloride 0.9%**
- **Do not give any medications with anticoagulant properties (including aspirin) without discussion with the Neurosurgical Registrar**
- **Ring on-call Neurosurgical Registrar if GCS declines ≥2 points or there is evolution of focal deficit**

SPONTANEOUS SUBARACHNOID HAEMORRHAGE

Causes

- 75% due to aneurysm
- 5% AV malformation
- 7-20% unknown

Diagnosis

- CT without contrast: 90-95% sensitive in first 24h
- Lumbar puncture for xanthochromia: indicated if there is a strong clinical suspicion and negative CT. May be negative very early (<6h), high sensitivity 12 hours -2 weeks
- MRI: less sensitive for acute haemorrhage

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World Federation of Neurological Surgeons (WFNS) grading

Grade	GCS	Major Focal Deficit*
1	15	No
2	13-14	No
3	13-14	Yes
4	7-12	Yes or No
5	3-6	Yes or No
*Aphasia, hemiparesis or hemiplegia		

Investigations

- On admission: FBC, electrolytes, creatinine, Group and Hold, coagulation, ECG, CXR and CT scan (if not already done)
- CT angiogram (usually vascular imaging of choice)
- Daily blood specimens: FBC, electrolytes, creatinine

Management

1. Continuous CVP monitoring (triple lumen CVL is preferable for ≥ grade 2 SAH or if patient requiring inotropes)
2. GCS on admission, 30min to 2h observations depending on clinical condition
3. Continuous ECG and O_2 saturation monitoring
4. Chart nimodipine 60 mg q4h po/NG (IV route very rarely used owing to complicated administration - seek advice prior to using this) to help prevent vasospasm
5. IV fluids: sodium chloride 0.9% at 125 mL/h (add potassium if needed) to provide at least 3 L over 24h (give less IV fluids in the older patient)
6. Pre-operatively aim for normotension. If systolic BP >160mmHg consult Neurosurgery Registrar for consideration of IV labetalol or hydralazine
7. Flat bed rest pre-operatively unless otherwise stated by Neurology Registrar
8. TED stockings
9. Post-craniotomy for clipping of cerebral aneurysm:
    - Read the post-operative recommendations/instructions
    - Maintain MAP, systolic BP and CVP as instructed by Neurosurgery Registrar in the post-operative note
    - If low BP or clinical vasospasm, firstly give fluid challenge (Gelofusine®) as instructed
    - Secondly commence IV dopamine (5 micrograms/kg/min) as instructed
10. Post-coiling of cerebral aneurysm:
    - Maintain MAP, systolic BP and CVP as instructed by Neurosurgery Registrar
    - Prescribe antiplatelets as per post-operative instructions
    - 48h of IV heparin and APTT/INR specimens as instructed by Neuroradiologist

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- Titrate IV heparin following results as instructed. This is done via a neuroradiology-specific protocol which will be outlined in the notes. You can ring the on-call Neuroradiologist with results if uncertain. This is preferable to getting the heparin regimen wrong.

Complications

- Re-bleeding
- Vasospasm (see below)
- Hydrocephalus
- Electrolyte disturbances (especially hyponatraemia)
- Seizures
- Extracranial complications: ECG changes, arrhythmias, neurogenic pulmonary oedema (rare), gastrointestinal haemorrhage

Management of vasospasm

- Diagnosis is based on the delayed onset of neurological deficit: new focal signs, increasing headache, increasing drowsiness (a GCS drop of ≥2)
- Usually between 3-14 days post SAH
- Time is critical. Every minute counts
- Delay can result in irreversible stroke
- Contact the Neurosurgery Registrar urgently
- Exclude rebleed, hydrocephalus, hyponatraemia, sepsis, hypoxia, seizures
- Investigations required immediately: serum sodium, CT scan, ABGs. Give a STAT bag of Gelofusine® to expand the circulating volume and optimise cerebral perfusion

Treatment

Deficit is only reversible for a limited time, therefore commence on HHH (Hypervolaemia, Haemodilution and Hypertension) therapy STAT.

1. Hypervolaemia: aim for a CVP of 8-12 by supplementing the IV sodium chloride 0.9% infusion with 200-250 mL boluses of colloid (Gelofusine®)

2. Hypertension: aim for systolic BP 180-220 mmHg and MAP >110 mmHg (for unclipped aneurysms aim for SBP of 160 mmHg and MAP 100-110 mmHg – discuss this with the Neurosurgery Registrar). Commence dopamine infusion 5 micrograms/kg/min and then titrate against BP: main complications of dopamine are tachycardia and polyuria. It may be necessary to chase urine output to maintain euvolaemia. If not tolerated the patient may require a noradrenaline infusion in DCCM

3. Haemodilution: aim for Hct of 35 and Hb of 100-140

If unable to meet criteria in neuro intensive care within 20min, contact Neurosurgery Registrar about consideration of transfer to DCCM for noradrenaline infusion.

If no symptomatic improvement after 20min of effective HHH therapy (SBP 180-220 mmHg, CVP 10-12 mmHg), contact Neurosurgery Registrar about consideration for angiography with a view to endovascular treatment (papaverine and angioplasty)

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HYPONATRAEMIA ON THE NEUROSURGICAL WARD

(See Electrolyte Disturbances chapter for further information on hyponatraemia)

Causes

- SIADH
- Cerebral salt wasting
- Iatrogenic

Specific concerns

- Cerebral oedema (due to low serum osmolality)
- Confusion (at sodium <125)
- Seizure activity (at sodium <120)
- Nausea and vomiting
- Rate of development important

Management of SIADH

- Assess fluid status
- 24h urine volume and urinary sodium
- Daily weighs
- Water restriction (500-1000 mL/24h)
- Sodium correction: not more than 12 mmol/L/day and not more than 1 mmol/L/h unless the hyponatremia has occurred rapidly (over 24h) and is associated with major symptoms such as coma or seizures
- If sodium very low: IV sodium chloride 1.8 % at 80 mL/h, with administration of furosemide

Cerebral salt wasting

- Causes are unclear, due to unidentified natriuretic factor
- Clinical features are hyponatraemia and hypovolaemia (compared to SIADH)
- Management is assessment of fluid status and sodium replacement

Hyponatraemia in subarachnoid haemorrhage patients

Discuss with the Neurosurgery Registrar.

HYPERNATRAEMIA ON THE NEUROSURGICAL WARD

- In hyperosmolar states exclude DM and hyperalbuminaemia (these may contribute to hyperosmolality)
- Exclude dehydration as a contributing factor

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DIABETES INSIPIDUS (DI)

Causes

- Central: a lack of ADH production from hypothalamus or secretion from pituitary. Particularly common in head injury (especially if brain dead), pituitary and hypothalamic surgery/tumours and basal skull fractures. Injury to posterior pituitary stalk following trans-sphenoidal surgery or craniopharyngioma may also cause DI
- Nephrogenic: lack of kidney response to ADH

Clinical features

- Polyuria (>250 mL/h for >2h): may lose up to 15 L/day
- Decreased urine osmolality (<400 mOsm/kg H2O)
- Decreased urine sodium and specific gravity
- Raised serum osmolality (concerns ++ if sodium >150 mmol/L)
- Confusion, seizure activity, coma
- Hypotension, dehydration

Three clinical patterns

1. Transient DI: normalises 12-36h post-op
2. Prolonged DI: may persist for months or even permanently (one-third of these patients will not return to normal 1-year post-op)
3. Triphasic response: initial polyuria 4-5 days; partial recovery after 1 week (or even water retention); develop transient/permanent DI

Management

- Allow patient to drink if thirsty. If decreased level of consciousness and unable to respond to thirst, consider replacing two-thirds of urine output with glucose 5%

- If sodium approaching 150 mmol/L and urine output very high discuss with Neurosurgery Registrar about giving desmopressin (1 microgram IV or 10 micrograms intranasally). If patient shows response to first dose then titrate subsequent doses to patient requirement – usually twice a day or just when required. Some patients may require this permanently. Once patient in recovery phase, usually need to replace around 5 L water over 2-3 days (to replace losses)

RAISED INTRACRANIAL PRESSURE

Cerebral perfusion pressure

- Cerebral blood flow (CBF) is critical to brain function
- CBF depends on cerebral perfusion pressure (CPP), which can be determined by:

CPP=MAP-ICP

CPP: cerebral perfusion pressure

MAP: mean arterial pressure

ICP: intracranial pressure

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- Normal adult CPP ≥50 mmHg
- CBF dependent also on autoregulation, where the CPP would have to drop below 40 in a normal brain before CBF is impaired

Causes

1. Trauma
    - Oedema
    - Hyperaemia (= normal response to head injury, due to vasomotor paralysis and hence autoregulation; may be more significant than oedema in raising ICP)
    - Masses: haematomas (EDH, SDH, intraparenchymal)
    - Foreign bodies
    - Depressed skull fracture
    - Hydrocephalus due to CSF path obstruction

2. Tumours
    - Oedema, with loss of normal blood brain barrier
    - Hydrocephalus
    - Mass effect

3. Hypoventilation causing vasodilation

4. Systemic hypertension

5. Venous sinus thrombosis

Symptoms and signs

- Headache (increases with coughing/stooping), vomiting (usually worse in the mornings), papilloedema
- Reduced level of consciousness
- Cushing's triad (only in around 30%)
    - Hypertension
    - Bradycardia
    - Respiratory irregularity

Management

1. Always talk to Neurosurgical Registrar

2. Pre-emptive treatment
    - Elevate head of bed by 30-45°
    - Avoid venous obstruction around neck
    - Maintain normal pCO_2, pO_2 and MAP
    - Avoid raised cerebral metabolism e.g. hyperthermia
    - Manage seizures
    - Organise urgent CT head if cause not known

3. Primary treatment
    - If communicating hydrocephalus: LP and tap off CSF until normal ICP (see below)
    - Insertion of External Ventricular Drain (EVD) in theatre
    - If EVD not draining, bring down level of drain and check that it is not blocked
    - Sedate patients (decrease cerebral metabolism): ICU setting
    - Paralysis (decrease cerebral metabolism): ICU setting
    - Mannitol 20% (20 g/100 mL)
        - 0.5-1 g/kg or 100 mL bolus over 15min
        - Increases CPP if BBB intact, otherwise can cross into brain and make oedema worse
    - Diuretic (e.g. IV furosemide 20-40 mg bolus)
        - Use only in emergencies (e.g. when pupil dilates)

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LP should always include pressure measurement (use initial rush, not final resting pressure)

Normal CSF pressure	
Adults and older children	<10-15 mmHg (7-15 cm CSF)
Young children	3-7 mmHg (about 10 cm CSF)
Infants	1.5-6 mmHg (9-12 cm CSF)

4. Secondary treatment
    - Raise MAP
    - Hypothermia
    - Hyperventilation (can make ischaemia worse, use only if ischaemia is secondary to vasoconstriction or may be used as a bridge to other therapies)
    - Barbiturates (may cause further complications)

5. Permanent management
    - Remove cause (e.g. debulking of tumour)
    - Insertion of a CSF shunt in rare circumstances

CSF LEAK

Post head injury from nose or ear

- Collect specimen and send to the laboratory for ß2 transferrin level (to confirm it is CSF)
- Most settle spontaneously
- If not, discuss with Neurosurgery Registrar for consideration of lumbar drainage or surgical repair

Post-surgery

Most common after posterior fossa surgery, intradural spinal surgery and endoscopic pituitary surgery. Place a stitch through site of leak under sterile conditions. If this fails to control leak, discuss with Neurosurgery Registrar re:

- Lumbar drainage
- Return to theatre to re-close wound

Prophylactic antibiotics are not given for either situation.

TRANS-SPHENOIDAL PITUITARY SURGERY

Pre-operative workup

- Formal visual field tests (for macros) including OCT (Optical Coherence Tomography)
- Films available (MRI and usually fine slice CT) Web 1000 digital images or hard copies
- Chart usual medications (except aspirin which should be stopped 10 days prior to surgery) and hormone replacement (as per Endocrinology service)
- Chart xylometazoline hydrochloride 0.1% (Otrivin®) nasal spray (2 puffs each nostril 4 hours prior to operation and repeated at time of call to theatre)

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- Contact Endocrinology team pre-op
- Panel of pituitary hormones should have been done in the last 4 weeks otherwise repeat as a baseline:
    - Prolactin must be done as **urgent = same day** for all suspected **acute** macroadenomas with visual symptoms or signs, or any patient with a macroadenoma in whom a prolactin result is neither documented in the notes nor on the Labtests or A+ databases. Medical therapy with dopamine agonists may be the preferred treatment
    - HGH, IGF-1
    - LH, FSH, Testosterone (males): Oestradiol (pre / peri-menopausal), LH, FSH (post-menopausal)
    - Cortisol (at 0800-0900h) **OR** Synacthen® test, TSH, free T4, glucose, Cr, Na+, K+

Pre-operative blood panel: G&H, coags, FBC, creatinine and electrolytes.

Intra-operative management

- Hydrocortisone 100 mg IV as a STAT dose at time of induction of anaesthetic, if pre-operative diagnosis of adrenal insufficiency (see below)
- In-dwelling urinary catheter in all patients
- Fat may be harvested from thigh or abdomen if intra-operative CSF leakage

POST-OP MONITORING AND GENERAL MANAGEMENT

Fluid balance

- q1h fluid balance, q4h urine specific gravity for 48 hours or until DI controlled – subsequently daily fluid balance totals are recorded until discharge. 12 hourly electrolytes for 48 hours
    - Contact Registrar if UO >12h post-op >250 mL/h for 2 consecutive hours or if urine specific gravity <1.001 and send off serum [Na+] urgently to rule out DI
    - Treatment: oral fluid replacement is ideal. If unable to keep up with thirst, consider desmopressin (1 microgram IV or 10 micrograms nasally). If patient is not alert, consider IVFs (e.g. replace UO with 2/3 volume using glucose 5% while awaiting blood results then tailor to patient). Liaise with Endocrinology team

- No spirometry, nose blowing or drinking through straws

- Often chart antibiotics until nasal packing removed (go by operation note)

Glucocorticoids

(A) Patients with possible pre-operative adrenal insufficiency (given routine steroids)

Criteria:

1. Taking glucocorticoids pre-operatively **OR**
2. Subnormal cortisol response to Synacthen® (<700 nmol/L for 250 micrograms test, <500 nmol/L for 1 microgram test) **OR**
3. Possible cortisol deficient because maximum serum cortisol <400 nmol/L **OR**
4. Cortisol status not established e.g. emergency

Give perioperative hydrocortisone

- Day 0 (op day): 100 mg IV BD starting with induction
- Day 1: 50 mg po/IV BD
- Day 2: and subsequently regular hydrocortisone 15-30 mg/day

Note: If surgical or post-operative complications occur, these patients will need "stress" doses of hydrocortisone until the acute event has resolved (liaise with Neurosurgery and/or Endocrine teams).

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These patients remain on glucocorticoids until their endocrine follow-up at 6-8 weeks.

Labtests form to measure 0900h serum cortisol (pre-dose), Free T4, Testosterone, Oestradiol/FSH, sodium, potassium, and creatinine at 3-4 weeks post-discharge.

(B) Patients with Cushing's disease. No steroids pre- or immediately post-op

- Serum cortisol levels measured evening of day of operation and daily x 2 (0900h and 1600h) during hospital admission. Results need to be reviewed by house staff on the day bloods are collected. If cortisol <100 nmol/L this indicates adrenal insufficiency and a need for regular hydrocortisone replacement 15-30 mg/day (discuss with Consultant and Endocrinology team

- If features of hypoadrenalism (low serum cortisol and/or hypotension or shock, hyponatraemia, hypoglycaemia or fever), discuss with Registrar and give a stress dose (e.g. 100 mg IV hydrocortisone STAT)

OTHER

- IDC out in 48 hours

- Send any fluid for beta-2-transferrin if CSF leak suspected (need at least 1mL)
    - Treatment options include lumbar drainage or direct packing of sella or sphenoid sinus

- GH and IGF-1 levels need to be checked prior to discharge of acromegalic patients

- Prolactin level on days 1 and 2 post-op in patients who have prolactinoma

- If no complications, discharge patients after:
    - 48 hours if endoscopic approach
    - 3 to 5 days if septal pushover technique

- Discharge instructions for patient
    - Form for repeat creatinine and electrolytes within 1 week of discharge
    - See own doctor or phone ward if new symptoms of excessive thirst, polyuria, headache, symptoms of adrenal insufficiency, unusual headaches, fever or CSF rhinorrhoea

- F/U imaging (e.g. at 3 months) – to be advised by Consultant

- Endocrinology appointment 6-8 weeks, as discussed with Endocrinology team who will have reviewed as an in-patient

- Neurosurgical appointment 6-8 weeks

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WHO TO CALL

- On-call Women's Assessment Unit (WAU) Registrar
- On-call Delivery Unit Registrar
- On-call Anaesthetic Registrar for O&G
- Blood Bank
- Coagulation Lab
- Obstetric Emergency x**777**

This is a useful guide for common obstetric and gynaecology emergencies. Some of these are serious life-threatening conditions. It is very important that you involve senior staff early if you have any concerns.

General information to have when calling the Registrar

1. Patient name, age and NHI
2. Concise presenting complaint/chronologically relevant findings on history and examination
3. If pregnant: dating of current pregnancy and known complications, past obstetric history (G_ P _ and current gestation)
4. Past gynaecological history
5. Relevant past medical history/medications used
6. Relevant findings on blood/USS work up
7. Clinical impression and proposed management plan

GYNAECOLOGY (INCLUDES PREGNANCY LESS THAN 20 WEEKS GESTATION)

Circulatory shock in the O&G patient

- A patient in circulatory shock is not uncommon in O&G. The most common causes are acute blood loss, sepsis, or both.
- Shock can also be caused by products of conception sitting in the cervix with minimal blood loss. If this is suspected, then a speculum examination is required to confirm the diagnosis and treat the problem by removing the tissue with sponge forceps.
- O&G patient population tends to be younger with good cardiovascular reserve
- Better able to withstand circulatory shock from whatever cause, sometimes with minimal evidence of acute heavy blood loss
- This can provide a false sense of security, as the line between compensating and decompensating is quite narrow.

Some signs in recognising a patient in shock

- Bedside: anxious/confused patient or reduced level of consciousness.
- Hypovolaemia: mottled skin appearance, cool/clammy to touch peripherally, conjunctival pallor, weak thready pulse, increased cap refill time.

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- Sepsis: warm/sweaty to touch.
- Observations: BP <90/60, Temp >38°C, HR >100/min, urine output <30 mL/h.
- Presentation with hypotension/tachycardia and decreased urine output suggests an effective blood loss volume of at least 30-40% (1.5-2 L in a woman with normal BMI).
- Quick recognition of shock is required to improve the outcome for the patient, with immediate resuscitation.
- Massive transfusion protocol: this protocol is designed for heavy bleeding with shock and/or coagulopathy, and at times is needed in obstetrics (e.g. placenta previa, post-partum haemorrhage – the uterus at term has blood flow of 350 mL/min).
- Resuscitation in these situations requires senior assistance.

ADHB ADULT MASSIVE TRANSFUSION PROTOCOL (MTP)

http://excellence.adhb.govt.nz/bloods/ProcessMaps/adult_massive_transfusion_protocol.pdf

ABDOMINAL PAIN (PREGNANCY EXCLUDED)

Relevant investigations

- FBC/creatinine and electrolytes/LFTs/CRP
- Vaginal (genital) swabs (1x high vaginal swab and 1x endocervical swab) for MC&S and chlamydia/gonorrhoea culture (purple and orange swabs)
- USS pelvis/renal/upper abdo if indicated
- AXR if bowel obstruction/perforation suspected
- MSU

Management

URGENT on-call Registrar/Consultant referral required if:

- Suspected ovarian torsion from history and examination. Delay in diagnosis may reduce the chance of saving the ovary. Red flags include a known adnexal mass, a woman of reproductive age, recent fertility treatment and previous torsion. Typical signs are of sudden onset, severe pelvic pain often associated with vomiting. Patients may be febrile and inflammatory markers can be raised.
- If haemodynamically unstable from suspected ovarian cyst rupture (from significant internal bleeding):
    - Keep NBM
    - Obtain IV access + group and screen
    - IV morphine
    - IV fluid resuscitation
    - Antiemetics prn
    - The need for USS to confirm diagnosis is to be decided after senior staff assessment (presentations may be similar between torsion, ovarian haemorrhagic cyst, cyst rupture and mid cycle pain)
- Refer all other cases to on-call Women's Assessment Unit (WAU) Registrar after workup

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- Treat underlying cause ± referral to other appropriate services dependent on diagnosis

PELVIC INFLAMMATORY DISEASE (PID)

Refer to PID protocol for details

- Refer to PID protocol for details. See Sexual Health chapter
  - Analgesia prn
  - If clinically well enough can be referred for outpatient management

Haemorrhagic cyst/cyst rupture/mid cycle pain

- Usually diagnosed clinically along with ultrasound findings
- Expectant management with analgesia usually appropriate

CONTRACEPTION

Please take the opportunity to ask a woman about contraception if appropriate. New Zealand has a high rate of adolescent pregnancies and STIs. If a patient would like some advice about contraception or changing her contraception you can consult with the on-call WAU Registrar in hours. Alternatively you can refer her to the New Zealand Family Planning website https://www.familyplanning.org.nz/ for more information.

