NHS

Bedside Clinical Guidelines Partnership

Emergency Medicine Guidelines 2018–19

These guidelines are advisory NOT mandatory
Unless stated, drug doses assume normal renal and hepatic function
See BNF/BNFc for further advice

If you notice an error or omission, please let us know as soon as possible – bedsideclinicalguidelines@uhnm.nhs.uk

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General adult medical guidelines
General adult surgical guidelines
Nursing guidelines
Paediatric guidelines
Neonatal guidelines
Obstetrics guidelines
Emergency medicine guidelines

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PREFACE ● 1/2

Unless stated, drug doses assume normal renal and hepatic function

This book has been compiled as an aide-memoire for all staff concerned with the management of **patients attending the Emergency Department (ED)**. The guidelines have been drafted with reference to published literature and amended after consultation. Wherever possible, the recommendations made are evidence based. Where no clear evidence could be identified from published literature the advice given represents a consensus of the expert authors and their peers and is based on their practical experience.

No guideline will apply to every patient, even where the diagnosis is clear-cut; there will always be exceptions. These guidelines are not intended as a substitute for logical thought and must be tempered by clinical judgment in the individual patient.

These guidelines are advisory, NOT mandatory

Several of the guidelines included here make reference to other guidance published by the Bedside Clinical Guidelines Partnership. The user is reminded to ensure that the most recent version of each text is consulted.

The book is divided as follows:

Infection prevention

It is not always possible to identify individuals with an infection, so it is important for everyone to adopt a safe method of working to protect staff, patients and others from infection. These guidelines have been adapted from national guidance and should be **followed at all times**. This section includes guidance on the aspects of prevention and management of infection.

Clinical guidelines

Contains guidance on the assessment and management of key emergency presentations including:

- Management of cardiopulmonary resuscitation (adult and children) including verification of death
- Assessment and management of key aspects of major and minor trauma, including the use of the Major Haemorrhage Policy for trauma
- Management of common acute musculoskeletal problems (non-traumatic)
- Guidance on emergency presentations for ear, nose and throat, ophthalmology, obstetrics and gynaecology, acute medical problems, acute surgical problems and acute paediatric problems
- Prescribing: guidance on specific medications mentioned in the guidelines (also refer to the prescribing section in the **Medical** guidelines)

Application of the recommendations in these Emergency Medicine guidelines should be made in a manner that actively promotes individual patient's privacy and dignity and protects their modesty

DO NOT attempt to follow any of these guidelines unless you are deemed competent and have received the necessary education to do so

Additions and revisions

The editors acknowledge the infinite time and trouble taken by numerous colleagues in the drafting and amendment of the text. The accuracy of the detailed advice given has been subject to exhaustive checks. However, any errors or omissions that become apparent should be brought to the attention of the Clinical Guidelines Developer/Co-ordinator (01782 676697 or bedsideclinicalguidelines@uhnm.nhs.uk), so that these can be amended in the next review, or, if necessary, brought to the urgent attention of users. Constructive comments or suggestions would also be welcome.

Supporting information

Where possible, the guidelines are based on evidence from published literature. It is intended that evidence relating to statements made in the guidelines – and its quality – will be made explicit.

Where supporting evidence has been identified, it is graded 1 to 5 according to standard criteria of validity and methodological quality as detailed in the table below. A summary of the evidence supporting each statement is available, with the original sources referenced, on Trust intranet>Clinicians>Clinical guidance>Clinical guidelines>Emergency medicine>Supporting information. The evidence summaries are developed on a rolling programme, which are updated as each guideline is reviewed.

Level	Treatment benefits	Treatment harms	Prognosis	Diagnosis
1	Systematic review of randomized trials or n-of-1 trials	Systematic review of randomized trials, systematic review of nested case-control studies, n of-1 trial with the patient you are raising the question about, or observational study with dramatic effect	Systematic review of inception cohort studies	Systematic review of cross sectional studies with consistently applied reference standard and blinding
2	Randomized trial or observational study with dramatic effect	Individual randomized trial or (exceptionally) observational study with dramatic effect	Inception cohort studies	Individual cross sectional studies with consistently applied reference standard and blinding
3	Non-randomized controlled cohort/follow-up study	Non-randomized controlled cohort/follow-up study provided there are sufficient numbers to rule out a common harm	Cohort study or control arm of randomized trial	Non-consecutive studies, or studies without consistently applied reference standards
4	Case-series, case-control studies, or historically controlled studies	Case-series, case-control, or historically controlled studies	Case-series or case-control studies, or poor quality prognostic cohort study	Case-control studies, or poor or non-independent reference standard
5	Mechanism-based reasoning	Mechanism-based reasoning	n/a	Mechanism-based reasoning