Common scenarios that may present in an acute setting:

- Mirena/IUD strings not seen or device malpositioned on imaging: If the patient is not wanting or due to have the device removed, in general no further action is required. If there is a concern regarding perforation of the uterus, please refer to the Gynaecology Service. It is useful to request an AXR prior to referral to assess for an extra uterine IUCD.

- Pregnant with IUD in situ: refer to gynaecology service. IUD should be removed as non removal results in a higher miscarriage rate.

- PV spotting with Jadelle, Depo medroxyprogesterone acetate is a common side effect. This can be treated with a Combined Oral Contraceptive (COC) containing 30 micrograms ethinyloestradiol, with active pills administered continuously for three weeks or longer.

- Missed COC pill:
  - Only 1 missed pill: continue taking pills, no extra precautions required.
  - Two or more pills missed in 1 week: at risk of pregnancy until 7 continuous days of hormone pills are taken. Patients need to use barrier contraception or avoid intercourse while taking 7 hormone pills.
  - If less than 7 hormone pills left in the packet, finish packet and skip inactive pills going straight to the hormone pills of the next packet.

- Antibiotics: there are no changes in hormone levels during antibiotic use, so no extra precaution is required (except for with enzyme inducing antibiotics, including rifampicin and rifabutin).

- Diarrhoea and vomiting: extra precaution only required if this has occurred within three hours of tablet intake. Need to follow the 7 day rule as above.

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ABDOMINAL PAIN WITH DIAGNOSED PREGNANCY (<20 weeks gestation)

β-HCG and pelvic USS

- Serum β-HCG is required for all patients with suspected miscarriage/ectopic.
- Pelvic USS is generally required for all suspected miscarriages/ectopics for diagnosis, except when ruptured ectopic is suspected and the patient is haemodynamically unstable, in which case clinical judgement and bedside urinary pregnancy test can be used to decide on need for emergency laparotomy/surgery.
- If no intrauterine pregnancy seen on transvaginal ultrasound and β-HCG >1500 (or β-HCG >2000 following negative transabdominal ultrasound), this means ectopic until proven otherwise.

Other investigations

- FBC
- Blood group + antibodies

Management

- Call a code and request urgent on-call WAU Registrar/ Obstetric Registrar/Consultant assessment if haemodynamically unstable from suspected ectopic pregnancy or heavy PVB from any form of miscarriage
    - Large gauge IV line x2
    - FBC
    - IV fluid resuscitation
    - Urgent cross-matching
    - Keep NBM

- Cervical shock
    - Vasovagal stimulation with hypotension/bradycardia as a result of cervical dilation. This can result in syncope
    - IV fluid resuscitation
    - Urgent speculum examination to remove any clots/tissue at cervical os

- Clinically stable ectopic pregnancy
    - Keep NBM
    - Clinical assessment required by on-call WAU Registrar/Obstetric Registrar after work up completed
    - Management options include medical management with methotrexate or surgical management: see protocol N:\Groups\Everyone\POLICY\LocalProtocols\WomensHealth\Gynaecology\Ectopic Pregnancy.pdf
    - Note: Expectant management is justified for Pregnancy of Unknown Location (PUL)

- Clinically stable missed miscarriage/inevitable miscarriage/incomplete miscarriage
    - Discuss management with on-call WAU Registrar/Obstetric Registrar
    - Symptomatic patients require on-call WAU Registrar/Obstetric Registrar assessment
    - Speculum examination to assess cervical os opening, remove any visible clots/conception tissue from cervical os
    - For gestation <13 weeks, management options include expectant/medical management with misoprostol or surgical evacuation, see protocol N:\Groups\Everyone\POLICY\LocalProtocols\WomensHealth\Gynaecology\MiscarriageExpectantMedicalSurgical.pdf
    - For confirmed 2nd trimester miscarriage (no heart beat with fetus >13 week on USS measurement)
        - On-call WAU Registrar/Obstetric Registrar assessment required
        - Medical management of fetal demise usually recommended
        - Further investigations are required including other blood tests/placental histology/post mortem, see National Women's website

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- Threatened miscarriage (live intrauterine pregnancy seen on USS)
    - Discharge with expectant management
    - Ensure 1st antenatal bloods taken, and taking folic acid and iodine supplementation
    - Enquire about booking with a LMC

- Pregnancy of unknown location (β-HCG <1000, USS unable to confirm placentation site)
    - Discharge with expectant management for serial β-HCG follow up from EPAU

- Molar pregnancy
    - Non-urgent surgical evacuation required unless haemodynamically unstable
    - Gynae-oncology referral once molar pregnancy confirmed on histology

- Rhesus -ve women with -ve anti-D antibodies
    - Gestation <13 weeks: all with any form of miscarriage or ectopic pregnancy require anti-D 250 units IM. In twins and other multiple gestation, 625 units IM is given <13 weeks.
    - Gestation >13 weeks: anti-D 625 units IM required
    - Anti D needs to be given within 72 hours of PV bleeding or surgical procedure in Rh neg women

- Offer pregnancy loss counselling

HEAVY PV BLEEDING (PREGNANCY EXCLUDED)

Possible Causes

- Anovulatory heavy bleeding
- Ovulatory heavy bleeding
- Cervicitis/endometritis
- Endometrial polyps
- Submucous/Intramural fibroid
- Endometrial hyperplasia/carcinoma
- Cervical ectropion/polyps/carcinoma
- Bleeding disorder e.g. von Willebrands
- Dysfunctional uterine bleeding (i.e. all other causes excluded)

Assessment

- History (duration, regularity, amount, associated other symptoms, symptoms of anaemia, check sexual history, smear history or recent cervical procedures e.g. LLETZ)

- Examination: vital observations, conjunctival pallor, general nutrition status, abdominal masses/tenderness
    - Speculum exam: check for bleeding and lesions from vulva/vagina/cervix, obtain genital swabs. Take cervical smear if not actively bleeding and is due. Consider performing pipelle endometrial sampling if not bleeding heavily (pregnancy must be excluded first).
    - Bimanual exam: check for uterine size/tenderness/mobility/adnexal masses and tenderness

- Blood test: full blood count, coagulation studies if indicated, urine or serum β-HCG

- Group and screen

- USS pelvis

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Management

- If haemodynamically unstable, acute resuscitation (call code) and urgent on-call WAU/Gynae Registrar assessment
    - Large bore IV cannula x2
    - IV fluid resuscitation
    - Urgent cross-matching
    - Keep NBM

- If Hb <80 (regardless of whether on-going PVB or not) admission is usually required for consideration of packed red cell transfusion or total dose iron infusion

- Agents helpful in reducing PVB acutely (caused by endometrial shedding)
    - NSAIDs
    - Tranexamic acid 1 g qid
    - Medroxyprogesterone 10-50 mg daily (higher doses may be given) OR norethisterone 5 mg tds, initially
    - If findings suggestive of cervicitis/endometritis (bleeding/discharge/pain), requires antibiotic treatment

- Post cervical cone biopsy bleeding: usually caused by local infection
    - Silver nitrate diathermy to bleeding surface/place surgicel and monsels onto bleeding area/ vaginal packing
    - Antibiotic treatment (amoxicillin + clavulanic acid)

- USS findings suggestive of endometrial fibroid/polyps/endometrial thickening entails further endometrial investigation by pipelle or outpatient hysteroscopy/D+C (decided by Registrar/Consultant assessment)

HYPEREMESIS GRAVIDARUM

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"Hyperemesis" is a symptom complex and there are important differential diagnoses to be considered. Most cases occur in normal pregnancies; however, diagnoses of molar and multiple pregnancies need to be excluded by ultrasound.

- Admission criteria: ketones in the urine or weight loss (10% body weight)
- Ketones need to be cleared before discharge
- It is rare for women to require long term enteral feeding but if required, this necessitates a multidisciplinary approach to the clinical management

Assessment

- Dehydration
- Urinary output
- Weight
- Nausea
- Vomiting
- Consideration of other causes of vomiting

Investigations

- FBC
- Renal function; LFTs

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- MSU for culture
- Urinary ketones
- Ultrasound scan to exclude molar/multiple pregnancy, etc
- Thyroid function tests (if patient has intractable N+V)

Management

Refer to https://adhb.hanz.health.nz/Policy/Hyperemesis%20in%20Pregnancy%20Pathway%20-%20AED,%20Gynaecology%20and%20Maternity%20patients.pdf

- IV fluid (sodium chloride 0.9% with the addition of KCl according to the laboratory results)
- Antiemetics (metoclopramide (1st line), cyclizine/ondansetron (2nd line), prochlorperazine (3rd line)
- Folic acid, iodine, pyridoxine and thiamine
- Some may need dietary advice prior to discharge, to have small/frequent meals.
- May need referral to dietician
- Daily weight whilst in hospital

BLEEDING IN PREGNANCY (>20 weeks gestation)

N:\Groups\Everyone\POLICY\LocalProtocols\WomensHealth\Maternity\Antepartum Haemorrhage APH.pdf

Investigations

- FBC and coagulation screen (coagulation abnormalities are more likely with placental abruption).
- Check blood group and antibodies.
- Kleihauer if rhesus –ve.
- Other tests as appropriate e.g. if abruption in the presence of pre-eclampsia.

Note: abruption is a clinical diagnosis and does not require ultrasound for confirmation.

Management

- All cases must be assessed by on call WAU Registrar/Obstetric Registrar/Consultant.
- If concerns about maternal or fetal wellbeing (i.e. obstetric emergency), contact must be made even before full work up has been completed.
- **Do not** perform digital vaginal examination unless placental site known.
- Insert IV line, 16 gauge or larger, x2 if heavy PV bleeding.
- Urgent group and save. Cross-match ≥4 units if history of severe/on-going PV bleeding. If heavy PVB, contact on-call anaesthetic staff as massive transfusion protocol may need to be instituted.
- Commence IV crystalloid fluids for resuscitation if haemodynamically unstable or on-going heavy PVB.
- All women with suspected placental bleeding, and who have known -ve rhesus status without anti-D antibodies, will require anti-D prophylaxis, to be given within 72 hours of bleeding onset. In general only 1 vial (625 units) of IM anti-D is required, but further vials may be needed depending on Kleihauer result (discuss with Registrar/Consultant).
- Keep NBM whilst awaiting assessment by senior staff.
- Decisions such as need for admission / corticosteroid administration / delivery planning to be made by on call Registrar/Consultant.

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ABDOMINAL PAIN (>20 weeks gestation)

- Sterile speculum examination
    - Discuss with on-call Registrar before performing. Look out for:
        - Cervical length
        - Cervical opening/dilatation
        - Discharge/bleeding/liquor pooling
        - Cord prolapse
        - Genital swabs obtained if indicated
- If considering fetal fibronectin testing for suspected threatened preterm labour between 24 and 34 weeks gestation
    - Be familiar with the fetal fibronectin protocol, certain contraindications exist
    - Do not lubricate speculum with KY jelly as this can cause a false +ve result
- Digital vaginal examination
    - In general should not be performed by House Officers, at least not before discussing with Registrar/Consultant
    - Must **not** be performed if concerns around ruptured membranes

Investigations

- FBC, LFTs, creatinine, electrolytes, CRP
- MSU
- Fetal fibronectin if indicated
- Genital swabs if indicated
- Kleihauer if suspected abruption or history of significant abdominal trauma
- USS dependent on clinical suspicion
    - Obstetric: growth/placental position/fetal lie/cervical length
    - Non obstetric: fibroid degeneration/adnexal masses/renal/upper abdo/appendix

Management

- Insert IV line, obtain group and hold/urgent cross-match if indicated
- Keep NBM until reviewed by senior staff
- Alert on call Registrar/Consultant regarding presentation
- Treat the underlying cause
- Rhesus -ve women with -ve antibodies with suspected abruption or history of abdominal trauma should have 1 vial (625 units) of IM anti-D as prophylaxis and may require more dependent on Kleihauer result
- Decisions regarding admission/tocolysis/corticosteroid administration/delivery planning to be advised by on-call Registrar/SMO

PRE-ECLAMPSIA

Pregnancy induced hypertension

- A multisystem disorder principally involving the cardiovascular and renal systems and utero-placental function

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- Other systems involved are the gastrointestinal (liver), coagulation function and central nervous systems
- The severity of the condition is determined by the gestation and the degree of abnormality of blood pressure, renal function, CNS signs, other system abnormalities and fetal condition
- An individual management plan needs to be established for each patient

Common presentations

- Asymptomatic but LMC referral with raised BP and dipstick proteinuria
- Intermittent headache
- Acute RUQ pain
- Sudden weight gain or swelling
- Seizure in pregnancy or post partum (40% of eclamptic fits occur post-partum) without prior epilepsy history

Diagnosis

- No one finding is pathognomonic, usually a combination of findings

>20 weeks gestation

- Recurrent headache
- Visual disturbance
- Liver capsule tenderness
- Accelerated weight gain with facial/upper limb oedema
- BP >140/90 on 2 or more occasions
- Urine PCR >30mmol/L or 24h urine >0.3g/d
- Decreased platelet count <150 (or decreasing trend)
- Raised AST/ALT
- Raised urate (not specific)
- Raised creatinine
- Reduced urine output
- Hyper-reflexia and increased clonus
- IUGR fetus especially if early onset +/- abnormal Doppler
- Non-reassuring CTG
- Papilloedema

Can occur any time from >20 weeks to 6 weeks post partum.

Assessment

- Blood pressure
- CNS: symptoms, hyper-reflexia and clonus
- Fluid retention: presence of oedema including pulmonary oedema, fluid balance and daily weight
- Abdomen: assessment of epigastric pain, uterine pain, obstetric palpation, assessment of fetal size, amniotic fluid
- Blood tests: FBC, creatinine, urate, liver function tests (if LFTs or platelets abnormal, obtain coagulation profile)
- Urinalysis: proteinuria (abnormal if protein/creatinine ratio >30)
- Fetal welfare: cardiotocograph (CTG), BPP, ultrasound scan for fetal growth, amniotic fluid, umbilical arterial Doppler

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Acute management

- All patients need to be referred to/assessed by on-call WAU/Obstetric Registrar
- Cure of pre-eclampsia is ultimately achieved by delivery of fetus/placenta but timing depends on the gestation and severity of PET

Supportive measures

1. BP >160/100

- 1st line agents include methyldopa and labetalol
- Discuss patient with on-call WAU/Obstetric Registrar before implementing treatment
- Severe hypertension may be quickly controlled with short acting agents such as short acting nifedipine/IV or PO labetalol
- Must have CTG monitoring if using fast acting anti hypertensive medications

2. Increased jitteriness, hyperreflexia/clonus, visual disturbance

- MgSO4 protocol with transfer to obstetric HDU
- Urgent on-call WAU Registrar/Specialist/Physician required
- PET bloods to be repeated to assess progression
- CTG monitoring
- IV line
- G+S

SPONTANEOUS RUPTURE OF MEMBRANE (PRE-LABOUR RUPTURE OF MEMBRANES)

>37 weeks gestation

- 70% will go into labour within 24 hours
- Care usually managed independently by midwifery staff

Assessment

- Routine observations obtained
- MSU
- Check fetal presentation (97% cephalic)
- Speculum examination not mandatory if history of SRM is very obvious. Colour of liquor should be noted
- Exclude fetal distress with CTG

Management

https://adhb.hanz.health.nz/Policy/Rupture%20of%20Membranes%20in%20Pregnancy.pdf

- Any concerns with above needs to be discussed with on-call WAU/Obstetric Registrar
- If Group B streptococcus (GBS) positive on swab >35 weeks, meconium liquor present, maternal or fetal concerns, management should be discussed with the WAU Registrar as induction of labour is required
- All stable patients are given the option of induction of labour or conservative management. If conservative management is chosen, they are discharged with advice to check temperature, pulse

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rate and liquor colour 4 hourly and to return if any abnormalities in these or once contracting strongly/regularly every 3-5 minutes. Induction of labour will be arranged for these patients 18-24 hours after rupture of membranes.

- N:\Groups\Everyone\POLICY\LocalProtocols\WomensHealth\Maternity\Group B Strep Neonatal Disease.pdf

<37 weeks gestation

- Etiology uncertain, likely as the result of subclinical chorioamnionitis
- Occurs in 4% of all pregnancies, cause of 40% of all preterm deliveries
- 50% deliver within 1 week of SRM

Assessment

- Accurate gestation and obstetric history
- Time of SRM and any uterine activity
- Associated vaginal bleeding/discharge
- Systemic symptoms suggestive of infection
- Temperature/heart rate/BP
- CTG for fetal wellbeing, uterine activity
- Abdominal palpation for uterine tenderness/tone/fetal presentation
- Portable USS to check fetal presentation/depth of liquor pockets
- MSU
- Sterile speculum examination (NO digital exam):
    - Confirm liquor pooling and colour/consistency
    - Exclude cord prolapse
    - Visualise cervical length/dilation
    - Obtain vaginal swabs for culture

Management

- Urgent referral to senior staff if evidence of maternal or fetal compromise
    - Regular painful contractions
    - Findings suggestive of chorioamnionitis/systemically unwell
    - Fetal distress
    - Cord prolapse present

- All other cases must be referred to and seen by on-call WAU/Obstetric Registrar/SMO

- Suspected chorioamnionitis/cord prolapse/fetal distress/advanced preterm labour are obstetric emergencies
    - Call obstetric code
    - Insert IV line 16 gauge
    - Urgent FBC/cross-match
    - Keep NBM
    - Continuous CTG if >24 weeks gestation

- For clinically stable patients with preterm pre-labour rupture of membranes, the general approach is:
    1. Admission
    2. Betamethasone (Celestone Chronodose®) 11.4 mg IM, 2 doses 24 hours apart if gestation >24 weeks and <34+6 weeks (Betamethasone can be administered from as early as 22+5 weeks after discussion with NICU team and SMO, on a case by case basis)
    3. Erythromycin 400 mg qid for 10 days
    4. Nifedipine protocol for tocolysis if necessary
    5. Inform NICU staff about admission followed by discussion with patient about likely neonatal outcome for gestation

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POST-PARTUM HEAVY PV BLEEDING

https://adhb.hanz.health.nz/Policy/Postpartum%20haemorrhage%20(PPH)%20-%20Prevention%20and%20management.pdf#search=Postpartum%20Haemorrhage

Primary PPH = PVB >500 mL within 24 hours post-partum

Common causes in order from most common to least:

1. Atonic uterus
2. Retained placental tissue
3. Vaginal/perineal tears
4. Coagulopathy

Assessment / management

- Quick review of history, recognise emergency situation
- Call for help (obstetric code) if ongoing heavy PVB
    - Less severe bleeding still requires early referral to/assessment by on-call DU Registrar
- Insert IV line <16 gauge x2
- Ensure cross match taken/available
- FBC/electrolytes/coagulation screen
- Stat IV fluids
- Assess uterus size/tone
- Rub uterus/bimanual compression
- Insert indwelling urinary catheter
- On-call senior staff to provide input for pharmacological and rest of PPH management
- Keep NBM

Contact senior staff immediately.

Secondary PPH = Heavy PVB >500 mL, >24 hours post-partum to 6 weeks

Common causes

- Endometritis: increasingly heavy PVB with discharge/uterine tenderness, systemically unwell with fever/shakes/chills, severe = septic shock
- Retained placental tissue: heavy PVB ± endometritis findings. Pelvic exam may reveal larger uterine size than expected/open os
- Less common – uterine inversion

Assessment / management

- Urgent senior staff assessment if haemodynamically unstable/ongoing heavy PVB
- As per primary PPH
- Assess signs/symptoms of likely cause
- Speculum exam
    - os open/closed
    - Remove clots/placental tissue from cervix/vagina if present
    - Visualise for discharge, obtain swab for culture
    - Check for tears
- Start antibiotics – cefuroxime 750 mg IV q6h, metronidazole 400 mg PO q12h (or 500 mg IV if NBM)
- Consider USS to assess for retained placental tissue

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Ophthalmology

Acute Eye Clinic

The acute eye service is divided into the Acute Referral Clinic and Emergency Eye Clinic.

- Acute Referral Clinic (ARC)
- GPs, optometrists and hospital doctors can refer patients to the acute referrals clinic through the on-call Eye Registrar. Patients are provided with an appointment time to be seen.
- Emergency Eye Clinic (EEC)
- Emergency patients who should be seen immediately can present to the Emergency Eye Clinic where they are triaged by the acute nurse.
- These cases are also to be discussed with the on-call Eye Registrar by the referring hospital doctors, GPs, or optometrists.

WHO TO CALL

- On call Eye Registrar Nurse
- Emergency Eye Clinic
- **Referral via RCP, however if urgent (within 48hrs) you MUST also call to discuss**
- Eye clinic reception/enquiries

Information to have when calling the Registrar

- Name, age, NHI
- Details of the patient including history, ambulatory status, and location
- Visual acuity
    - This is one of the vital signs in ophthalmology – **check it before you call**
- Brief history of the presenting complaint
- Basic eye examination (without slit lamp)
    - Is the eye red and inflamed?
    - Is the cornea clear or cloudy? Is there any fluorescein uptake?
    - Pupillary response to light? Is the red reflex visible?
    - Check ocular motility, visual fields
    - Cranial nerve examination (in some cases)
    - Any other examination findings you have elicited
- Cases that should always be discussed with the Eye Registrar
    - Significant facial trauma
    - Any change in vision especially in a short time frame
    - Severe ocular pain
    - Red eye with photophobia

THE OCULAR HISTORY

Include the following while reporting:

History

- Monocular OR binocular symptoms
- Rate of onset
- Duration of symptoms

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- Associated features: redness - localised vs. diffuse / photophobia / discharge /nausea
- Pain (if so, severity and type)
- Visual changes e.g. loss of vision, blurring, haloes, floaters, flashes of light
- Double vision
    - Monocular – think of an intraocular problem
    - Binocular – think of misalignment of eyes / strabismus
- Trauma: mechanism of injury (blunt vs. penetrating)

Past Ocular History

- Surgery including laser eye surgery
- Past ocular diagnoses and treatment
- Refractive error: short-sighted (myopic), long-sighted (hypermetropic), astigmatism
- Lazy eye (amblyopia) as a child
- Contact lens use

Past Medical History

- Diabetes
- Hypertension
- Cardiovascular issues/risk factors
- Autoimmune conditions
- Cancer
- Current medications – amiodarone, ethambutol, corticosteroids, psychoactive medications, alendronate

THE OCULAR EXAMINATION

1. Vision assessment:
    - Test **best-corrected visual acuity** (VA) i.e. with glasses if available. Distance vision should always be tested with distance glasses (NOT reading glasses).
    - Check each eye's visual acuity separately (cover one eye).
        - Check with pinhole if VA is reduced. Pinhole test will improve vision with refractive errors. If no pinhole is available, you can create your own with an 18G needle (or pen) on any piece of paper or cardboard.
    - Visual acuity is expressed in Snellen fraction:
        - Snellen fraction = Testing distance (usually 6m) / Smallest line patient can read on the chart, e.g. 6/18 vision means your patient can see at 6 meters what a normal eye could see 18 meters away. Numerator is always constant.
    - Snellen charts can be printed from https://ascendbroking.co.uk/wp-content/uploads/2020/02/Snellen-Eyesight-Chart.pdf. These charts have been formatted to check acuity at a distance of 3 meters. VA in this case can still be expressed in 6/6 format.
    - Hierarchy for low vision: Snellen acuity>count fingers>hand movement>light perception>no light perception

2. Test for visual fields on confrontation

3. Examine pupils
    - Examine for size, shape, and symmetry
    - Reactivity to light – direct and consensual reflex
    - Test for RAPD (relative afferent papillary defect) with swinging flashlight. If a pupil dilates when light is swung to that eye, this indicates RAPD with ipsilateral retinal or optic nerve damage.
4. Test for eye movements

5. Test cranial nerves (if relevant to presenting complaint)

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6. Record external examination findings if relevant (4 Ls)
    - Lymph nodes
    - Lacrimal apparatus
    - Lids
    - Lashes

7. Systematically examine all anterior segment structures
    - Preferably with a slit lamp but understand it may not be readily available

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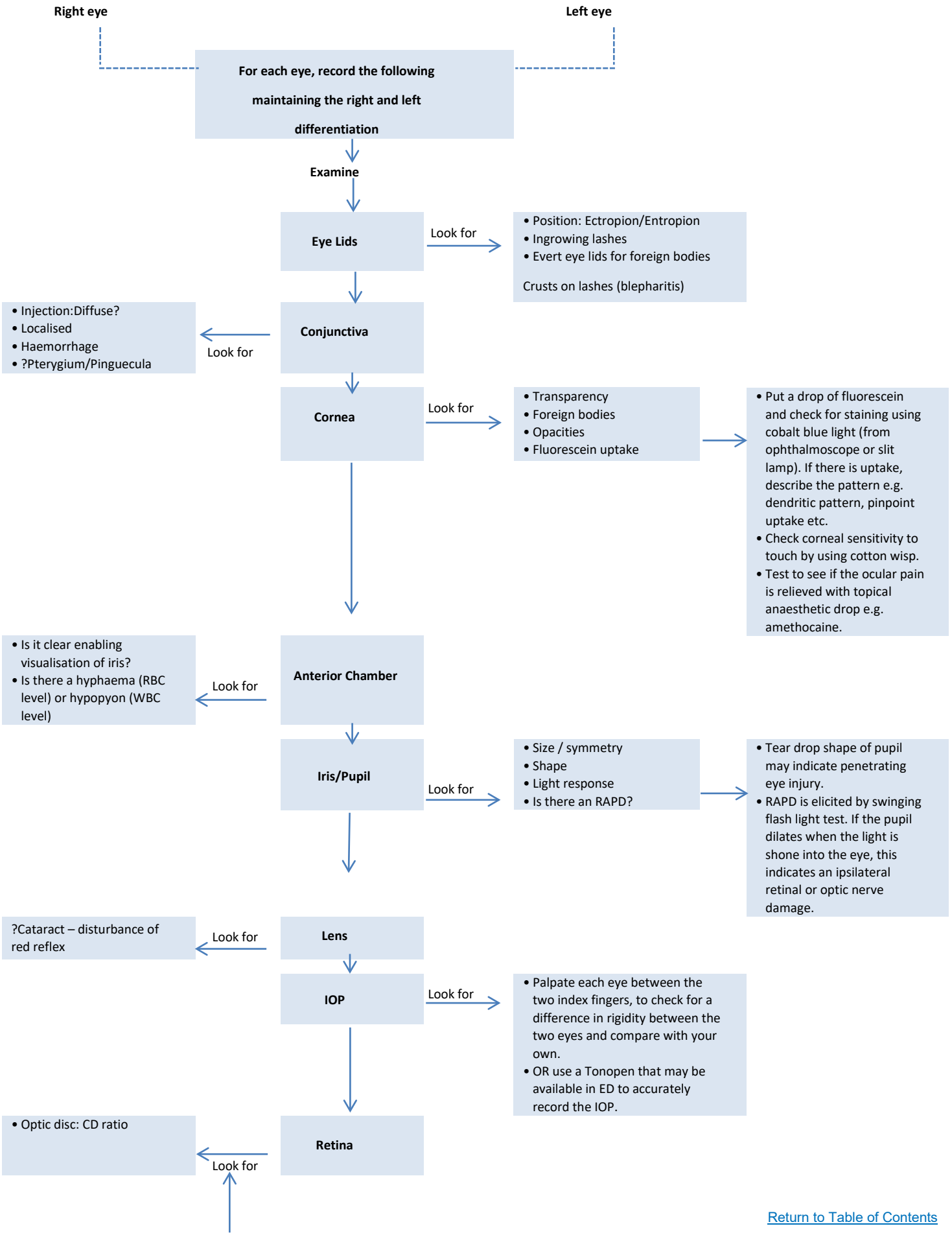
EXAMINATION ALGORITHM



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- Retinal vessels – ?leakage ?cotton wool spots ?haemorrhage.
- Retina (may be difficult to examine with direct ophthalmoscope).

- Dilate with tropicamide 1% to make fundal examination easier or possible.
- It is safe to dilate in nearly all patients UNLESS there is a past history of angle closure glaucoma. Advise patient to seek help if a red/painful eye develops in the next 6 hours. Use an ophthalmoscope in a dim room light setting and ask the patient to look into the distance. Use the side dial to set the appropriate correcting lens on the ophthalmoscope if you or the patient has refractive error. This is best done while focusing on a retinal vessel and setting the side dial until the vessel is in focus. Then, follow the vessel in the direction towards the optic disc.

ACUTE RED EYE

Note: Red eye in a patient with a **recent history of eye surgery** (in the last 2 weeks) or any **previous glaucoma surgery** or **corneal transplant** MUST be discussed with the Eye Registrar.

Causes of red eye include but are not limited to:

- **Adnexal** – trichiasis (misdirected lashes), entropion, ectropion, blepharitis, meibomitis, acne rosacea, dacrocysitis, foreign body in the fornices of eye-lids.
- **Conjunctival** – conjunctivitis (bacterial, viral, chemical, allergic, vernal, medication related), subconjunctival haemorrhage, foreign body, inflamed pinguecula.
- **Corneal** – infectious or inflammatory keratitis, contact lens related issues, corneal foreign body, inflamed pterygium, recurrent corneal erosion, chemical burn.
- **Other causes** – trauma, post-operative, enophthalmitis, anterior uveitis, scleritis, episcleritis, angle closure or medication related (prostaglandin analogues).

Differential diagnosis of Red eye (common conditions)

	Conjunctivitis	**Acute iritis**	**Acute glaucoma**
Pain	Maybe	++ (tender globe)	Maybe
Discharge	Bacteria – Pus Virus – serous Allergic - mucous	No	No
Vision	Normal	Reduced (cloudy)	Reduced (corneal edema)
Pupil	Normal	Smaller	Fixed in mid-dilation
Others	Periauricular lymph nodes swelling (if viral)	Synechiae, AC cells and flare	Nausea and vomiting

Common ocular complaints in contact lens wearers

Corneal abrasion, infected ulcers, sterile infiltrates (immune mediated), giant papillary conjunctivitis, superficial punctate keratitis.

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BLEPHARITIS

Common, particularly in patients over 40.

Symptoms

- Discomfort, burning sensation, foreign-body sensation, tearing

Signs

- Crusting on lashes, red, thickened eyelid margins with prominent blood vessels

Management

- Warm compresses to lids for 10 minutes followed by lid massage to clear the meibomian glands. Preferably done at least 3-4 times a day.
- Scrub eyelid margins with diluted mild shampoo (Johnson's baby shampoo) using a cotton bud
- A course of topical antibiotic ointment may help (chloramphenicol QID)
- Artificial tears as required for ocular surface irritation
- Oral doxycycline can help with meibomian gland dysfunction (100 mg a day for 1 month)

MEIBOMIAN CYST OR CHALAZION

Symptoms

- Swelling or discomfort in the upper or lower lid

Signs

- Well-defined, subcutaneous eyelid nodule, often with some inflammation surrounding the nodule, due to a blocked meibomian gland orifice
- Signs of blepharitis

Management

- Treat with warm compresses for 15-20 min and light massage over the lesion. If the cyst forms into an abscess, or there is cellulitis then refer to Eye Registrar.
- Long term blepharitis treatment (see above)
- Most resolve by 6 weeks, but if a chalazion persists or is causing distress then it can be treated with incision and curettage. Send in a written referral addressed to the Meibomian Cyst Clinic (non-urgent).
- Suspected lid tumours should be referred to outpatient Oculoplastics Clinic (semi-urgent)

TRICHIASIS / MISDIRECTED EYELASHES

Symptoms

- Irritation, watering and discomfort if misdirected eyelashes rubbing on the cornea or sclera

Signs

- Posteriorly directed lashes touching the ocular surface
- Check for fluorescein staining of cornea

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Management

- Pluck out offending eyelashes with forceps
- Chloramphenicol ointment or drops for corneal abrasions
- If a corneal ulcer is present i.e. fluorescein staining with corneal infiltrate (white opacity) then discuss with Eye Registrar
- Non-urgent outpatient referral for patients requiring permanent eyelash removal (radiowave ablations)

ECTROPION – OUTWARD TURNING OF EYELID MARGIN

Symptoms

- Irritation and watering

Signs

- Loose, droopy lower lid not in contact with ocular surface
- Elevated tear film
- Conjunctival inflammation in the region of the ectropion
- Check for fluorescein staining of the cornea due to exposure. If present discuss with Eye Registrar.

Management

- Regular artificial tears are used during the day and an ointment at night
- Refer to Oculoplastics Clinic (non-urgent)

ENTROPION – INWARD TURNING OF EYELID MARGIN

Symptoms

- Discomfort on blinking, pain and watering

Signs

- Multiple lashes rubbing against the globe. Check for fluorescein staining of the cornea, if present discuss with Eye Registrar

Management

- Taping of eyelid skin to evert the lid
- Antibiotic ointment e.g. chloramphenicol ointment QID
- Refer to Oculoplastics Clinic (semi-urgent priority)

PRESEPTAL AND ORBITAL CELLULITIS

Preseptal cellulitis

- Cellulitis anterior to orbital septum (not spreading deeper than the eyelids). May follow meibomian cyst, insect bite or lid trauma.

Orbital cellulitis

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- Cellulitis spreading into orbit, vision threatening and needing urgent aggressive treatment. Often secondary to sinusitis, trauma, or neglected preseptal cellulitis

In both cases the eyelids are swollen, warm, erythematous and tender. The distinguishing clinical features are listed below:

	Preseptal cellulitis	**Orbital cellulitis**
Systemically unwell	Sometimes	Often
Red eye	No	Yes
Ocular motility	Full and normal	Reduced eye movements
Proptosis	No	Yes
Change in visual acuity and colour vision defect	No	Sometimes – urgent
Relative afferent pupil RAPD	No	Sometimes – urgent

- Look for causes e.g. wounds, infected chalazion, dacrocystitis, sinusitis
- CT sinuses/orbits is the preferred modality to investigate for causes of orbital cellulitis
- Refer cases to the Eye Registrar urgently

DACRYOCYSTITIS – INFECTION OF THE LACRIMAL SAC

Symptoms/signs

- Erythematous, tender swelling over the nasal aspect of the lower eyelid
- Purulent discharge may be expressed from the punctum when pressure is applied over the swelling
- Check for signs of orbital cellulitis (table above)

Management

- Refer to Eye Registrar

CONJUNCTIVITIS

Can be subdivided into viral, bacterial, atopic/allergic.

Symptoms

- Discharge
  - Bacterial = purulent (often with lids glued together on waking)
  - Viral = watery
  - Allergic/atopic = watery or mucus
- Viral conjunctivitis (e.g. adenovirus) may be preceded by a prodrome of fever, sore throat, and rhinitis. Affects one eye initially then becomes bilateral. Often have pre-auricular lymphadenopathy.
- Itchy eyes with a history of eczema/asthma is classic for allergic conjunctivitis. Patients with allergic conjunctivitis may have history of seasonal or perennial hay fever. Usually bilateral.

Signs

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- Swollen lids with diffuse conjunctival injection
- Follicles = viral, chlamydia
- Papillae or cobblestones = Atopic/allergic or bacterial
- Corneal changes e.g. punctate staining, abrasions, ulcers
- +/- palpable pre-auricular node in viral conjunctivitis

Management

- Take conjunctival swabs (bacterial/viral/chlamydial)
- Bacterial conjunctivitis:
    - Topical antibiotics (e.g. chloramphenicol drops 6x/day for 7 days + chloramphenicol ointment at night)
    - For chlamydia conjunctivitis discuss with the Sexual Health Registrar
    - Urgent referral required if gonococcal conjunctivitis is suspected – may perforate cornea
- Viral conjunctivitis:
    - Symptoms worsen for the first 4-7 days and may take up to 3-4 weeks to resolve
    - Very contagious so advice regarding minimizing spread (hand washing, not sharing towels)
    - Should remain off work or school until discharge has settled
    - Most cases will resolve without treatment. Artificial tears and cool compresses can be used for symptomatic relief
- Atopic/allergic conjunctivitis:
    - Eliminate inciting agent and avoid rubbing of the eyes
    - Mild: Artificial tears
    - Moderate: Above plus add in mast cell stabiliser (e.g. sodium cromoglycate 2% eye drops QID) or dual action agents (e.g. olopatadine 0.1% BD) for prevention. These should be taken regularly and take 2 weeks to get full effect
    - Severe: Refer to Eye Registrar
- Note: Any red eye in a patient with previous **glaucoma surgery** or **corneal transplant** MUST be discussed with the Eye Registrar

Follow up

- GP follow up in 2-3 weeks to ensure resolution
- Refer if diagnosis not clear or corneal changes

INFLAMED PTERYGIUM / PINGUECULUM

Symptoms

- Ocular irritation

Signs

- Localised redness and swelling
- Pterygium: Wing-shaped fold of fibrovascular tissue arising from the nasal conjunctiva and extending into the cornea
- Pingueculum: Yellow-white conjunctival lesion, not extending into cornea

Management

- Artificial tears 4-6x/day
- Protective eyewear for ultraviolet light
- In severe cases, short course of topical NSAIDs may be considered (discuss with Eye Registrar first)
- Send non-urgent referral to Eye Clinic if irritation is persisting/if pterygium is encroaching on the visual axis/interfering with contact lens wear

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SUBCONJUNCTIVAL HAEMORRHAGE

Causes include trauma, valsalva, anticoagulation therapy and rarely hypertension, most commonly idiopathic.

Symptoms

- Usually asymptomatic

Signs

- Blood underneath the conjunctiva, often in a sector of the eye

Management

- No treatment required, resolves spontaneously in 1-2 weeks
- Exclude conjunctival neoplasm, penetrating eye injury in trauma, hypertension
- If recurrent do coagulation studies and check blood pressure
- Artificial tears for irritation if present

SCLERITIS AND EPISCLERITIS

	SCLERITIS	EPISCLERITIS
Pain	Severe eye pain (keeps the patient up at night)	Mild or no pain
Symptoms	Localised or diffuse redness Tender to touch Photophobic No discharge Often associated with autoimmune disease	Localised redness Mildly photophobic No discharge No systemic associations
Signs	Sectorial or diffuse injection Inflamed vessels don't move with cotton bud +/- bluish scleral hue	Sectoral injection Inflamed vessels move with cotton bud
Referral	Discuss all with Eye Registrar as potentially blinding (urgent!)	Discuss with Eye Registrar, but is a minor condition

CORNEAL ULCER

Symptoms

- Risk factors include contact lens wear, trauma, foreign bodies, topical steroid use
- Mild-severe ocular pain, photophobia, decreased vision

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Signs

- Focal white/grey opacity in cornea with overlying epithelial defect that stains with fluorescein
- Check for corneal sensitivity with a cotton wisp
- Check for hypopyon (white level of pus in the lower anterior chamber)

Management

- Refer all patients to the Eye Registrar urgently

DENDRITIC ULCER (HERPES SIMPLEX VIRUS)

Symptoms

- Red eye, irritation, photophobia
- Previous history of HSV with ocular involvement

Signs

- Fluorescein staining, linear, branching corneal lesion with club-shaped terminal bulbs at the end of each branch
- Reduced corneal sensation

Management

- Viral swab of the eye
- Start aciclovir 3% eye ointment 5x/day and discuss with Eye Registrar regarding follow-up

SHINGLES AFFECTING V_1 (HERPES ZOSTER OPHTHALMICUS)

Symptoms/signs

- Acute vesicular skin rash one side of the forehead and scalp. Involvement of the external nasal nerve (Hutchinson sign) which supplies the tip of the nose correlates significantly with subsequent development of ocular complications.
- HZO can cause conjunctivitis, keratitis, uveitis, scleritis, retinitis, choroiditis, optic neuritis and increased intraocular pressure

Management

- If the skin rash has been present for <72hrs commence oral valaciclovir 1 g TDS for 7 days (Discuss with ID)
- Conjunctivitis is the predominant feature in the first 7-10 days and managed with artificial tears 4-6x/day
- Ocular involvement (e.g. uveitis) is not usually evident for 1-2 weeks after the onset of rash. Please contact the Eye Registrar about the timing of review.