Excerpt from: OCEBM Levels of Evidence Working Group. The Oxford Levels of Evidence 2. Oxford Centre for Evidence-Based Medicine. 2011. http://www.cebm.net/index.aspx?o=5653

Evaluating the evidence base of these guidelines involves continuous review of both new and existing literature. The editors encourage you to challenge the evidence provided in this document. If you know of evidence that contradicts, or additional evidence in support of, the advice given in these guidelines, please forward it to the Clinical Guidelines Developer/Co-ordinator, Room D17, Ground floor, West Building, University Hospitals of North Midlands NHS Trust, Royal Stoke University Hospital, Newcastle Road, Stoke-on-Trent, ST4 6QG (01782 676697 or e-mail: bedsideclinicalguidelines@uhnm.nhs.uk)

Evidence-based developments for which funding is being sought

As new treatments prove themselves more effective than existing ones, the onus falls upon those practising evidence-based healthcare to adopt best practice. New treatments are usually more expensive than older ones. Within the finite resources of the Trust and the NHS as a whole, the adoption of these treatments has to be justified in terms of the improvements they will bring to the quality or cost-effectiveness of care. The priorities for funding new areas of treatment and patient care will be determined at Trust level.

CONSENT ● 1/5

INTRODUCTION

Consent is a complex subject. This guideline provides a brief outline of the issues involved in assessing and informing adult patients (aged ≥18 yr), so they can give valid consent. For patients aged <18 yr, see **Trust policy C43** (Trust intranet)

Full Trust policy C43, 'Policy and Procedures for Obtaining Consent' is available on the intranet and must be adhered to at all times. Further information can also be obtained from 'Reference guide to consent for examination or treatment' 2nd edition 2009 https://www.gov.uk/government/publications/reference-guide-to-consent-for-examination-or-treatment-second-edition

CAPACITY

Assessing competence

- Adult patients are assumed to be competent unless demonstrated otherwise
- assume competence if patient able to understand and weigh up information needed to make decision
- unexpected decisions do not prove that a patient is incompetent, but may indicate the need for further information or explanation
- patients may be competent to make some healthcare decisions, even if not competent to make others

The greater the associated risks, the more stringent the consent process should be. This includes making comprehensive notes in the medical records

Does the patient have the capacity to consent?

- To decide whether an individual has capacity to make a decision, apply the two-stage test of capacity

Two-stage test of capacity

1 Does the person have an impairment or disturbance in the functioning of his/her mind or brain?
If the answer to this question is 'yes'

2 Has the impairment deprived him/her of the capacity to make **this particular decision?**

- In order to answer the second question you need to ask – can the patient:
- understand information about proposed treatment, its purpose and why it is being proposed?
- retain information for long enough to make an effective decision?
- use or weigh that information as part of the decision-making process?
- understand the benefits, risks and alternatives?
- understand the consequences of his/her refusal?
- communicate his/her decision (whether verbally, using sign language or other means)?

Where there is any doubt or disagreement about whether the patient has capacity, an application to the court MAY be necessary – you must seek advice, in office hours Monday–Friday, from Legal Services Department or, out-of-hours, from the medical director or executive director on-call, via hospital call centre (0)

CONSENT

When

- Consent is required before an adult is:
- examined
- treated
- cared for
- Consent must be given before commencing a procedure or treatment other than in exceptional circumstances, such as:
- life-saving procedures
- emergencies
- Giving and obtaining consent is usually a process that should start as soon as a patient is offered a procedure, so that s/he has time to assimilate the information. It is not a one-off event and should be revisited should the situation change

Refusal of treatment

- A competent adult has the right to refuse treatment, and it is morally and ethically wrong to persuade him/her otherwise, even if the decision seems apparently irrational. His/her refusal is binding
- A competent pregnant woman may refuse treatment, even if this would be detrimental to the fetus. Advice should be sought from the Legal Services Department where a fetus is placed in danger as a result of a mother's refusal of treatment as it may be appropriate to revert to the Court of Protection
- If the patient refuses, ensure s/he clearly understands the implications of refusal and that it may result in death
- A patient can withdraw consent at any time and has the right to stop treatment at any stage
- if there is any doubt, check that the patient still wishes to proceed