ARC EYES / WELDER'S FLASH / ULTRAVIOLET KERATOPATHY

Symptoms

- History of welding or using sunlamp without protective eyewear
- Ocular pain, irritation, photophobia

Signs

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- Fluorescein staining punctate epithelial defects
- Evert eyelids to look for foreign bodies

Management

- Chloramphenicol ointment or drops QID for 3 days
- Analgesia: cyclopentolate 1% TDS for ciliary spasm ± eye patch
- Refer if not resolved after 2 days

UVEITIS

Symptoms

- Deep ocular pain with photophobia and reduced vision
- Previous episodes of uveitis
- Associated systemic disorders e.g. ankylosing spondylitis, inflammatory bowel disease, reactive arthritis, psoriatic arthritis, sarcoidosis, TB

Signs

- Circumcorneal injection
- Keratic precipitates on corneal endothelium
- Cloudy anterior chamber with cells. Look for hypopyon
- Posterior synechiae (irregular iris/pupil configuration due to iris adhering to the lens)

Management

- Refer to Eye Registrar

ENDOGENOUS ENDOPHTHALMITIS

Rare form of endophthalmitis that results from seeding of infection from another source in the body. Sources include endocarditis, liver abscesses, infected lines/catheters. Results in a very serious ocular infection that can be blinding.

Symptoms

- Acute onset of redness, pain, photophobia and decreased vision

Signs

- Red eye
- Hypopyon and fibrin in the anterior chamber
- Vitritis (inflammatory cells in the vitreous)
- Choroidal abscesses

Management

- Discuss with Eye Registrar
- Refer unwell patients who have red eyes, acute or subacute eye pain, photophobia and decrease in vision
- Refer septic patients when positive blood cultures come back (if unable to report visual symptoms due to illness)

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ACUTE ANGLE-CLOSURE GLAUCOMA

Symptoms

- Unilateral severe pain around the eye with headache, nausea and vomiting
- Reduced vision with halos

Signs

- Circumcorneal injection with a hazy oedematous cornea
- No iris details visible due to corneal oedema
- Mid dilated poorly reactive pupil
- Raised intraocular pressure (can be appreciated on palpation)

Management

- Refer immediately to Eye Registrar: this is an **emergency**

DECREASED VISION

Classify onset (sudden vs. gradual) and painful vs. painless

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Sudden painless vision loss

Urgent referral to Eye Registrar

- Vascular/Ischemia
  - Retinal artery occlusions
  - Retinal vein occlusions
  - Optic neuropathy including
    - Giant Cell Arteritis (GCA)
    - Anterior Ischemic Optic Neuropathy (AION)
- Vitreous haemorrhage
- Retinal detachment

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Sudden painful vision loss

Urgent referral to Eye Registrar

- Acute angle closure glaucoma
- Uveitis
- Optic neuritis (Multiple Sclerosis)
- Acute iritis

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Gradual painless vision loss

Outpatient referral

- Cataract
- Age-related macular degeneration
- Diabetic retinopathy
- Open angle glaucoma
- Refractive errors

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Transient vision loss

Discuss with Eye Registrar – this may be urgent

- Amaurosis fugax (TIA, microemboli, migrainous spasm of arteries, HTN)
- Migraine
- Impending central retinal vein occlusion
- Giant cell arteritis

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GIANT CELL ARTERITIS

Occurs in patients >50 years.

Symptoms

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- Sudden, painless visual loss; initially unilateral, but may rapidly become bilateral, may be preceded by amaurosis fugax
- New cranial nerve palsy or complaint of binocular diplopia
- Headache (temporal or occipital)
- Jaw or tongue claudication (pain with chewing)
- Scalp tenderness (tenderness with hair combing or over temporal arteries)
- Weight loss
- Anorexia
- Proximal muscle and joint aches (polymyalgia rheumatica)

Signs

- Impaired optic nerve function tests
  - Visual acuity, pupillary response (RAPD), colour vision, visual fields to confrontation
- Swollen optic discs (if possible without dilating drops)
- Tender, non-pulsatile temporal arteries

Management

- Check FBC, CRP and ESR urgently
- Refer immediately to Eye Registrar – this is an emergency

AGE-RELATED MACULA DEGENERATION (AMD)

This is the leading cause of irreversible visual loss in the western world in people over 60 years. The two main types are non-exudative (dry) or exudative AMD (wet).

Symptoms

- Non-exudative
  - Gradual loss of central vision
- Exudative
  - Rapid onset of distortion of straight lines or edges (Amsler grid changes)
  - Rapid onset of visual loss
  - Central or paracentral scotoma

Signs

- Reduced visual acuity
- Macular drusen and pigmentary change in non-exudative AMD
- Macular haemorrhages, drusen and pigment change in exudative AMD

Management

- Discuss cases with the Eye Registrar
- If exudative AMD is suspected further investigation with fundus fluorescein angiography and OCT is required
- Treatment for exudative AMD is with intravitreal anti-VEGF therapy e.g. bevacizumab (Avastin®), ranibizumab (Lucentis®) and aflibercept (Eylea®)
- Patients are provided with an Amsler grid for self-monitoring of their AMD

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DIABETIC RETINOPATHY

Related to microvascular occlusion and leakage

Risk factors include duration of diabetes, poor glycaemic control, dyslipidaemia, uncontrolled hypertension and smoking

Symptoms

- Usually asymptomatic until macula oedema develops or vitreous haemorrhage occurs, both resulting in visual loss

Signs

- Divided into proliferative and non-proliferative (further subdivisions exist)
- Diabetic maculopathy affecting central vision

Management

- Optimise glycaemic control, lipids and blood pressure
- Ensure all patients with diabetes are referred to their DHB's regular photo-screening programme for retinopathy
- If visual changes reported or signs of maculopathy or neovascularizatition develop then discuss with Eye Registrar

FLASHES AND FLOATERS

The key features on history taking are the time of onset and the progression of symptoms, associated loss of vision, and risk factors such as a background of diabetes, trauma, myopia, previous retinal detachment.

Flashes

- Retinal tears or detachment
- Posterior vitreous detachment
- Vitreous pulling during quick eye movements
- Migraine
    - Typically characterised by stereotyped binocular visual disturbance which progresses over a few minutes and followed by headache, nausea or vomiting

Floaters

- Caused by material floating in the vitreous
- Retinal tears or detachment, posterior vitreous detachment, vitreous haemorrhage

All cases need to be discussed with the Eye Registrar on-call who will assess the degree of urgency.

OCULAR TRAUMA

CORNEAL ABRASION

Symptoms

- Usually history of trauma
- Significant pain and photophobia, usually relieved by topical anaesthetic

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Signs

- Conjunctival injection with an area of fluorescein uptake on the cornea. Instill fluorescein and use cobalt blue light to highlight uptake.
- Visual acuity will be reduced if the abrasion is overlying the visual axis
- Make sure there is no underlying or surrounding corneal ulcer (opacity within the cornea) which should be referred to the Eye Registrar

Management

- Chloramphenicol ointment or drops QID for 3 days
- Pain relief
    - Eye patch (optional). There is no clear evidence to suggest padding the eye speeds healing.
    - Cyclopentolate 1% TDS to stop ciliary spasm
- **NEVER** prescribe topical anaesthetic agents! (when used frequently, they are toxic to cornea)
- Abrasions usually heal within 12-72 hours; if not refer to Eye Registrar

CORNEAL AND CONJUNCTIVAL FOREIGN BODIES

Determine the mechanism of injury. Was the patient wearing safety goggles? Did the foreign body arise from metal striking metal, which may suggest an intraocular foreign body?

Symptoms

- Pain and foreign body sensation

Signs

- Instill topical anaesthetic to control blepharospasm and pain
- Foreign body usually visible on the cornea
- Evert eyelids and inspect fornices for additional foreign bodies
- Check pupil is round and pupil response to light

Management

- Try removing foreign body with a cotton bud or 23G needle mounted on a syringe under slit lamp guidance (use the beveled end of the needle to gently pick off the foreign body)
- Multiple superficial foreign bodies may be more easily removed by irrigation
- Management as per corneal abrasion (see above)
- Discuss with Eye Registrar if the foreign body is deeply embedded, corneal opacification (infiltrate suggestive of infection) or the presence of a resistant rust ring

HYPHAEMA

Blood in the anterior chamber.

Refer all patients to the Eye Registrar

RUPTURED GLOBE / PENETRATING OCULAR INJURY / CORNEAL OR CONJUNCTIVAL LACERATION

Symptoms

- Sudden visual loss following trauma involving a potential penetrating object e.g. car crash, machinery, sharp objects, air guns

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Signs

- Full thickness scleral or corneal laceration may be visible
- Intraocular contents may be outside the globe (this tissue often looks like a brown gelatinous foreign object)
- A shallow anterior chamber (or a very deep AC) compared with the contralateral eye
- Tear-drop shaped or irregular pupil
- Hyphaema
- Limitation of eye movements

Management

- Refer all patients to the Eye Registrar immediately
- Protect the eye with a hard shield (not a pad). A shield made from a polystyrene/foam cup is an acceptable alternative
- No food or drink (in preparation for surgery)
- Antiemetics + position head at 45º

EYELID LACERATIONS

Symptoms

- Pain +/- watering

Signs

- Determine the size and depth of the laceration
- Involvement of the eyelid margin or canaliculus if medial to the puncta
- Evert the lid to determine if it is full thickness
- Examine the eye carefully to ensure no associated globe laceration

Management

- Tetanus immunisation
- Antibiotic prophylaxis
- Discuss all cases with the Eye Registrar – generally refer if laceration involves lid margin or lacrimal drainage system

ORBITAL BLOW-OUT FRACTURE

Exclude a fracture in all cases of blunt ocular trauma

Symptoms

- Diplopia due to bruising of an extraocular muscle (mild) or muscle entrapment (severe) typically worse in the direction away from the fracture site
- Blurred vision if there is associated ocular injury

Signs

- Limitation and/or painful eye movements
- Enophthalmos (may initially be masked by orbital oedema) or proptosis (possible sign of retrobulbar haemorrhage which requires urgent management)
- Ecchymosis with subcutaneous emphysema

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- Palpable step-off along the orbital rim
- Hypoaesthesia in the distribution of the infraorbital nerve (ipsilateral cheek and upper lip)
- Determine the nature of the trauma and whether a ruptured globe or intraocular foreign body may be present
- Visual acuity and optic nerve function tests (see section on Giant Cell Arteritis)

Management

- Requires a CT scan of the orbits if suspicious of a fracture. Write this specifically on CT request as a CT head typically stops halfway through the orbits and uses slices that are too thick.
- Most patients do not require urgent intervention
    - Patients <15 years with minimal signs of trauma but with inferior rectus muscle entrapment (white eye blow out fracture) require urgent intervention to prevent muscle ischemia
- Instruct patient not to blow nose
- Discuss all cases with the Eye Registrar

CHEMICAL BURN

Chemical burns (especially alkali injuries) represent the most urgent of all ophthalmic conditions. The offending agent does not necessarily have to be in liquid form and can include vaporized agents or even solid matter such as concrete or lime.

Treatment (irrigation) should be instituted immediately, even before testing vision.

- Instill topical anaesthetic to help with discomfort then begin copious irrigation of the eye, preferably with sodium chloride 0.9% or Lactated Ringers solution (Hartmann's solution) for at least 30min.
- Sweep conjunctival fornices with a moistened cotton bud to remove any crystallised particles

Signs

- Punctate erosions or large defects can be appreciated with fluorescein staining of the cornea or conjunctiva (underneath eyelids)
- Chemosis
- Limbal ischaemia (interruption of blood flow through conjunctival/episcleral vessels causing a very white eye)

Discuss all cases with Eye Registrar regarding treatment/referral.

DIPLOPIA

Symptoms:

- Check if there is monocular or binocular diplopia. Monocular diplopia persists when the unaffected eye is covered, whereas binocular diplopia is abolished when either eye is covered.
- Ask about the direction of displacement of images (horizontal, vertical, diagonal). Is the diplopia intermittent or constant? Are there any associated symptoms (headache, vision loss, neurological symptoms)?

Signs

- Examine for any associated features: anisocoria (asymmetric pupil size), ptosis (droopy eyelids), limitation of eye movements (any obvious cranial nerve palsy 3, 4 or 6), painful eye movements, proptosis (protrusion of the eye).

Causes of binocular diplopia include

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- Cranial nerve palsies
- Myasthenia gravis
- Thyroid eye disease
- Orbital tumours
- Orbital inflammation (non-thyroid)
- Giant cell arteritis
- Supranuclear palsies
- Decompensated squints
- Orbital fractures
- Orbital cellulitis

Causes of monocular diplopia include

- Cataract
- Refractive error
- Corneal/retinal pathology

Management

- Depends on the cause. Neuroimaging may be indicated in some cases.
- Discuss with Eye Registrar regarding referral of sudden onset strabismus and/or binocular diplopia

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ORL Head and Neck

WHO TO CALL

ORL-HNS On-call Registrar

Mon to Fri: 0800-1600:

Adult ORL-HNS Registrar; Paediatric ORL-HNS Registrar

Outside these hours:

ORL-HNS Registrar

ACUTE OTITIS MEDIA (AOM)

Natural history

1. Ear pain: acute/subacute onset and usually associated with URTI
2. Conductive hearing loss
3. Fever
4. Subsequent purulent ear discharge with resolution of pain and fever

Pain in the presence of discharging ear indicates a complication of otitis media (e.g. mastoiditis, intracranial infection) or possibly a tumour.

Vertigo in the presence of AOM may indicate labyrinthitis, a complication of AOM.

Patients with these symptoms need to be discussed with the ORL Registrar urgently.

5. Continued hearing loss due to middle ear effusion until full resolution:
    - 80% have effusion at 2 weeks
    - 20% have effusion at 2 months
    - A ventilation tube (grommet) may be indicated in acute management of complications of AOM, or if the effusion persists for 8 weeks

Organisms

- Viruses
- *S. pneumoniae*
- *H. influenzae*
- *M. catarrhalis*

Signs

- Hearing loss (perform a clinical test of hearing +/- tuning fork tests)
- Bulging drum or discharging ear (take a swab)
- Fever: temperature tends to normalise when ear drum ruptures
- Rhinitis
- Pharyngitis

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Treatment

Analgesia:	Paracetamol, NSAIDs
Antibiotics:	Amoxicillin or cotrimoxazole -Can reduce pain if no improvement with analgesia alone -May reduce complications e.g. mastoiditis

PERFORATED TYMPANIC MEMBRANE

Usually following direct ear trauma, barotrauma or secondary to otitis media. Some perforations are small and will close spontaneously. Tympanic membrane perforations do not require acute ORL review.

- If discharging, take a swab for culture and sensitivity
- Advise patient to keep ear dry
- Refer to ORL Clinic to arrange a routine clinic assessment (including microscopy and audiology)

VERTIGO

This is defined as a perception of rotation. The most important diagnostic point is to distinguish between central (neurologic) causes and peripheral (ORL) causes.

Peripheral causes (most patients)

1. Benign paroxysmal positional vertigo (most common peripheral cause)
2. Ménière's disease
3. Labyrinthitis, vestibular neuronitis

The most important features in distinguishing the causes of vertigo are:

1. Whether or not hearing is affected
2. Duration of the vertigo
3. Precipitating factors
4. Associated symptoms

Benign paroxysmal positional vertigo (BPPV): lasts <30sec and hearing is normal. The vertigo is produced by placing the head in a certain position. The Dix-Hallpike manoeuvre can be diagnostic. Particle repositioning manoeuvres are the recommended treatment for most patients.

Ménière's disease: vertigo lasts minutes to hours and hearing is reduced. This condition consists of episodic vertigo, deafness, tinnitus, and aural fullness. The patient's hearing may worsen after each episode. The pathophysiology is thought to be related to increased volume in the endolymph of the inner ear. Hence the pathological description is endolymphatic hydrops. Treatment may include lifestyle modification (low salt diet, low caffeine intake, low stress) and medications. The medications used for acute episodes are prednisone and antiemetics. The medications used for prevention of attacks include bendroflumethiazide and betahistine. Surgery is occasionally required.

Vestibular neuronitis: vertigo tends to last for a few days to a week, with normal hearing. Thought to be due to viral infection of the vestibulo-cochlear nerve. There is persistent nystagmus towards the affected side. Offer symptomatic treatment if appropriate.

Labyrinthitis: vertigo lasts for days, and hearing may be permanently impaired. Etiology may be viral or bacterial. Bacterial labyrinthitis may be secondary to acute otitis media or bacterial meningitis. Treat bacterial infections with appropriate antibiotics.

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Central causes

Usually associated with other brainstem symptoms such as ataxia, diplopia, hemiparesis etc.:

- Vertebrobasilar ischaemia, pontine lesion, cerebellar infarct
- Multiple sclerosis
- Psychogenic dizziness

Evaluation of vertigo

In any patient with a balance complaint, the following must be examined:

- The ear, particularly the middle and the inner ear
- Cerebellar function
- Vision
- Neurology of lower limbs, especially proprioception

Management

- These patients may require an MRI scan of head, inner ear and vestibular–cochlear pathways □ this is decided by the ORL Registrar, Fellow, or Consultant.
- Treatment for vertigo: diazepam (for severe episodes) and an antihistamine (for milder episodes). For recurrent vertigo: hyoscine hydrobromide patch may be helpful.
- Treatment for nausea and vomiting: metoclopramide, prochlorperazine or ondansetron.

FACIAL PALSY

Facial palsy refers to dysfunction of the facial nerve (i.e. a peripheral nerve lesion/lower motor neuron facial weakness). A patient with a unilateral facial palsy has **weakness of the entire face on one side**. Note that only the lower part of the face is weak in a patient with facial weakness secondary to a stroke (upper motor neuron facial weakness). A thorough Head and Neck and neurological examination is required to differentiate between these two presentations, and to look for a possible cause of a peripheral facial palsy.

The most common causes of a peripheral facial palsy/facial nerve palsy are:

- Bell's palsy (idiopathic)
- *H. zoster* (Ramsay Hunt syndrome)
- Middle ear infection
- Trauma
- Tumour: most patients with a facial palsy will be required to have an MRI scan (Acoustic series) and/or a CT scan of the Temporal Bone and Parotid, depending on the clinical picture.

Bell's Palsy

- This is a diagnosis of exclusion, i.e., all other causes of facial palsy must be considered and then excluded before making this diagnosis.
- Aetiology: idiopathic, but probably herpetic infection.
- If total palsy consider treatment with oral valaciclovir 1 g three times a day for 1 week (ID approval required) and oral prednisone 40 mg a day for 1 week, then 20 mg a day for 3 days and then 10 mg a day for 2 days.
- If some facial movement is present, then recovery will almost certainly occur and there is no need to treat.

Ramsay Hunt Syndrome

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- *H. zoster* infection, probably of the geniculate ganglion of the VII nerve or nucleus. Other cranial nerves, especially vestibular and cochlear, may be affected. Vesicles/scabs may be present on the face, pinna, upper neck, ear canal, or pharynx
- Facial palsy is common, with worse prognosis than idiopathic VII palsy (Bell's palsy):
    - Untreated with complete palsy: 10% complete recovery
    - Untreated with partial palsy: 68% complete recovery
- Maximum palsy usually occurs within 1 week but there is evidence that late denervation occurs up to 14 days after the onset of the palsy.

Investigations

- Discuss further evaluation with ORL Registrar.
- May require CT scan of Temporal Bone and/or Parotid region to exclude the possibility of head and neck cancer, or an MRI scan (Acoustic series) to exclude the possibility of a cerebello-pontine angle tumour.

Treatment

- Oral valaciclovir 1 g three times a day for 1 week (ID approval required).
- If facial palsy, treat with oral prednisone 40 mg a day for 1 week, then 20 mg a day for 3 days, and then 10 mg a day for 2 days.

FACIAL CELLULITIS

- Often associated with nasal vestibulitis, insect bites, acne, and otitis externa
- Always consider a dental cause and examine teeth
    - Pressure-sensitive teeth (get patient to suck on ice cube) may indicate dental abscess. If this is suspected discuss with Dental Registrar.
- Usually due to *S. pyogenes* or *S. aureus* (or in children, rarely, *H. influenzae*). If associated with otitis externa may be Gram negative e.g., *P. aeruginosa*
- Check for diabetes

Management

- May require admission for IV treatment
- Mark out area with felt-tip pen to assess response to treatment
- Incise any furuncle, swab for Gram stain and culture
- Swab any obvious infective source for Gram stain and culture
- Most cases will respond rapidly to flucloxacillin

EPISTAXIS

Causes

Most of the time bleeding occurs from vessels in the anterior part of the nasal septum but bleeding can also occur from posteriorly in the nose. Anterior nose bleeds can be controlled by occluding the entire soft part of the nose between thumb and finger and by positioning the patient head up and leaning slightly forward. The pressure needs to be firm enough that patient is mouth breathing. Maintain this position for 5 minutes. If bleeding continues down the back of the throat despite adequate anterior nasal compression, then a posterior epistaxis is likely.

Points to note in the history include:

- Medications (anticoagulants, aspirin, antihypertensives, etc.)
- Recent URTI, nasal surgery or trauma
- Family history of bleeding disorders

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If recent epistaxis but not currently bleeding and patient is haemodynamically stable, contact ORL Registrar and arrange for Acute ORL clinic visit next day.

If there is **epistaxis following nasal or sinus surgery** an assessment of the rate of bleeding needs to be made. Often nasal bolsters are placed under the nose following this type of surgery and may be changed once or twice before discharge. If there is continued bolster changing needed (three or more changes within 4 hours of surgery) then the nose requires examination and the ORL Registrar called.

Initial management for active bleeding (on the ward or in ED)

All House Officers can perform this level of management.

- The principle is to control bleeding. If the bleeding point can be identified and cauterised, then this is the best management. The patient is given ice to suck by the nursing staff.
- If the patient is suffering from severe blood loss, insert a wide bore IV luer (e.g., 16G) and resuscitate with IV fluids and arrange for urgent cross-match of blood along with other blood tests (FBC, coags, electrolytes and creatinine, LFT).
- Anxiety increases the bleeding and a calm, reassuring approach by staff will help allay patient's fear.
- Consider oral diazepam or IV morphine if the patient is hypertensive and/or very anxious.
- Spray the nose first with lidocaine + phenylephrine (Entop Plus®). Pack the nose with cotton wool balls or half-inch ribbon gauze soaked in a mixture of 4% lidocaine topical solution and 1:1000 adrenaline (in ratio of about 3:1). Leave this pack in place for 10 min.

Examine the nose with a headlight

- Put on a headlight to examine the nose
- Remove the packing from the nose
- Use a suction to clear the nose of any blood clots. Try to identify the bleeding point

Cauterise

- If vessels can be identified, then they can be cauterised. Use silver nitrate for small bleeders but larger bleeders require cautery with bipolar diathermy. This may require help from the ORL Registrar. After the cauterisation, apply antibiotic ointment to the area, e.g., chloramphenicol eye ointment, to prevent crusting.
- If bleeding settles completely then patient can be discharged with instructions to see GP within the next 48 hours. Patient should apply the chloramphenicol eye ointment TDS to nose for 7 days.

Nasal packing

- If bleeding continues and the nose needs to be packed, then the patient usually needs admission.
- Contact ORL Registrar, preferably before further packing is undertaken.
- Usually only required if a posterior bleed and not accessible for cautery. Use Rapid Rhino nasal pack or Merocel Slimline epistaxis tampon after ensuring the nose is well anaesthetised. If the bleeding persists, then the Registrar may need to insert a ribbon gauze pack or use an epistaxis balloon (rare).
- Topical antibiotic therapy is required if packing is used.
- The patient should not have repeated nose packing. If there is ongoing bleeding despite the pack, then the ORL Registrar needs to review the patient. A definitive procedure (septoplasty/artery ligation or embolisation) may be required.

Further procedures

- Occasionally a patient may require a general anaesthetic to access and control the bleeding. This may involve a septoplasty and/or occasionally ligation of the arterial supply (sphenopalatine, maxillary, ethmoidal or external carotid). If there is a history of nasal trauma, the possibility of

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anterior ethmoidal artery ligation should be considered earlier than with other epistaxis patients. Radiological intervention with embolisation of feeding vessels may also be employed.

Admission is required if

- Significant comorbid conditions e.g., uncontrolled hypertension or warfarin therapy
- Significant or continuing blood loss
- Nasal packing in place

Treatment at discharge

- Chloramphenicol eye ointment to the nostril TDS for 7 days
- Simple analgesia e.g. paracetamol
- Advise no nose blowing for 1 week

SINUSITIS

The diagnosis of sinusitis is made based on the clinical presentation, endoscopic examination, and, if required, a CT scan of the sinuses.

Treatment of uncomplicated sinusitis

- Topical nasal decongestants (e.g., xylometazoline 0.1% as nasal soak or nasal spray) (maximum 3-5 days) and oral antibiotics as per ID guidelines.

- Nasal and sinus rinsing with sodium chloride/sodium bicarbonate solution three times daily is very effective (e.g., NeilMed Sinus Rinse®).

  Instruct the patient as follows: fill the rinse bottle with warm water and add one of the sachets to it. Keeping your head forward over a basin, rinse one side of the nose several times. The solution will go up one side of the nose and down the other. Do the same on the other side. Carry this procedure out 2 or 3 times a day as instructed using one sachet and one bottle of fluid at each rinsing session.

Treatment of complicated sinusitis

- Any sign of complications requires admission to hospital, IV antibiotics and will usually be followed by surgical drainage.
- Usually treat empirically with IV amoxicillin + clavulanic acid 1.2 g q8h until organism known.
- IV fluids to be accompanied by topical nasal decongestion q2-4h, monitoring of conscious state and checking of visual acuity and pupillary reflexes.
- Nasal and sinus rinsing with sodium chloride/sodium bicarbonate solution is very effective, carried out three times daily as instructed.
- Children may develop orbital cellulitis from acute ethmoidal sinusitis, in which case IV antibiotics are necessary.

Assessment

- Full cranial exam looking for the following:
  - Loss of colour vision, diplopia (orbital cellulitis)
  - Loss of sensation in the VI and VII distribution (cavernous sinus thrombosis)
  - Headache, nausea and vomiting, other signs of meningitis (subdural abscess)

- An abscess appearing over the frontal region is a "Pott's puffy tumour" (osteomyelitis of frontal bone) until proven otherwise. Such patients should have an urgent full series CT scan of the head and sinuses and have urgent surgical management which may include a fronto-ethmoidectomy via an endoscopic or external approach.

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- NB. Be aware of possible invasive fungal sinusitis in patients with significant immunocompromise (e.g., poorly controlled diabetes, haematological background).

FOREIGN BODIES

Foreign bodies in the pharynx / oesophagus

- Fish bones tend to lodge in the tonsil, the posterior one-third of tongue, the valleculae or (rarely) posterior pharyngeal wall.
- Coins, meat bolus, chop bones etc. tend to lodge in the post-cricoid/cricopharyngeus/upper oesophageal region.

Clinical features

- **Pain on swallowing** (odynophagia) is the usual symptom of patients who think they have a foreign body stuck in the throat. Many have a mucosal abrasion only and will improve over subsequent days.

- **Pain above the cricoid:** the object will usually be visible on mirror examination or flexible nasendoscopy. Foreign bodies in the tonsil or base of tongue are usually reliably localised by the patient who will point to a specific region and side of the neck at or above the hyoid. These can usually be removed under local anaesthetic.

- **Pain at or below the cricoid in the midline**: the foreign body is likely to be at or just below the cricopharyngeus in the pharyngoesophageal region.

- **Marked discomfort:** discomfort on cricoid pressure (pushing the cricoid cartilage posteriorly) is highly suggestive of a retained foreign body in the pharyngoesophageal region.

- **Dysphagia**: complete dysphagia – causing the patient to spit out all his/her saliva – occurs when the food passage is blocked.

Examination with a headlight initially, followed by a flexible endoscope is important

Apply topical lidocaine + phenylephrine (Entop Plus®) to the nose and evaluate the posterior nose, nasopharynx, base of tongue, hypopharynx, and larynx.

Investigations

X-rays

- Lateral XR of the neck (soft tissue) should be taken.
- If air is visible in the retro-oesophageal space or soft tissues, penetration of the pharynx/oesophagus has occurred, and admission is mandatory.

Treatment

Removal of foreign body

- **Always discuss with the on call ORL Registrar**
- If the foreign body is visible, then it can be removed under local anaesthesia.
- If the foreign body is seen on X-ray in the oesophagus, then admission to the ward is necessary and pharyngo-oesophagoscopy under general anaesthesia is required.
- Patients with oesophageal meat boluses are generally referred to Gastroenterology for definitive management using a flexible gastroscope.

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- If the patient is thought to have passed the object into the stomach and there are no complications, then the patient can be discharged with advice to return if getting worse or not better the next morning.

Foreign body in the ear

- Not usually an acute problem.
- These patients can be seen at the next available ORL clinic.
- If there is a live insect stuck in the ear, then fill the ear with oily drops e.g., clioquinol + flumethasone (Locorten Vioform®) to kill it.

Foreign body in the nose

- Foreign body should be removed within the next few days as there is theoretical potential for aspiration.
- However, if the foreign body is a disc battery (more common in children) then urgent removal is required.
- Usually, a combination of good vasoconstriction and anaesthesia e.g., lidocaine + phenylephrine (Entop Plus®) with a good headlight and gentle technique is successful. If familiar with the equipment can use a rigid endoscope.
- Do not attempt to remove a foreign body from the nose without anaesthetising the mucosa.
- Use large forceps to grasp the object (small forceps push the object further back in the nose).

Foreign bodies in the trachea and/or bronchus

- Suspicion based initially on history.
- Requires careful chest and airway examination, followed by inspiratory and expiratory CXR.
- Removed under general anaesthesia by tracheoscopy and bronchoscopy.

TONSILLITIS

- Most cases of tonsillitis in the community are of viral origin, but most of the cases presenting to hospital are either bacterial infections or due to glandular fever (EBV infection).
- Bacterial tonsillitis may be complicated by abscess formation adjacent to the tonsil (quinsy) or in the neck (parapharyngeal abscess).

CLINICAL FEATURES

Pain, temperature, dysphagia, and cervical lymphadenopathy are common features. Fatigue is a more common feature with glandular fever.

Trismus

- Trismus is inability to open the mouth fully.
- In tonsillitis, it is caused by spasm of pterygoid muscles, and is usually a sign of abscess either in the peritonsillar space (quinsy) or parapharyngeal space.

Unilateral tonsillar swelling

- Bulging of the soft palate and displacement of the uvula to the opposite side is indicative of peritonsillar cellulitis or abscess (quinsy).
- Medial displacement of the tonsil is indicative of parapharyngeal abscess.

Bilateral tonsillar swelling

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- May be either bacterial or viral.
- A white or greyish/white exudate on the tonsils is seen in glandular fever.

Upper lateral neck swelling and tenderness

- If bilateral, usually indicates lymphadenopathy
- If unilateral, may indicate parapharyngeal or cervical abscess.

Abdominal tenderness

- Upper abdominal tenderness may be indicative of glandular fever induced hepatosplenomegaly.

INVESTIGATIONS

Assess the airway

- Arrange admission for definitive management if the airway is compromised. Reassessment is needed at regular intervals.
- Some patients, particularly with glandular fever tonsillitis, will have a narrowed airway and particular care must be taken to manage this. Close nursing observation and pulse oximetry is a minimum requirement. Look for quinsy.

Assess the cardiovascular status

- Usually the patient will be dehydrated; one of the criteria for admission is inability to tolerate oral fluids. Adequate hydration with isotonic fluids (e.g. sodium chloride 0.9%) is initially required. Do not give glucose + sodium chloride until the patient is rehydrated.

Blood tests: FBC (look for atypical lymphocytes which suggest glandular fever), electrolytes, renal function, liver enzymes and glucose. Tests for glandular fever include Monospot test and/or EBV serology.

TREATMENT (FOR TONSILLITIS, QUINSY, AND DEEP NECK SPACE INFECTIONS)

- Antibiotics: IV benzylpenicillin 1.2 g q6h first choice. Sometimes metronidazole (IV, or oral if patient can swallow) is also added to this regimen but discuss with ORL Registrar first. For quinsy give penicillin and metronidazole.
- Analgesia:
    - **Topical**: benzydamine oral spray (three or four doses of spray or gargle, every 2-3 hours until pain settles)
    - **Systemic**: simple e.g., paracetamol, NSAIDs (e.g., ibuprofen suspension (100 mg/5 mL) usually 400 mg q4h in the acute phase until pain settles)

Quinsy (peritonsillar abscess)

- Requires aspiration and usually incision and drainage under local anaesthetic (although local anaesthetic is less effective due to local tissue acidosis).
- IV rehydration and antibiotics are adjunctive therapies (see above).

Parapharyngeal abscess

- Might present much like a quinsy. Have a high index of suspicion if:
    - Tonsil is medialised with relatively normal soft palate as compared to swelling and erythema seen in quinsy
    - Painful neck movements
    - Tenderness or fullness on neck palpation
    - Trismus
    - Lateral pharyngeal wall oedema/fullness on flexible endoscopy
    - Failure to resolve with drainage by peritonsillar route

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- Have a low threshold for CT scan if patient is not improving in 24 hours

Treatment (for glandular fever)

- Antibiotics are not helpful unless there is a co-existent bacterial infection. Symptomatic treatment initially until swab and serology results known
- Analgesia (see "Tonsillitis")

POST-TONSILLECTOMY PAIN

Severe pain will last 10-14 days following tonsillectomy. Analgesia use is variable but usually involves paracetamol and may require tramadol, NSAIDS and OTC throat lozenges (e.g., Difflam®/Strepsils®)

If pain is uncontrolled, the patient will reduce oral intake and probably get dehydrated.

This also needs to be assessed to determine whether admission is needed.

POST-OPERATIVE HAEMORRHAGE

- This will usually apply to tonsillectomy or nasal surgical procedures
- All patients must be admitted
- **The ORL Registrar must be notified in every case**

PRIMARY HAEMORRHAGE

- This occurs within the first 24 hours post-op and usually within the first few hours
- Each case will require IV therapy, blood cross-match and antibiotics
- Ensure that there is adequate IV access (e.g., 16G)
- The ORL Registrar must be contacted immediately. It is not safe to wait and see what happens

Tonsil

- Remove any large clot protruding from the tonsillar fossa
- Place firmly (with Magill's forceps) a swab soaked in lidocaine/adrenaline solution (see EPISTAXIS) into the fossa and hold it in position for 5 minutes while the patient remains in the sitting position. The use of the head-light is needed to leave both hands free for this procedure.
- A small bleeder can often be coagulated with a silver nitrate stick or with bipolar diathermy obtained from the operating rooms.
- Coagulation status (including bleeding time) and haemoglobin must be checked and corrected. The patient may need to return to the operating room for ligation of blood vessels.

Nose

(See EPISTAXIS)

- Ensure patient is not hypertensive
- May require some sedation
- Contact ORL Registrar

SECONDARY HAEMORRHAGE

- This occurs up to 14 days post-op. Most secondary haemorrhages post tonsillectomy stop bleeding spontaneously. However, these cases require admission for observation, IV fluid replacement, IV antibiotics (usually amoxicillin or amoxicillin + clavulanic acid) and bed rest.

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- Repeated episodes of bleeding must be taken seriously and may precede a large volume life-threatening bleed. These cases must be discussed with the ORL Registrar and/or Consultant.
- Bleeding following nasal surgery may require packing of the nose by the ORL Registrar and/or Consultant.
- These patients should remain nil-by-mouth in case a return to the operating room is necessary.

ACUTE SUPRAGLOTTITIS / EPIGLOTTITIS

In the past this condition was more common in children. However, with the advent of vaccination, this infection is now more common in adults. Suspected cases of Acute Supraglottitis must be discussed with the ORL Registrar and the PICU or Adult DCCM team urgently.

ADULT SUPRAGLOTTITIS / EPIGLOTTITIS

- Always discuss with ORL Surgeon and intensivist.
- Usually due to *H. influenzae* but also occurs with *S. pneumoniae* and *S.aureus*.
- Presents with increasing pain in throat, odynophagia, dysphagia, often with cellulitis involving soft tissues of the neck.
- Flexible endoscopy (by ORL Registrar/Consultant) will confirm diagnosis.

Investigations

- Lateral x-ray neck: swollen epiglottis/supraglottis
- FBC
- Blood cultures

Treatment

- Sit the patient upright
- Humidified O_2
- Nebulised adrenaline (adrenaline 1 mg [1 mL of 1 in 1000 strength] diluted to 5mL with sodium chloride 0.9%)
- Antibiotics
  First choice: amoxicillin-clavulanic acid 1.2 g IV q8h or cefuroxime 750 mg IV q6h.
- IV fluids
- Nil-by-mouth
- In cases with significant airway obstruction, intubation (in the operating room preferably) or tracheostomy is required. In the event of a sudden loss of the airway an emergency cricothyroidotomy may be required.

Monitoring

- HDU or ICU care
- Pulse oximetry
- q30min pulse, blood pressure and respiratory rate
- Any deterioration must be treated immediately

EMERGENCY TRACHEOSTOMY TUBE MANAGEMENT

- In patients with tracheotomy tubes in situ, sometimes the tube becomes blocked with secretions which are firm and they crust around the distal end of the tracheostomy tube. The patient immediately has a compromised airway.
- Remove the inner tube, use a flexible suction tube down the tracheostomy tube and suction any debris away. Sometimes small amounts of sodium chloride 0.9% (2-3mL) can be flushed down the tracheostomy tube to loosen hard secretions. The patient will cough.
- Clean the inner tube then replace the inner tube back in situ (within the outer tracheostomy tube).

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MANAGEMENT OF CERVICAL HAEMATOMA POST HEAD & NECK SURGERY

A haematoma may develop in any patient who has undergone Head and Neck surgery. A haematoma may cause airway obstruction, not only because of the mass effect of the haematoma on the airway, but (more importantly) because the haematoma will compress the lymphatics in the neck, causing mucosal oedema and airway obstruction.

If a haematoma is suspected, the ORL Registrar should be notified immediately. If the patient has signs of airway obstruction (stridor, dyspnoea, inability to talk) a call should be put out to the ACH Airway team, and the neck wound should be opened immediately to allow the haematoma to drain, to reduce the pressure in the neck. The patient will then require transfer to the operating room for washout of the neck, haemostasis +/- tracheostomy.

MANAGEMENT OF CALCIUM METABOLISM POST THYROIDECTOMY

Indicated for patients undergoing:

1. Total thyroidectomy
2. Subtotal thyroidectomy
3. Completion thyroidectomy
4. Thyroid lobectomy (hemithyroidectomy) if they have previously had the opposite thyroid lobe removed (completion total thyroidectomy)
5. Parathyroidectomy

Rationale

There are usually 2 parathyroid glands on the posterior surface of each thyroid lobe. Only 1 healthy parathyroid gland is necessary for normal calcium haemostasis. Unilateral thyroid surgery does not pose a risk of hypoparathyroidism unless the contralateral side has previously been operated on (possibility of contralateral parathyroid gland removal).