Exception to this rule

- The only exception applies to treatment for a mental disorder in a patient detained under the Mental Health Act. However, this does not preclude the individual from giving or withholding consent to treatment for physical conditions and an assessment of the patient's capacity to consent must be made as above

Consent must be given voluntarily and not under any form of duress or undue influence from healthcare professionals, family or friends

Format of consent

- Consent can be:
- written
- oral
- implied (i.e. patient offering arm for the taking of blood). It would be good practice to document the actions/conversation around implied consent

A signature on a consent form does not in itself prove that consent is valid – the law now requires explanation of all 'material risks'. A risk is material if 'that patient' would attach significance to it

Implied consent

- Assumed when, following explanation of the proposed procedure/treatment, patient indicates willingness to proceed by co-operating, for example:
- extending arm to have blood taken

Expressed consent

- Must be obtained for any procedure carrying a 'material risk' – a risk is material if that patient would attach significance to it
- Usually given in writing by signing consent form, but can be given orally with written documentation supporting the oral discussion
- Consent need not necessarily be spoken, but should be clear and interpretable (e.g. hand squeeze) and should be given free from duress

Expressed consent must be recorded in patient's clinical records; a consent form alone is no longer enough

SEEKING VALID CONSENT IN A COMPETENT ADULT

Who

- Doctor in charge of patient's care/surgeon capable of performing the procedure should be the person gaining consent from the patient

Obtain correct forms

- Use a standard NHS consent form
- **consent form 1** – for patient agreement to investigation or treatment
- short **consent form 3** – for patient agreement to investigation or treatment for procedures where consciousness is not impaired
- Read notes on consent form carefully so that you are fully aware of content
- Complete box containing patient's details, and 'type of operation, investigation or treatment' which **must** state side of body/head **in full** (**right** or **left**, **not R** or **L**) where this is relevant

Identify patient correctly

- By name
- By date of birth
- By hospital number and/or NHS number
- Ensure a senior colleague in clinic or hospital has seen patient, and that procedure or operation is still needed. This information can be obtained from notes and by speaking to patient and/or senior clinician

Essential information

- Allow patient to make a balanced decision about proposed procedure/treatment by giving sufficient information about material risks (i.e. would that patient attach significance to the risk?):
  - nature
  - purpose
  - benefits and material risks
  - alternatives
- Present information in an open and unbiased way (document in notes what leaflet provided)
- Ensure patient understands explanation. If patient does not speak English, do not proceed further until an approved interpreter is available. If an interpreter has been used, the consent form must be signed by doctor and interpreter in addition to patient. It is not appropriate to use a family member or friend to interpret
- After full discussion of procedure or operation with patient, allow him/her to read the consent form and leaflets provided
- Where a patient is unable to sign their name, a mark or sign made by the patient is adequate
- Where a patient is unable to physically sign a consent form but is able to express their wish, it is acceptable for an advocate (nurse) to witness the process and to sign the consent form to this effect

If patient is not offered much information, in a form s/he can understand, as reasonably required to make a decision, consent will not be valid and may be challenged

Training programmes

- If the patient does not wish to be involved in student training programmes, document this on consent form and in medical notes, and inform consultant responsible for care. Reassure patient that care is not compromised by this refusal

Document

- Document discussion in case notes, including risks and benefits explained
- Fill in consent form and make additional notes in the medical records
  - if patient satisfied with explanations given by you, fill in and sign part to be completed by doctor/dentist/healthcare professional
  - if explanation was given by a colleague and patient is satisfied with explanation from that colleague, document name of doctor/dentist/healthcare professional who explained procedure; to take consent, they should be capable of undertaking the procedure
  - a patient wishing to refuse some aspects of treatment or care (e.g. a Jehovah's Witness refusing blood transfusion) must list procedures that s/he does not want to receive. There is a space provided in the 'statement of the patient' section of the form
  - if patient agrees to procedure or operation with or without any documented refusals, s/he completes and signs 'statement of the patient' section of the form
  - doctor/dentist/healthcare professional signs form, having given detailed explanation of consequences of any refusals
  - make detailed record of this in patient's medical notes
- Ensure all team members, including surgeon and anaesthetist performing procedure or operation, are fully aware of any refusals and are able to comply with patient's wishes while performing procedure or operation (e.g. Jehovah's Witness refusing blood transfusion)