1. **Routine in-patient blood tests** – results to be available on am ward round
    a. Patients on an **am list** (surgery completed by 1pm)
        i. Serum calcium and PTH level at 4-6pm day 0
        ii. Serum calcium at 6am day 1
        iii. Serum calcium at 4pm day 1 (if still in hospital)

    b. Patients on a **pm list** (surgery completed after 1pm)
        i. Serum calcium and PTH level at 9 pm day 0
        ii. Serum calcium at 6am day 1
        iii. Serum calcium at 4pm day 1 (if still in hospital)

2. **Outpatient blood tests**
    a. Patients discharged on day 1 without supplementation
        i. Serum calcium morning day 2 at community laboratory

    b. Patients discharged on calcium and vitamin D supplements
        i. Serum calcium Monday am and Thursday am weekly until outpatients appointment with consultant surgeon
        ii. If patient from another DHB, contact GP by phone and arrange serum calcium Monday and Thursday weekly

3. **Management and interpretation of first tests results**
    a. Normal PTH, normal calcium
        i. Discharge day 1

    b. Symptomatic hypocalcaemia
        i. Urgent serum calcium STAT
        ii. Start oral calcium effervescent 1 g TDS and calcitriol 0.5 microgram TDS

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iii. If symptoms persist or progress or if patient unable to take oral supplements: calcium infusion: 10mL of calcium gluconate 10%, in 500mL sodium chloride 0.9% over 5 hours
iv. Not for day 1 discharge

c. Asymptomatic: but PTH <1.7 pmol/L (even if calcium normal)
   i. Start oral supplements: 1g calcium effervescent bd and calcitriol 0.5 microgram BD
   ii. Can discharge day 1

d. Asymptomatic: PTH normal range but calcium low
   i. Await second and possibly third calcium level
   ii. Repeat PTH on second test
   iii. If trending down start bd supplements
   iv. If stable or trending up can discharge without supplements

MAJOR HEAD AND NECK SURGERY: FREE FLAP PROBLEMS

Problems can arise with the free flap itself or with the donor site.

- If asked to see a post-operative patient who has had a free flap reconstruction, look at the flap with a good headlight.
- In every case the ORL Registrar will need to be called to discuss the findings and for review. Important features are the flap colour, temperature, degree of swelling, associated mucopurulent discharge around the flap, bleeding from the flap margins and areas where the flap may have become detached from the surrounding tissue.
- If the flap is very pale or white, it is probably an arterial supply problem. Contact the on-call ORL Registrar immediately.
- If the flap is congested and a darker (even bluish) colour, it is more likely to be a problem with the venous drainage from the flap. Contact the on-call ORL Registrar immediately.
- The Registrar will check the supply using the Doppler and check the flap with a needle prick to look for bleeding. The Registrar and the surgeon will be checking the flap post-operatively at regular intervals. If the flap is compromised, then the patient will be returned to the operating room for revision of the flap pedicle.

NASAL TRAUMA

Clinical features

Nasal obstruction, epistaxis, nasal pain, external nasal swelling or deformity, periorbital bruising. Examination requires headlight and nasal speculum. **Look for septal haematoma or abscess**. This is seen as bilateral septal swelling which is soft and boggy on palpation (using cotton bud tip or even gently with any blunt instrument tip). If significant pain and fever, then consider septal abscess.

Management

- Contact ORL Registrar for admission and management if septal haematoma, abscess, or uncontrolled epistaxis.
- Treatment for nasal fractures depends on the extent of the injury and the time since the injury. If major trauma with **compound wound and exposed cartilage and bone** then contact the ORL Registrar for admission and management.
- If the injury occurred 24-48 hours prior to assessment, there is often significant swelling over the nose which limits evaluation. In these cases, it is reasonable to have the patient return to their GP in a further 1-2 days. The GP can refer to ORL if required at this stage.
- If there is limited swelling and a full evaluation can be made then treatment is determined by symptoms
  - If there is no internal or external deformity, then no referral to ORL is required
  - If there is external or septal deformity, then referral to ORL is indicated

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ACC: Nasal injuries to be treated under ACC acutely are defined as those in which surgery is deemed necessary to be carried out within 7 days of being assessed. **If the surgery cannot be performed within 7 days, then it is an Elective ACC case.**

All DHBs have their own Elective Contracts with ACC and all ORL Specialists in private can arrange elective ACC surgery. Clearly if the injury occurred some time ago (>14 days) and is stable, then this should be managed through an Elective ACC contract.

NECK LUMPS

Causes

Adenopathy is the commonest cause of a neck lump. This may be caused by infection or by cancer (usually metastatic squamous cell carcinoma). In an adult >40 years old, a neck lump is malignant until proven otherwise.

Other causes of a neck lump include cysts, abscesses, or haematomas. Note whether the swelling is unilateral or bilateral and whether multiple or single. Conduct a full head and neck examination. Ask about a history of smoking and alcohol consumption.

Management

Consult with the ORL Registrar regarding management.

If infection is suspected several blood tests are usually obtained to determine the cause of the inflammatory adenopathy. These bloods include FBC, Toxoplasmosis serology, EBV serology, CMV serology, Cat Scratch Disease serology and Quantiferon Gold if Tuberculosis is suspected. If bacterial infection is suspected antibiotics are prescribed. A CT scan may be required to exclude an abscess.
If there are no signs of infection or inflammation, the patient must be evaluated for a neoplasm (and probable malignant neoplasm). The workup of these patients must be discussed with the ORL Registrar. The upper aerodigestive tract should be examined endoscopically by the ORL Registrar/Consultant. An FNA (Fine Needle Aspiration) of the lump and CT scanning of the neck are usually done after this. These investigations may be performed as an outpatient. The ORL Registrar will then organise a follow-up clinic appointment.

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Orthopaedics

WHO TO CALL

Orthopaedic on-call Registrar

For medical referrals, see below.

At any time the department is covered by a House Officer, Registrar, Senior Registrar and Consultant. House Officers wanting assistance should first contact the Registrar who in turn contacts the Senior Registrar who contacts the Consultant as required.

Medical referrals on orthopaedic patients

- >65 years old between 0800-1600h - call on-call OPH Registrar
- >65 years old between 1600-0800h - call on-call Medical Specialties Registrar
- <65 years old between 0800-2200h - call on-call Medical Registrar
- <65 years old between 2200-0800h - call on-call Medical Specialties Registrar

CLINICAL PATHWAYS

Clinical pathways exist for:

- Patients with Neck of Femur fractures
- Patients undergoing total hip and knee replacement surgery

Copies of these pathways will be given to each house officer at the orientation meeting for the run

Elective orthopaedic surgical patients

Pre-operative work-up of patients for joint replacement and other major orthopaedic surgery will include:

- Baseline blood tests including coagulation profile
- Group and hold
- Chest x-ray
- ECG
- Mid-stream urine examination

Routine post-op antibiotic prophylaxis

- Routine post-operative antibiotic prophylaxis is usually cefazolin 1 g IV q8h for 3 doses. Post-operative antibiotics are only required if implants/metal-ware have been placed, otherwise a single dose at the time of anaesthetic induction is enough.
- For patients with antibiotic allergy or colonisation with resistant organisms, see the full guideline on HIPPO.
- If there has been a compound wound or deep infection the recommendation for duration and type of antibiotic should be in the written or dictated op note.

Routine post-op weight-bearing status

- Elective THJR and TKJR will be mobilised full weight-bearing after surgery.
- Routine NOF fracture fixation will be weight-bearing as tolerated (WBAT) unless otherwise specified in the operation note.
- Routine fracture fixation patients should have weight-bearing status identified in the hand written and dictated operation note. If this is unclear please check with your team Registrar.

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REFERRAL FOR ANAESTHESIA

- All acute patients should be discussed with the Anaesthetic Coordinator when they are booked for surgery.
- Acute patients should have FBC, coagulation screen, creatinine and electrolytes and an ECG as standard part of the admission.
- The Acute House Officer should take a detailed medical history and examine the heart and lungs prior to discussion with the Anaesthetist on-call. Make sure to include details around recent procedures and anaesthesia, BMI and recent investigations such as cardiac echo that may influence suitability for anaesthesia.
- All elective patients should be referred to the pre-operative Anaesthetic Assessment Clinic (see Anaesthesia Services chapter).

DVT PROPHYLAXIS

Strategy for thromboembolism risk assessment and management

(See also Thrombosis and Anticoagulation chapter)

Requirements for all patients

Clinical staff should be reminded of their obligations to document thoroughly:

1. Their physical examination findings including assessment for signs of venous thromboembolism in patients with reduced mobility
2. When patients are placed on a nil-by-mouth regime, intravascular fluid supplementation should be considered as appropriate and accurately recorded
3. Fluid intake for all patients awaiting surgery should be recorded with the intention of ensuring maintenance of optimal hydration

IMPORTANT: House Officers should not anticoagulate post-operative patients without discussion with Senior Registrar or Consultant. Isolated thrombi in calf veins are not considered an indication for anticoagulation without specific input from Consultant or Senior Registrar. IT IS RARE THAT BOTH ASPIRIN AND ENOXAPARIN (CLEXANE®) ARE REQUIRED TOGETHER.

1. **Patients for elective total hip and total knee replacement**
   a. **No risk factors**
      - Check with teams, but may include enoxaparin (Clexane®) for 72 hours post-op then aspirin 100 mg on discharge for 6 weeks.
      - Below the knee compressive stocking for 6 weeks starting preoperatively
      - Bilateral foot pumps starting immediately on return to ward
      - Early mobilisation, day 1

   b. **Patients with risk factors**
      - Individual surgeons to define prophylaxis on a case by case basis

2. **Patients with proximal femoral fractures**
   - Check with teams/clinical guideline, but may include enoxaparin (Clexane®) for 72 hours post op then aspirin 100 mg on discharge for 6 weeks. Some staff prefer aspirin 100 mg alone for 6 weeks. Longer term anticoagulation may be considered in some cases.
   - Below the knee compressive stocking for 6 weeks starting preoperatively

3. **Other patients for elective surgery**
   - Individual surgeon preference

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- NO chemical thrombo-prophylaxis to be used in patients undergoing any SPINAL SURGERY

4. **Patients admitted with fracture / other injuries requiring a period of bed rest prior to definitive surgery**
    - Enoxaparin (Clexane®) 40 mg daily at 6pm to be discontinued 12 hours before planned surgery
    - Use of below knee compressive stockings

    In cases where wound ooze or bleeding are an issue:
    - Inform Registrar / Fellow / Consultant, on-call staff if team members away
    - Discontinue anticoagulants
    - Consider oral tranexamic acid 500 mg TDS for 72 hours
    - Consider negative pressure dressing
    - **Patients with major pelvic injuries or major lower limb trauma awaiting surgery should not** be started on this regime of enoxaparin (Clexane®) until 48 hours after the injury and should only be done in consultation with either the Senior Registrar / Fellow or Consultant
    - Patients with major internal bleeding e.g. liver trauma may have anticoagulants withheld until considered safe by the trauma or general surgical teams

5. **Patients referred for surgery after a long period of immobility or with special risk factors**
    a. Consider ultrasound scanning to detect pre-existing thrombus

Note: All patients receiving aspirin or other chemical thrombo-prophylaxis to receive omeprazole 20 mg daily

FRACTURES

Types / Classifications

- Simple (closed) vs. compound (open)
- Transverse vs. oblique vs. spiral
- Comminuted (bone fragment broken into >2 pieces)
- Avulsion (capsule, ligament or muscle pulled / torn from insertion taking fragment of bone with it)
- Impacted (1 fragment driven into the other)
- Greenstick (occurs in children)
- Buckle (occurs in children)

Describing a fracture to the Orthopaedic Registrar

- **Patient name**, age, dominant hand, occupation, normal level of function or mobility, past medical history
- Which **bone**?
- **Open** or **closed**
- **Type: transverse, oblique or spiral**
- **Displacement**: describe displacement of the distal fragment relative to the proximal fragment in 2 planes, describe % of thickness of bone displaced e.g. 50% displaced in the AP and 50% displaced in the Lateral plane

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- **Angulation**: describe the angle the distal fragment makes compared to the proximal fragment and the direction of the angulation. e.g. a Colle's fracture has dorsal angulation of the distal fragment

- **Special features**: e.g. across growth plate (Salter Harris), into joint, pathological

Essential aspects of management of a fracture

- Check if it is an open injury (never assume). If it is open, it will need urgent attention. In the Emergency Department, give tetanus booster and start IV antibiotics e.g. amoxicillin + clavulanic acid. Wash the wound and dress it with wet gauze. Stabilise the fractured limb in a back slab and refer to the Registrar immediately.

- Check neurological and vascular status of the affected limb. Exclude other injuries.

- Get x-rays: should have 2 views (AP and lateral), joint above and joint below

- Analgesia

- Reduce fracture: as a temporary measure (e.g. ankle fracture that requires internal fixation and has large amount of talar shift) or as definitive treatment (e.g. Colle's fracture under Bier's block)

- If you think there is a chance they might need an operation then find out when last meal was, keep them nil-by-mouth/IV fluids until seen by Registrar

- Record the patient's age, occupation, and normal level of function or mobility because it often influences management

COMPARTMENT SYNDROME

Most cases occur in the forearm, leg or foot. 85% of cases are due to severe trauma in association with a fracture or dislocation or crush injury. This is an emergency because delayed recognition inevitably leads to the development of muscle ischaemia leading to necrosis and contracture.

Diagnosis

- The cardinal sign is pain on passive stretch of the muscle
- Pain out of proportion to the injury, especially on passive extension of the fingers or toes and not relieved by analgesics
- Pallor
- Palpable tightness of the compartment
- Perishingly cold
- Paraesthesia (occurs earlier than paresis)
- Paralysis (usually very late)
- Pulselessness: don't wait for this, must act before this occurs

Management

1. Notify Registrar of your concerns, keep patient nil-by-mouth
2. Split or remove all casts, bandages and dressings all the way down to skin. Split the entire length of the cast
3. Padding impregnated with dried blood may cause compression, which is not relieved by merely splitting the cast
4. Place the limb at the level of the heart. Do not elevate.
5. Fluid replacement and coagulation control
6. Fasciotomy is the treatment of choice: The earlier this is done, the more likely a successful outcome

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LOW BACK PAIN

DIFFERENTIAL DIAGNOSIS OF ACUTE BACK PAIN

Local causes

- Acute non-specific
- Prolapsed interverterbral disc
- Trauma: fractures, soft tissue injury
- Tumour
- Infection
- Metabolic bone disease

Important causes of referred pain

- Retroperitoneal: pyelonephritis, renal colic
- Abdominal: cholecystitis, pancreatitis, peptic ulcer, AAA/dissection
- *H. zoster*

APPROACH TO THE PATIENT WITH BACK PAIN

Aim

- To identify signs/exclude serious disease
- Prevent long term disability
- Promote early return to normal level of physical activity

History: identify red flags

- Cauda equina syndrome. Look for: urinary retention, faecal incontinence, gait abnormality, saddle area numbness, lax anal sphincter
- Significant trauma
- Recent weight loss
- History of carcinoma
- Fever
- IV drug use
- Steroid use
- Patient >50 years old
- Severe unremitting night-time pain

Clinical examination

- Identify neurological deficit – see the ASIA score for a guide to a fast neurological assessment
- Check temperature
- PR examination is not negotiable. Ask the patient if they can feel it normally and also get them to squeeze your finger to assess sphincter function

Investigations

- FBC, ESR and CRP
- X-ray: AP and lateral views of region of spine affected
- CT/MRI: in consultation with Orthopaedic Registrar / Senior Registrar

Management

- Provide assurance and explanation
- If history and examination negative for serious problem, further investigation is not warranted; encourage activity and continuance of usual daily activities
- Simple analgesia

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- Consider oral diazepam 5 mg tds as a muscle relaxant (should be short term, only in hospital)
- Encourage patient to mobilise in the department
- Patient should be discharged with advice to watch for neurological symptoms
- Work activities modified e.g. lifting, bending, twisting, light duties
- Bed rest for >2 days to be discouraged
- Patients suffering from chronic back pain are difficult to manage; they are usually on full analgesic therapy. Adding a tricyclic antidepressant (TCA) e.g. amitriptyline may be beneficial. Consider referral to the Pain Clinic.
- Referred pain requires management of the primary disease process

ADMISSION CRITERIA

This needs to be discussed with your Registrar.

Discuss urgently if:

- Suspicious of cauda equina lesion
- Neurological signs
- Infection
- Tumour
- Significant trauma or inability to mobilise with analgesia

Admit to Short Stay Ward/OPH if

- Elderly, unable to mobilise
- No home support

Follow-Up

- Provide a discharge letter
- Instruct patient to see general practitioner
- Physiotherapy is prescribed by general practitioner, if necessary

NOTE ON BLOODS FOR ACUTE ADMISSIONS

All patients should get a FBC, creatinine and electrolytes and coagulation screen

- Indication for both ESR and CRP:
  - Suspicion of septic native joint/osteomyelitis
  - Back pain
  - Painful prosthetic joint
  - Tumour work-up
- Other patients require CRP in isolation.

This is a useful site for house officers to look up orthopaedic conditions and management:
http://www.wheelessonline.com

ACUTE OR PROGRESSIVE BILATERAL WEAKNESS

Causes

- Myelopathy (cord compression, infarction or demyelination, infection)

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- Neuropathy (Guillain-Barre syndrome)
- Central (brainstem infarction)
- Psychogenic
- Rarely: parasagittal brain lesion, myasthenia gravis, myopathy

Clinical approach

- Upper or lower motor neuron-pattern (including reflexes, plantars, rapid movements hands and feet)
- Bilateral vs. unilateral vs. asymmetric vs. focal
- Proximal vs. distal vs. both
- Sensory deficit
- Time course
- Associated features – involvement of cranial nerves or arms or sphincter dysfunction

Spinal cord compression

Presentation

- Back pain/tenderness
- Upper motor neuron-pattern weakness
- Bladder and/or bowel dysfunction
- Sensory level

Causes

- Trauma
- Tumour: extrinsic/intrinsic
- Haemorrhage
- Extra-dural abscess
- Disc prolapse

Investigations and management

- Remember that quick action may avoid irreversible paraplegia. The duration, rate of progression, and degree of the neurologic deficit dictate the urgency.
- If recent onset, rapid progression, and/or significant neurological deficit obtain immediate neurological or neurosurgical consultations and MRI spine.
- Catheterise if urinary retention.
- If suspect malignancy, order CXR.
- FBC, ESR, electrolytes, glucose, Ca2+, creatinine, LFT, albumin.
- Do not delay MRI by ordering x-rays of spine.
- Depending on MRI, serum protein electrophoresis and PSA may be indicated.
- In patients with acute spinal cord compression due to malignancy consider IV steroids and urgent radiotherapy.
- Remember that in some tumours (e.g. myeloma, metastases) radiotherapy and/ or chemotherapy may be the treatment of choice. Urgent consultation with a Haematologist or Oncologist is recommended.
- If a patient with a known malignancy develops spinal cord compression inform the doctors who have been supervising care.

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Urology

UROLOGY INTRANET SITE

WHO TO CALL AND REFERRALS

Urology Specialist Nurse: Catheter issues and reviews

Urology on-call Registrar: 0730-2230h – Urology Registrar on call

2200-0730h – General Surgical Registrar on call

Outpatient referrals – via e-Referral system on RCP

For trial removal of catheters (TROC), fill in the specialized form using the e-referral system on RCP, find under 'Community Nursing' (district nursing)

NB: The Acute Urology Service is regional and runs through Auckland City Hospital. All hospitals within the Auckland region still run elective and outpatient services independently – outpatient referrals should be sent to the patient's domicile hospital.

RENAL COLIC

Differential diagnosis

The following must be excluded in anyone with suspected renal colic, especially the elderly:

- Aortic and iliac aneurysms
- Pyelonephritis
- Peritonitis, including appendicitis and diverticulitis
- Biliary colic
- Reno-vascular compromise, including renal artery or vein thrombosis
- Cancer, especially renal
- Endometriosis
- Ovarian torsion
- Appendicitis

To diagnose a stone, imaging must be performed. Incidental stones themselves don't cause acute pain. Pain is present if there is **obstruction** of the collecting system.