Give patient a copy of the consent form detailing nature, risks and benefits of procedure and patient leaflet where appropriate

VALID CONSENT FOR AN ADULT PATIENT WITHOUT CAPACITY

Decision maker

- Decisions whether to undertake treatment will be made by the 'decision maker' – the person proposing to take action on behalf of a patient who lacks capacity, usually the consultant. The decision maker must first determine what action would be in the 'best interests' of person lacking capacity and must take note of the statutory 'best interests' checklist under section 4 of the Mental Capacity Act
- If the treating consultant is unavailable, his/her staff grade doctor or senior trainee (but no one less senior) may deputise, provided that the decision is endorsed by consultant at the earliest opportunity

Whom to involve in decision

- Involve all relevant disciplines
- Discuss with those who have an interest in the patient's welfare or those with a statutory right to be involved (lasting power of attorney/court appointed deputy)
- If patient is judged to lack capacity has no one **other** than paid carers to look after them (i.e. no consultable friends or family), you must appoint an Independent Mental Capacity Advocate (IMCA)
- IMCA's duty is to try and ascertain what would have been the patient's wishes if s/he still had capacity. Information provided by IMCA must be taken account of by the decision maker when deciding what is in the patient's best interests but the IMCA cannot decide what treatment is given; this rests with the decision maker
- to appoint an IMCA, contact the safeguarding team
- Establish if patient has appointed an attorney under a 'Lasting Power of Attorney' (LPA) or a court-appointed deputy has been appointed (for health and welfare), for whatever reason, to act on patient's behalf. Legal advice may be needed to ascertain whether LPA is relevant to the situation
- where an attorney under an LPA has been appointed, it is his/her responsibility to inform clinicians

Advance decisions/directives

- A person may make an advance decision under the Mental Capacity Act if s/he is aged ≥18 yr and has the capacity to make the decision
- If the advance decision refuses life-sustaining treatment, it must be in writing, be signed and witnessed, **and state clearly that the decision applies even if life is at risk**
- ask about an advance decision (living will/advance directive – this will be called an advance decision and must be in writing as it applies to life-sustaining treatment) or an LPA. If there is evidence of any of these and you are unsure whether they apply, seek advice from Legal Services Department

Best interests

- Before reaching a conclusion about best interests:
- do not make assumptions about a person's best interests merely on the basis of his/her age, appearance, condition or behaviour
- try to identify all matters and circumstances relating to decision in question, which are most relevant to person who lacks capacity
- consider whether person is likely to regain capacity. Can the decision wait until then?
- do whatever is possible to permit and encourage the person to participate, or to improve his/her ability to participate as fully as possible in making decision
- if the decision concerns provision or withdrawal of life-sustaining treatment, you must not be motivated by a desire to bring about the patient's death. Do not make assumptions about the person's quality of life
- Try to find out views of person lacking capacity, including:
- past and present wishes and feelings – current views and whether s/he has expressed any relevant views in the past, verbally, in writing or through behaviour or habits
- beliefs and values (e.g. religious, cultural or moral) that would be likely to influence the decision in question
- other factors that patient would be likely to consider if able to do so

- Consult other people, if it is practicable and appropriate to do so, for their views about patient's best interests and obtain any information about patient's wishes, feelings, beliefs or values. But be aware of patient's right to confidentiality
- In particular, seek views of:
- relatives and carers, partners, close friends, any person previously named by person lacking capacity as someone to be consulted, any person having reasonable claim to have his/her views taken into account and, if appointed, IMCA (see above), attorney of an LPA, court-appointed deputy
- healthcare professionals, including GPs and nursing homes, to establish premorbid health and quality of life, and 'best interests'

Deprivation of liberty

- In April 2009, Deprivation of Liberty Safeguards (DoLS) were introduced as an amendment to the Mental Capacity Act 2005 (MCA) and are designed to ensure that any person lacking capacity to consent to care or treatment is suitably protected against arbitrary detention. If the patient is under compete and effective control in respect of their care and movements, and not free to leave without permission, then an application should be made to the Local Authority for permission to deprive them of their liberty – for advice, contact the safeguarding team