History

- Pain: severe, loin to groin radiation

Examination

- If there is a high fever >38^{o}C and significant renal angle tenderness, infection may be present
- May be tender over the affected kidney

Investigations

- MSU: haematuria is present in only 85% of patients with renal colic. If there are white cells or bacteria in the urine, consider infected stone (may need antibiotics)

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- FBC, creatinine, electrolytes, calcium, phosphate, uric acid (the WCC is often raised even when there is no infection)
- Non-contrast CT scan is the preferred radiological investigation (see below)

Management

- IV access for analgesia + fluids
- Adequate analgesia: paracetamol, NSAIDs +/- opioids if not controlled by simple analgesia
- Patients with infection and obstructed kidneys may develop sepsis: refer to Script App. Empiric antibiotics for a suspected infected obstructed urinary system is amoxicillin 1 g IV q6h, and gentamicin 5 mg/kg IV once daily (dose needs to be adjusted in renal impairment, see the aminoglycoside guide).

Further investigation

Diagnostic imaging is essential if:

- Pain is severe and on-going
- The diagnosis is in doubt
- Another condition is suspected
- The patient is elderly

In the young healthy patient in whom the diagnosis of renal colic is clinically not in question, the pain has completely settled and there is no suspicion of any complication, there is no need to obtain immediate diagnostic imaging. It can be arranged prior to discharge.

1. Non-contrast CT is the first-line choice for imaging

- Advantages: sensitivity 95-97% and specificity 96-98% in the detection of renal stones. Faster than Intravenous Urogram and avoids intravenous contrast
- Can diagnose other conditions such as AAA and GI tract disease, but is not as sensitive or as specific as contrast-enhanced CT

2. Plain x-ray KUB

- Lower sensitivity for stone detection. X-ray KUB has between 37%-80% sensitivity depending on stone size and density.
- X-ray KUB can be used as a cheap and easily accessible way to follow up stones if they are visible on plain films (e.g. visible on ‘scout film’ on CT scan – you can check the CT report for this)

3. Renal tract ultrasound

- USS sensitivity for renal tract stones is as low as 46%, but can identify obstruction (hydronephrosis) between 93-100% of the time
- Used in those who do not want or cannot be exposed to higher radiation doses (female patients below the age of 30, male patients below the age of 25, pregnant women). The trade-off is lower sensitivity of detecting stones, and lower anatomical detail.
- If the diagnosis is still unclear after an USS, the patient may require a CT for clarification.

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Disposition of the patient

Admit if:

- Fever >38°C or septic, as may require a nephrostomy
- Severe ongoing pain that does not settle with IV opioid and NSAIDs
- Recurrent attacks of colic with repeated visits to the Emergency Department
- Ureteric stone >8mm in diameter (these are unlikely to pass)
- Any obstructing stone in a solitary kidney
- Creatinine >200 micromol/L

Discharge

- Everyone else
- Follow-up can be through GP in 1 month (with repeat x-ray KUB if stone is visible on plain films) if the patient is medically well
- If complex, follow up should be through domicile Urology department – please discuss with on-call registrar if there is doubt
- Advise patient to sieve urine for a stone, which can be dropped to their GP for analysis if caught
- Return advise: Return if the patient develops fevers or severe unrelenting pain
- Give the patient a prescription for paracetamol, NSAIDs (e.g. diclofenac) unless there is a contraindication, and stronger PRN analgesia (such as codeine or tramadol)
- There is conflicting data on the role of alpha-blockers in maximizing stone passage and therefore alpha-blockers do not routinely need to be prescribed – current guidelines suggest efficacy in distal ureteral stones > 5 mm who are amenable to conservative management

Urosepsis

A patient is suspected of having sepsis if:

- Fever >38°C, rigors, obstructed renal system (on CT scan or ultrasound), infected urine, hypotension or looks unwell, then:

  Notify Urology Registrar or Consultant to consider urgent nephrostomy or ureteric stenting.

  1. Vigorous fluid replacement

  2. Antibiotics – gentamicin 5 mg/kg IV once daily (dose needs to be adjusted in renal impairment, see the aminoglycoside guide) and amoxicillin 1 g IV q6h

  3. Blood cultures/electrolytes/creatinine/blood count

  - Make sure the patient has a recent **coagulation screen**, as they will need this for nephrostomy insertion

  4. Notify DCCM if patient is unwell as may require post-nephrostomy support

  5. Insert IDC for fluid balance monitoring

  6. Keep the patient nil by mouth

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ACUTE URINARY RETENTION

History

- To be in acute retention the patient must have pain and the inability to pass urine (a patient with an incidentally found high residual urine is not in acute retention but may be in chronic retention, as is often the case in elderly patients with fever of unknown origin)
- Past symptoms of outflow obstruction and its duration
- Any previous episodes of retention/haematuria
- Past history of urological surgery and catheterisation
- Back pain

Examination

- Presence of palpable bladder
- Rectal examination to assess prostate size and consistency
- Neurological exam looking for cord compression (cauda equina syndrome can cause retention)
- Bladder scan – will usually show > 300-400 ml, but acute painful inability to pass urine at any volume may be considered retention

Investigation

- FBC, creatinine, electrolytes
- Do not routinely perform PSA test unless rectal exam is obviously abnormal. Due to retention, the PSA will likely be falsely elevated and require repeating.

Management

- Catheterise patient: urine specimen to laboratory (refer to **ALGORITHM FOR MALE URETHRAL CATHETERISATION**)
- Do not have more than two attempts to pass a urethral catheter
- If the patient does not drain an excessive amount of urine (<1500 mL) then they can usually go home with a non-urgent referral to Urology Outpatient Clinic. If they drain more, they may need to be admitted to monitor fluid and electrolyte balance, due to concerns of Post-Obstructive Diuresis
- If electrolyte abnormality i.e. hyperkalaemia, hyponatraemia, hypernatraemia or elevated creatinine then admit
- Commence on alpha-blocker, ensure no contraindication (risk of postural hypotension)
- When possible, medicines that may be contributing to acute urinary retention should be reviewed, especially anti-cholinergics
- Complete Community Nursing eReferral for trial removal of catheter in 7-14 days.

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MACROSCOPIC HAEMATURIA

- "A little bit of blood in a lot of urine makes it very red" – unusual to be haemodynamically unstable
- Once properly assessed most can be managed in an outpatient setting

Admit to urology if:

- Clot retention
- High residual volumes with pain
- Recurrent presentations
- Concerns with anti-coagulation
- Haemodynamically unstable or large haemoglobin drop

Differential diagnosis

- Cancer (bladder or kidney, rarely prostate)
- UTI
- Stones
- Benign prostatic bleed (large prostate, previous surgery)
- Trauma
- More rare causes including radiation cystitis

History

- Is it associated with renal or bladder pain or painful urination (dysuria)?
- Where does it occur in urinary stream: initial, total or terminal?
- Is it bright red blood, old dark blood or contain clots?
- Are they on anti-coagulation/anti-platelet agents

Examination

- Signs of hypovolaemia or anaemia
- Presence of palpable renal mass or palpable bladder
- Rectal examination to assess prostate

Investigations

- MSU to confirm that the red urine is blood, and ascertain if there is infection
- FBC, creatinine, electrolytes
- Imaging ultrasound/CT scan with contrast (CT intra-venous urogram is preferred, may be outpatient is patient is stable)
    - This can be followed up with outpatient referral to urology service at patient's domicile DHB
- Cystoscopy – done once bleeding settled to maximize the chance of accurate diagnosis and vision. Usually not done in the inpatient or acute setting.
    - Outpatient referral to urology service at patient's domicile DHB

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Clot retention

(blood that has pooled in bladder and formed clots)

- Catheterise with large bore catheter (20-24 Fr) using 3-way Foley catheter
- Irrigate the bladder with a 60 mL bladder tip syringe to remove clot (active explosion of clots – see bladder irrigation) and set up through and through irrigation (passive process to avoid further clots forming, will not work unless bladder syringe has been performed)
- Admit and investigate, as in haematuria protocol

TESTICULAR PAIN

Differential diagnosis

- Testicular torsion
- Epididymo-orchitis
- Testicular tumours
- Testicular trauma
- Torsion of testicular appendage
- Referred pain – e.g. appendicitis, hernia

A torted testes is only viable for 6-12h. Pain less than 24 hours requires urgent discussion with/referral to Urology service due to potential ischemic injury.

In someone with greater than 24 hours of consistent pain, the diagnosis of acute torsion is extremely unlikely. Appropriate work-up to investigate other causes before acute referral to Urology is warranted

History

- Onset of pain: sudden or gradual
- Any urinary symptoms or urethral discharge
- Previous history of testicular pain

Examination

- Generally the patient with torsion of the testis will appear uncomfortable whereas the patient with appendicular torsion and epididymitis will appear relatively comfortable
- Inspect the scrotum for swelling, redness and tenderness. Swelling of the entire scrotum is common to all 3 conditions. With torsion, swelling comes on typically later, usually after 12h
- Position of testis: Is it high riding? (suggests torsion)
- Is the body of testis normal or is there a mass in the body of the testis or the epididymis?
- Transilluminate for hydrocoele
- Inspect penis for discharge
- Local inspection should rule out a hernia
- Abdomen for pathology causing referred pain

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Investigations

- Urinalysis: pyuria is defined as >10 WCC/HPF (High Power Field)
- Urethral swab/ STI check: Gram stain, *Chlamydia trachomatis* antigen, *N. gonorrhoea* testing
- WCC count is raised in 30-50% of patients with either epididymitis or testicular torsion
- Colour Doppler USS: can differentiate between epididymitis and torsion by patterns of blood flow and differentiates between testicular haematoma and rupture

Management

1. Suspected torsion of testis

- Analgesia
- Refer to the Urology Registrar urgently

2. Epididymo-orchitis

The aetiology depends on age:

- **Young male** it is most commonly an STI: *Chlamydia trachomatis*, *N. gonorrhoea* and *Ureaplasma urealyticum*
- **Older male** it is most commonly a Gram negative rod: *E. coli* and *Klebsiella spp.*, rarely *Pseudomonas aeruginosa*
    - Patient febrile or septic: admit for IV antibiotics and studies to rule out abscess
    - Patient not septic: discharge on antibiotics, bed rest, scrotal elevation with folded towel, ice for 10min 3-4x/day and advise to ambulate when pain-free. Prescribe NSAIDs and paracetamol
    - At discharge refer all patients to their general practitioner for follow-up
    - Urology clinic referral is only required if complex case or recurrent presentations
- **Antibiotics**
    - **Younger male with risk factors for STI:** (treat as per

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- Sexual Health chapter)
- **Older males**: Select agents and manage IV/oral antibiotics as advised for pyelonephritis with 10 days total treatment. Please refer to the SCRIPT app.

UROLOGY TRAUMA

Urology trauma often occurs as part of a multi-system injury and is usually managed initially as per the EMST and Acute Surgical team guidelines.

For isolated urological trauma in stable patients contact the Urology Registrar on call.

COMMON UROLOGY POST-OP/WARD CONDITIONS

All urology patients should be initially assessed and managed as per guidelines and protocols for all surgical patients.

Urology ward nurses are highly specialised and knowledgeable of potential complications in urology patients and how to manage catheters. These are some common urology-specific issues that may be encountered while on the ward:

CATHETER NOT DRAINING

TURP/TURBT patients in particular. Differential diagnosis:

- Blocked catheter – blood or retained tissue
- Catheter not correctly placed within the bladder
- Renal failure/no production of urine

Assessment

(Be wary of the ward patient who has had a catheter inserted and has never drained much urine from when it was first put in!)

- Haemodynamic status
- Degree of pain (often severe and the reason for the patient review)
- Urine output (check how much in the last 4 hours, colour of urine, amount/speed of irrigation fluid if connected)
- Examine for palpable bladder, ask for a **bladder scan**
  - The result of the bladder scan will tell you if the pain is from retention from the blocked catheter
- FBC, cross match, electrolytes (in particular, watch for low sodium levels)

Management

- Pain will not be relieved until bladder is draining (don't just prescribe more analgesia)
- Consider manual flush + suction to ensure in correct position, remove obstruction/clot
- If post urological surgery, do not remove catheter without discussing with Urology Registrar (often maybe difficult to get the catheter back in again)

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- Excessive haematuria - may require faster irrigation, catheter traction/tamponade or return to theatre
- Radical prostatectomy/cystectomy/urethroplasty have potential anastomosis along the urethra so any catheter issues in the first 7 days after surgery should be discussed with Urology Registrar so as to avoid damaging these

BLADDER SPASM/PENILE TIP PAIN

- Occurs in patients with catheters and sometimes those with ureteric stents due to detrusor stimulation from the foreign body
- Penile tip pain is referred from the bladder so local anaesthetic gel is unlikely to be helpful
- Firstly ensure bladder is draining and catheter is not blocked
- Consider if the catheter is still necessary or not
- Consider reducing balloon size (10 ml is usually all that is necessary, 5ml may be appropriate in some patients)
- If the bladder is draining, consider starting low dose of solifenacin 5 mg po q24h (be aware of higher doses in elderly postoperative patients and those with contraindications to anticholinergics)

NEPHROSTOMY TUBE

Pigtail drain into renal pelvis either to relieve obstruction in the ureter or post-surgery PCNL, placed by Interventional Radiologists in Radiology Department.

No output from nephrostomy

Similar thought process to a blocked catheter:

1. Blocked
2. Fallen out/wrong position
3. Non-functioning kidney (not producing urine)

Management

- Initial flush: sterile conditions, small volume syringe (5 mL) with water for injection
- If flush does not relieve obstruction request nephrostogram via ROERS request to assess if in correct position – this needs to be discussed with interventional radiologist on-call
- If fallen out will need to be replaced by interventional radiologists, ensure clinical demand for nephrostomy tube still exists

Leakage around nephrostomy tube

- Often a sign of blockage of the nephrostomy tube itself
- Consider flush, if still leaking consider stoma bag
- Policy available on Urology intranet site

SUPRAPUBIC CATHETER

A catheter that goes directly into the bladder via the abdominal wall rather than through the urethra (still just a catheter, with the same balloon and potential problems).

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Replacing/changing

- Similar principles to changing an IDC. Sterile technique, 14 or 16F IDC generally
- Does not require specialist urology input to change SPC > 6 weeks old, but urology nurse specialists are available to assist, or the on-call urology registrar after-hours
    - If SPC < 6 weeks old, please discuss with urology service prior to change (as tract may not be fully formed and it is possible to form a false passage)
- Remove previous catheter after instilling 50mL sodium chloride 0.9% in the bladder and then prep and drape and apply lubricating gel to the SPC site
- Place new catheter through the previous insertion site
- Inflate balloon - ensure draining or if no return of urine then 40mL flush and show return of urine on aspiration
- If this is a long-term SPC having been changed previously it does not require regular dressing

Fallen out

- Time is of the essence. The catheter site will close over quickly and should have a new catheter placed as soon as possible, as outlined as above
- If there is resistance or difficulty contact the Urology Registrar on call
- For many patients if an attempt is not undertaken, and the tract closes over, it may mean they end up requiring a further operation and anaesthetic to have a new tract placed

INDICATIONS FOR URETHRAL CATHETERISATION

- Acute retention
- Unconscious or sedated patients unable to void
- In the operative and peri-operative setting
- Patients with prolonged epidural anaesthesia e.g. in labour
- Chronic retention, if develop impaired renal function or infection
- Incontinence. Note: urethral catheterisation for incontinence needs to be carefully assessed in light of social situation
- Trauma

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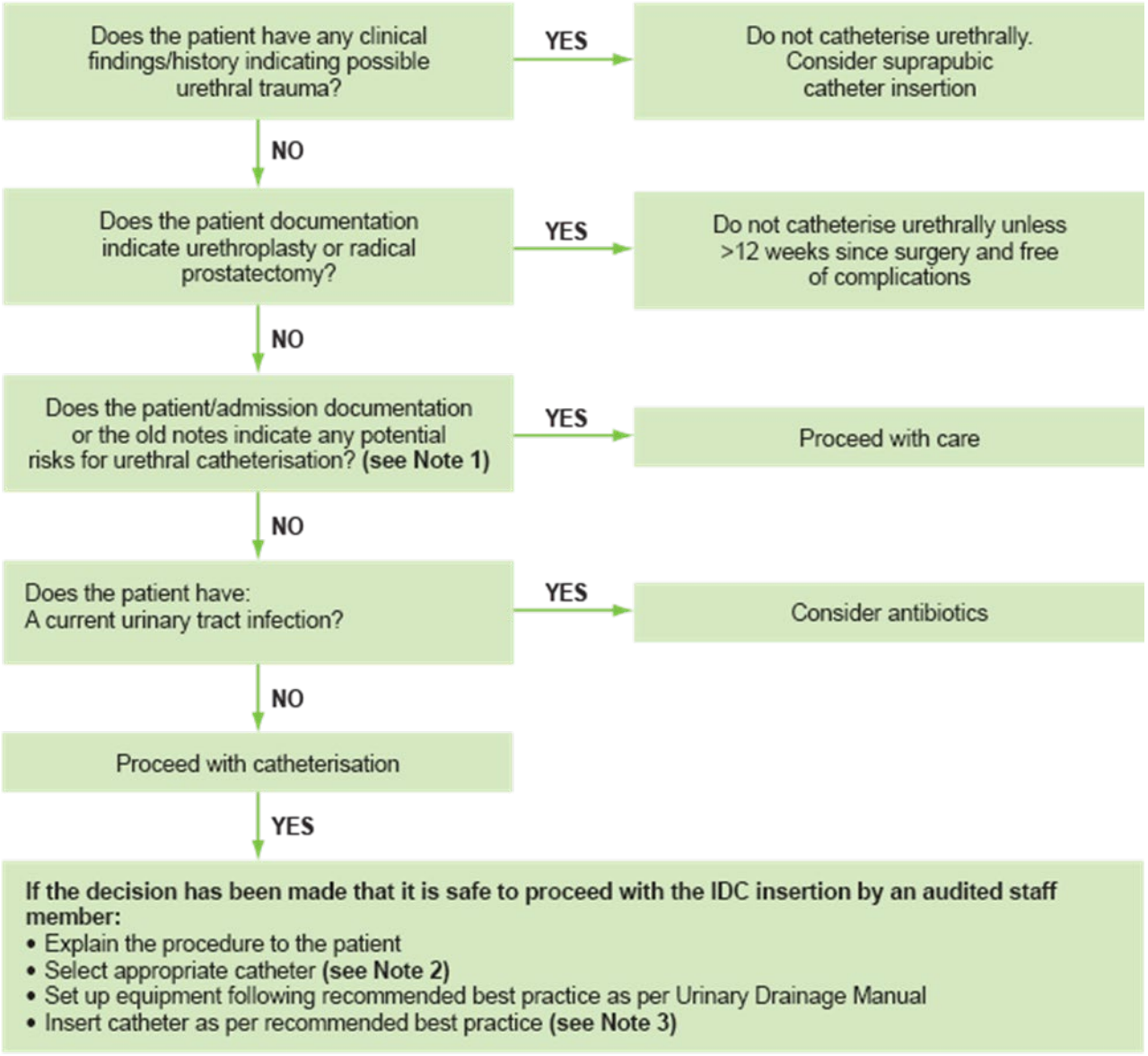
ALGORITHM FOR MALE URETHRAL CATHETERISATION

(Note: Male urinary catheterisation can be performed by registered Nurses when they have been trained, audited and are competent in this procedure.)



NOTES

Note 1

Potential risks for urethral catheterisations

- History of urethroplasty or radical prostatectomy in the last 12 weeks (Urology Registrar must be contacted to insert IDC and assess)
- Other prostate or urethral surgery in the last four weeks (e.g. TURP, urethrotomy, bladder neck incision) – usually IDC insertion is uncomplicated but discuss with Urology Registrar for advise
- Urethral trauma in the last 4 weeks
- Known prostate enlargement – larger sized IDC (14/16/18Fr) may be easier to place

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- Known urethral stricture – smaller sized IDC (10/12/14Fr) may be easier to place
- History of long-term difficulty in passing urine (e.g. urinary retention, poor urinary flow)
- History of difficult urethral catheterisation previously

Choose catheter size and type according to reason for catheterisation. **Rule of thumb:** Choose the smallest catheter that will suit the purpose of the catheterisation	
For uncomplicated urinary retention e.g. post anaesthetic medication side effects	Size 14
To facilitate accurate urine measurements e.g. following major surgery, sepsis, trauma	Size 14
For urinary incontinence e.g. severe CVA, medical conditions	Size 14
For patients with slight haematuria, turgid and/or mucous-laden urine e.g. augmented bladders	Size 16-20
For moderate to heavy haematuria with potential for clots e.g. post urological surgery, bladder and/or prostate cancer, renal, 3-way trauma	Size 20-24

Note 3

Follow recommended best practice as per Urinary Drainage Manual.

- If catheter does not pass along the length of the urethra and into the bladder with ease, do not proceed, **DO NOT INFLATE BALLOON**. Remove catheter and discuss with medical staff or Urology Charge Nurse.
- **If catheter is being inserted for retention,** ensure volume of urine drained is measured and documented in patient's notes.
- If catheter enters the bladder and urine begins to drain, **advance the catheter until the Y-connection reaches the meatus before inflating the balloon.** This ensures the balloon is clear of the urethra and within the bladder, preventing trauma on inflation. This trauma can be dramatic, and cause long lasting problems for the patient.
- **If the patient has not been circumcised,** return the foreskin to its natural position after catheterisation.

COMMON OUTPATIENT UROLOGY CONDITIONS ENCOUNTERED ON THE WARD

These generally do not require an inpatient consult.

AUCKLAND REGIONAL UROLOGY GUIDELINES AND REFERRAL RECOMMENDATIONS

Referral guidelines and management advice are given in the Auckland Regional Community Health Pathways, including the pathways for:

- Microscopic haematuria
- Lower urinary tract symptoms (including incontinence)
- Raised PSA
- Pain of the genitourinary system

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- Recurrent UTIs
- Scrotal mass

HealthPathways gives initial management advice which can be commenced while in hospital or followed up in primary practice.

Follow-up through the General Practitioner to assess response to treatment or investigation is often more appropriate than immediate referral to Urology Outpatient Clinic, as waitlist times are long and patients may benefit from more timely review.

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Vascular Surgery

WHO TO CALL

- **On-call Vascular Registrar:** between the hours of 0800-2200h. However, when a patient has already been reviewed by a Consultant or Registrar and queries arise during working hours, i.e. between 0800-1700h, in most cases it is best to talk directly to the Registrar of the Consultant already involved.
- **On-call Surgical Registrar:** between the hours of 2200-0800h. Overnight there is no dedicated Vascular Registrar. During this time all vascular cases are reviewed by the Surgical Registrar on call and discussed with the Consultant as necessary.
- **On-call Vascular Consultant: via operator** – in some emergency situations when the Vascular Registrar is tied up in the operating theatre the Consultant should be contacted directly. If the Consultant is also in the operating theatre it may be necessary to physically come to the operating theatre to directly discuss your case with the Consultant.
- **Vascular Nurse Specialist:** a useful resource who provides an ABI service and wound advice management during working hours. Another Vascular Nurse Specialist is also available during working hours to assist with the ward management of vascular surgery patients.
- **Outpatient referrals**: send e-referral via RCP.
- **Critical Care Input: CVICU Registrar**. All major vascular surgical cases go to level 4 ICU (CVICU) post-operatively as do any readmissions. Therefore for any ward patients who need ICU input, CVICU should be the first port of call, not DCCM.

Note: the above contact details apply to the Auckland Regional Vascular Service which is based at Auckland City Hospital and provides vascular coverage for Auckland, Waitemata, and Northland Hospitals.

REVIEW OF THE VASCULAR PATIENT

- Reason for current admission: from the patient, clinical notes and RCP
- Useful to know about history of dementia, hospital level care, terminal malignancy.
- Inspect the abdomen and limbs.
- Check the blood work including FBC, coags, renal function, ensure valid Group & Hold, review medications, especially antiplatelets/anticoagulants and recent imaging.
- Majority need HDU support post-op, discuss with on-call Registrar.
- Always read formal radiology reports, and if any comments, bring it to the attention of Registrar/Consultant.
- For any Management issues/doubts: call on-call Vascular Registrar or Consultant
- Have the clinical notes, medication charts handy and RCP open, when calling.

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ACUTE LOWER LIMB ISCHEMIA

History and physical examination are usually sufficient for the diagnosis

CTA is the investigation of choice

Most need embolectomy

It is important to search for the embolic source (heart/proximal vasculature)

- Classically presents with the "6Ps" – Pain, Pulselessness, Perishingly cold, Pallor, Paresthesia and Paralysis.

  The typical presentation is an acute onset (i.e. a few hours to a few days) of pain in leg/foot, weakness or no movements, cold to touch, foot pain or numbness which is worse on elevation. If the patient previously had no symptoms of peripheral vascular disease, the acute ischemia is more likely to be embolic (heart/proximal atherosclerotic disease).

- Etiology: embolus (still the most common cause), thrombosis of an atherosclerotic stenosis, trauma, aortic dissection, thrombosed popliteal aneurysm, occlusion of a bypass graft or endovascular stent.

- History: establish time-course and enquire about above etiologies. Establish current mobility status, check for dementia and living status: own home/ rest home/ hospital level care.

- Examination: document pulses including the contra-lateral leg:
  - Is pulse regular or irregular (i.e.?AF), capillary refill in either foot, degree of paresthesia.
  - Is the colour of leg pale/cyanosed/mottled with no blanching on pressure, calf tenderness and paralysis (the presence of these findings indicate the need for urgent intervention).
  - Put oxygen probe on either foot: no or very low O2 saturation levels, almost flat wave form in affected limb, suggest acute limb ischemia. Doppler interrogation will reveal no flow. Absence of arterial signals at the ankle almost always means that urgent surgical intervention will be necessary.

- Clinically palpable pulses versus hand-held Doppler signal must be clearly differentiated and ABPI performed.

- Urgently contact on-call Registrar.

- Initial management: oxygen, fluids, ECG, troponin, bloods, CXR, heparin, pain relief, Indwelling urinary catheter.

- Definitive management: Investigate urgently with CTA. Usually involves surgery (embolectomy or bypass), occasionally angioplasty, stenting or thrombolysis. If the leg is not salvageable (complete paralysis and anaesthesia with fixed staining of the limb) amputation or palliative care will be required.

CHRONIC LOWER LIMB ISCHEMIA

- Includes: claudication and "critical limb ischaemia".

- Claudication – seldom requires in-patient management unless sudden onset.

- Critical limb ischaemia: foot ulcers, gangrenous toes, rest pain; by definition these symptoms will lead to limb loss unless revascularization is performed. Gangrene (check if dry or moist). Dry gangrene is characterized by a non-infected black eschar. Wet gangrene has tissue maceration and purulence.

- In most cases critical limb ischaemia will be managed as an in-patient.

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- Typical clinical appearance: hair loss, cool foot, dry cracked skin, dystrophic toe nails, ulcers between toes/under heel, typically a ruborous foot with pallor on elevation (Buerger's sign).

- Ankle brachial blood pressure Indices (ABIs) are an essential investigation. Be careful to distinguish between the presence or absence of palpable pulses and Doppler flow. All these patients will have absent pedal pulses but all should have Doppler flow (unless they are acutely ischaemic). ABIs quantify Doppler flow giving us some idea of the severity of the ischaemia. A normal ABI is 0.9 or greater. ABIs of <0.5 are usually associated (but not always) with critical limb ischaemia. ABI <0.4 suggests critically ischemic foot. Ischemic rest pain is unlikely when ankle pressures exceed 55mmHg. Toe pressures of less than 20 to 30mmHg are also associated with advanced ischemia.

- Medical optimisation is essential but anti-coagulation is usually unnecessary. It is essential to have a good understanding of the patient's overall physiologic state before discussing the patient with the on-call Registrar as some patients (e.g. dementia, immobile) are clearly not revascularization candidates and may be best served with primary amputation at their local hospital or palliative care.

- Ask for x-ray of foot/leg: checking for possible osteomyelitis (bone rarefaction, periosteal elevation, new bone formation). A bone scan or MRI is indicated when osteomyelitis seems likely but a plain radiograph is negative. Bone changes may not be apparent until osteomyelitis has been active for 2 to 3 weeks. All ulcers should be tested for culture and Gram stains.

- Vascular imaging – discuss with Vascular Surgery or Interventional Radiology before requesting arterial imaging as there are multiple potential modalities that may be used depending on numerous factors (discussed in more detail in the imaging section).

- Management: mainly endovascular (angioplasty or stenting) or surgical (endarterectomy, bypass or amputation). Occasionally other techniques are used, such as sympathectomy, iloprost infusions or hyperbaric oxygen.

LOWER LIMB ULCERS

- Very common, usually venous

- Admission is usually for cellulitis +/- foot sepsis needing surgical drainage or debridement

ARTERIAL ULCERATION

- Common over bony prominences, often related to local pressure effects

- Cool, dystrophic skin

- "Punched-out" appearance with straight sides to the ulcer edge

- Base: sloughy, pale and devitalised with little or poor granulation tissue present

- Dry and necrotic

- Involve underlying structures such as tendon or bone

- Painful
    - Arterial lower limb ulcers suggest critical ischemia; need workup for restoring or improving arterial supply and debridement/amputation.
    - Investigations: ABI, Toe pressures, US Arterial, MRA.

VENOUS ULCERATION

- Classically develops in the medial gaiter region above the ankle

- Ulceration for protracted periods of time, sometimes decades

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- Pattern of intermittent healing and recurrence
- Visible varicose veins
- Haemosiderin pigmentation, ‘inverted champagne bottle legs’
- Ulcer with sloping edges
- Florid, friable granulation tissue in the base
- Exudes large volumes of fluid
- Rule out previous DVT
- Compression therapy is the cornerstone of managing calf ulcers due to venous disease (but it is essential to exclude arterial disease before these are applied – the patient must have an ABI of >0.9 to be managed with compression therapy). Always document the ABI in your discharge summary so that District Nurses can continue with compression dressings in the community.
- Arrange US venous system and vascular clinic review.
- Saphenous vein ablation also has a role to play in healing and preventing recurrence of venous ulcers. This can be achieved by stripping the saphenous vein, endovenous laser treatment (ELT), radiofrequency ablation (RFA) and US guided sclerotherapy.
- After ELT or RFA, or US-guided sclerotherapy it is common for patients to present with a painful cord down the course of the saphenous vein. This is due to an inflammatory response developing around the thrombosed vein. If the vein was very superficial it can occasionally cause a red or brown streaking appearance. It is treated with stockings, elevation and simple analgesia. It does not require antibiotics. If there is significant leg swelling, then an ultrasound to rule out DVT is useful. In patients with significant thrombophlebitis, a short period of anticoagulation with low molecular weight heparin is beneficial.

NEUROPATHIC ULCERATION

- Occur on sole/pressure points
- Structural foot deformities
- Diabetes is the most common cause for neuropathic ulceration
- Painless
- Surrounded by callosities
- Presence of sinus tracts suggests underlying tissue and bone may be infected
- Imaging: x-ray/MRI
- Rule out arterial insufficiency
- Need Podiatry, Orthotics, Diabetes team input
- Protect ulcerated area with off-loading footwear

DIABETIC FOOT SEPSIS

Principles

- Diabetic foot sepsis is treated as a medical emergency.
- It is a deep-seated infection with lymphangitis, gangrene and/or necrotizing fasciitis.

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- Generally, is polymicrobial
- Delay in treatment can lead to limb loss or loss of life
- Goals of care include stopping the spread of infection, debridement and preserving options for limb salvage
- Patients with signs of ascending infection or sepsis should be started on broad- spectrum antibiotics and aim for urgent surgical drainage.
- Surgical drainage is key to stop spread of infection
- In true sepsis with infection tracking up to the ankle, a guillotine style amputation is done
- Life over limb mentality must be considered to ensure sepsis is controlled

Findings

- Inflammation including redness, warmth, swelling, tenderness, or pain, fever, purulent discharge, and foul odour
- Cutaneous blisters, subcutaneous emphysema, skin discoloration, or foul-odour; altered mental status and shock means necrotising infection
- Important to remember that pain may be absent even in the most severe infections if there is sensory neuropathy
- Must examine foot for bogginess/phlegmon and palpate plantar aspect looking for pain with plantar pressure. This suggests deep space infection and requires prompt drainage.
- A brief vascular exam should be done to check if foot pulses are palpable or not

Suggested management of infected diabetic foot

- IV line, FBC, CRP, LFTs, renal function tests, blood cultures
- IV antibiotics (please refer to Script App for ID advice)
- Monitor blood sugars, start on variable rate intravenous insulin infusion as appropriate, monitor urine output
- Get urgent X-ray of foot: to check for gas, foreign body, osteomyelitis
- Keep the patient fasted for urgent surgical drainage/removal of dead tissues
- MRI may be needed (if deep soft tissue purulent collections suspected)
- Inform Vascular registrar, send a photo of the foot if possible and seek advice
- May need to get ID input for appropriate antibiotic cover

ABDOMINAL AORTIC ANEURYSM

- Threshold for intervention is typically 5.5 cm for males and 5 cm for women (unless symptomatic or infected). Aneurysms less than this size can simply be referred to outpatient clinic for surveillance.

- Thrombus within the aneurysm sac is a normal finding.

- The length of the aneurysm is insignificant; it is only the diameter (AP and lateral) that determines the need for intervention.

- Saccular shaped aneurysm needs to be discussed with on-call registrar.

- Any patient with a known AAA presenting with abdominal or back pain, collapse, or transient loss of consciousness, should be discussed with the on-call registrar without delay.

- Localised tenderness over the aneurysm is a common finding.

- Pain is caused by the retroperitoneal bleeding surrounding the aneurysm.

- Be wary of the first onset of "apparent renal colic" in an over 60 year old as this may actually be a ruptured aneurysm.

- If the patient has suffered cardiac arrest in the ambulance / remains unconscious / is anuric / has ECG signs of acute myocardial ischemia, they are extremely unlikely to survive surgery.

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CAROTID DISEASE

Most carotid intervention is done as an inpatient acute assessment and intervention. Referrals are usually from Medical or Neurology services. Patients are assessed and if it is thought that symptoms are related to the carotid stenosis, they are kept in hospital and treated whilst inpatient on next available list.

Carotid endarterectomy (CEA) is a well-established procedure that removes the source of embolisation, namely the plaque from the carotid artery.

- Any patient with MCA territory TIA / stroke and carotid stenosis greater than 50% should be discussed with the on-call Registrar as an in-patient to avoid unnecessary delays.
- A neck haematoma in a post carotid endarterectomy patient is a life-threatening condition (with potential airway compromise) and should be discussed with the on-call Registrar without delay. No investigation required. Get Anaesthetic support as will need exploration in OT.
- A severe headache post carotid endarterectomy is a significant concern and should be discussed with the Vascular team. It may represent hyper-perfusion syndrome and be a precursor to a major intra-cerebral bleed. Will need CT head.
- Post CEA patient review: ask for history of headache, any difficulty in breathing. Check BP, neck drain output. Check cranial nerves VIII, IX, X and XII.
- Look for any neck swelling/hematoma, any facial droop and drool from the corner of the mouth. Any issues contact on-call Vascular.
- Don't forget to restart antihypertensive medications on discharge at a lower dose and ask GP to up-titrate doses as needed.

IMAGING ISSUES

- All requests for arterial imaging should be discussed with Vascular Surgery and Interventional Radiology to avoid performing expensive, unnecessary or inappropriate investigations.
- Ultrasound is used to monitor the size of aortic aneurysms, to diagnose carotid stenosis and for evaluation of lower limb arterial system and bypass grafts.
- CT angiogram is used in aneurysms to precisely document anatomy and in particular determine suitability for endovascular intervention. It is useful in TIA / stroke to rule out bleeds and other pathology. Patients with moderate to severe renal impairment need discussion with a radiologist to arrange pre-hydration usually with 1L sodium chloride 0.9% to reduce the risk of contrast-induced nephropathy.
- Allergy to iodinated contrast material should be ascertained.
- MR angiogram is used for lower limb arterial disease and carotid disease. Some pacemakers and metal implants are not compatible. Moderate to severe renal impairment needs discussion with Radiologist due to risk of nephrogenic systemic fibrosis.

POST OPERATIVE CARE

- IV fluids: It is important not to overload vascular patients as they often have a fragile cardiac state, as opposed to general surgical patients who are often fluid loaded to counteract third spacing.
- Dialysis patients must NEVER be given IV fluids when they are nil-by-mouth – discuss with the Renal team when they are admitted to hospital so that in-patient dialysis can be organised for them.
- DVT prophylaxis: as per hospital guidelines but need to discuss with Consultant regarding TED stockings in patients with significant PVD and bypass grafts.

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- Vascular patients have systemic arterial disease, hence rely more on pharmacological DVT prophylaxis (enoxaparin (Clexane®)/heparin) instead of TED stockings.
- IV heparin infusion: in general should be managed using hospital protocols. However, if the APPT is not therapeutic after two adjustments this should be discussed with the Vascular team. In some cases this may be acceptable (e.g. post major arterial surgery where a prolonged APTT could result in major bleeding) and in others it may be dangerous (e.g. massive DVT patients). Do not blindly stick to the protocol if the APTT is clearly not becoming therapeutic.
- Leg swelling post fem-pop bypass: very common, usually due to lymphoedema/reperfusion oedema, rather than DVT. Simple elevation is sufficient.
- Chest pain: all vascular patients are by definition at high risk for post-operative cardiac events. Have a low threshold to get an ECG, troponin +/- Medical, Cardiology or ICU review.
- Bleeding from wounds: any degree of bleeding from any vascular surgery wound should prompt an urgent phone call to the on-call Registrar. It may be a "herald bleed" soon to be followed by exsanguination from anastomotic disruption.
- IV lines: take care not to damage potential venous conduits by inappropriate insertion of IV lines, especially in renal failure patients or patients who are going to have lower limb bypass grafts using arm veins. Where possible use the dorsum of the hand to site IV lines on the opposite arm from where the grafts are to be harvested.

PATIENTS ADMITTED FOR ANGIO/EVAR/TEVAR

Angiography is the direct intravascular administration of radiographically visible dye in order to gain information about a particular blood vessel. These procedures are performed using fine wires and catheters.

Common endovascular procedures are angioplasty, stenting, stent-graft repair of aneurysms, embolization, and catheter-directed thrombolysis.

Angiography is mostly therapeutic; uncommonly may be for diagnosis.

Endovascular procedures have reduced mortality and morbidity.

- Review the patient's history, lab work, and indications for the procedure.
- Previous open surgical or endovascular procedures are particularly relevant and should be reviewed as part of this pre-procedure routine.
- Check informed consent.
- An abbreviated physical exam should be done (evaluation of the groins is critical as the most commonly selected vessels for arteriography is femoral).
- Distal pulses or Doppler signals should be confirmed.
- Ankle-brachial indices should be recorded after any lower-extremity endovascular intervention and compared with pre-procedure values.
- Severe hypertension, arrhythmia, or renal insufficiency – will generally contraindicate angiography until optimised.
- Allergy to iodinated contrast material should be ascertained.
- Patients with prior contrast reactions with risk for recurrent allergic complications will need premedication with steroids, antihistamines and H2 receptor blockers.
- Review current medications:

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    - Antiplatelet agents as aspirin and/or clopidogrel are commonly taken by patients with peripheral vascular disease
    - Anticoagulants:
        - If on warfarin, check if INR is below 1.5.
        - If has mechanical heart valves or known pulmonary emboli: should be on bridging anticoagulation with a “window” for treatment (discuss with on-call Registrar)

- Patients with a personal or family history of bleeding problems should be carefully evaluated with a platelet count and coagulation studies (prothrombin time and partial prothrombin time). A Haematology consultation should be sought

- Check renal function

- Contrast materials are nephrotoxic.

- Check if needs intravenous hydration

- Pre-procedural antibiotics are not necessary for routine angiography

Post angiogram complications to look for:

- Haemorrhage from the access site – call the Vascular Registrar
- Allergic reactions to the contrast material
- Thrombosis of the punctured vessel
- Embolization of a clot from the catheter, air or atheromatous material
- Hematoma
- Pseudoaneurysm
- Arteriovenous fistula

ACUTE INTESTINAL ISCHEMIA

- Twice as common as a ruptured AAA
- There is a classic triad of symptoms: embolic source, pain out of proportion, intestinal emptying (vomiting and/or diarrhoea)
- Start on IV fluids, anticoagulation, pain relief.
- Needs urgent CTA
- If arterial obstruction – aggressive surgical or interventional treatment
- If venous obstruction – medical management, rarely surgical

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