Disagreement

- Application to court may be necessary. Seek advice from Legal Services Department, where there is:
- lack of unanimity among clinicians as to patient's condition, prognosis or 'best interests'
- lack of unanimity about whether treatment is appropriate
- evidence that patient, when competent, would have wanted treatment either to be given or not given and this is contrary to views of clinicians
- evidence that patient resists or disputes proposed treatment
- anyone with a reasonable claim to have their views or evidence taken into account (such as a parent, relative, partner, close friend or long-term carer) who asserts that the proposed course of treatment or failure to treat is contrary to patient's wishes or not in patient's best interests

Procedure when patient lacks capacity to give or withhold consent

- Never use standard consent forms for adult patients unable to consent for themselves
- If an adult patient does not have capacity to give or withhold consent for a significant intervention, document this fact in consent form 4 (form for adults unable to consent to investigation or treatment), along with assessment of patient's capacity, why healthcare professional believes treatment to be in patient's best interests, and involvement of people close to the patient. Where second opinion sought, person giving second opinion should also sign form to confirm agreement with decision to proceed
- For more minor interventions, this information needs to be entered only in patient's notes

When an application to the court of protection is a legal requirement

- In some circumstances the court of protection must be asked to make a decision on behalf of the patient:
- the proposed withholding or withdrawal of artificial nutrition and hydration (ANH) from a person in a permanent vegetative state or minimally conscious state
- where it is proposed that a person who lacks capacity to consent should donate an organ or bone marrow to another person
- the proposed non-therapeutic sterilisation of a person who lacks capacity to consent (e.g. for contraceptive purposes)
- where there is a dispute about whether a particular treatment will be in a person's best interests
- In the above circumstances, contact the Legal Services Department

STANDARD INFECTION PREVENTION MEASURES ● 1/2

CLINICAL AREAS

Standard precautions are the essential infection prevention measures necessary to reduce the risk of transmission of infectious agents to patients, staff and visitors

Standard precautions are to be used by all staff, for all patients in all care settings at all times on the assumption that all contact with blood, body fluids, secretions and excretion (except sweat), non-intact skin and mucous membranes, along with contact with the healthcare environment may result in the transmission of infectious micro-organisms

Staff

All healthcare workers must be aware of their individual responsibility for infection prevention

- Carry out regular and thorough hand hygiene and follow the World Health Organisation "5 moments for hand hygiene" – see **Hand hygiene** section of the Infection Prevention Questions and Answers Manual IP01b
- Cover all cuts and grazes with waterproof dressings
- All healthcare workers must ensure that their hepatitis B status is known and that they are up-to-date with all vaccinations, including influenza vaccination which is offered to all staff
- Any healthcare workers who develop symptoms of diarrhoea and/or vomiting (which cannot be explained) should report these symptoms to occupational health and should remain off work until symptom-free for 48 hr
- Staff who develop vomiting and/or diarrhoea (which cannot be explained) while on duty, please inform the staff member in charge of the area. Inform your line manager and return home until 48 hr after your symptoms have stopped
- Report any skin lesions or recurrent infections to occupational health

Patients

- Patients must be promptly assessed for infection risk on admission, before admission if possible and throughout their stay the assessment should influence placement decisions in accordance with clinical needs. Check iPortal for any infection prevention alerts. Assess risk in all patients, isolating patients with conditions that increase the risk of spreading micro-organism to others (e.g. suspected or known infectious diarrhoea, exfoliative skin condition, large open wound, productive cough)
- Patients should be encouraged and must be offered the opportunity to clean their hands before meals; before taking oral medication; after using the toilet commode or bedpan/urinal; and at other times as appropriate

Environment

- Maintain clean and dust-free environment
- Increase levels of cleaning in outbreak situations – infection prevention team (IPT) will advise domestic services/Sodexo services and ward manager on frequency and type of cleaning required for outbreak situations
- Use Virusolve 5% for daily cleaning of hard surfaces in all adult areas (or Tristel fuse and Tristel Jet disinfectant at County Hospital)

General equipment

- Use single patient use or disposable equipment where possible
- Never attempt to decontaminate or reuse single use items
- Decontaminate reusable equipment after use
- Follow manufacturers' instructions for cleaning
- A number of cleaning products are available: refer to decontamination policy

Protective equipment

- See **Use of personal protective equipment section of the Infection Prevention Question and Answers Manual IP01b**
- For invasive procedures, during contact with sterile sites, non-intact skin and mucous membranes, and when handling sharps and contaminated equipment, wear gloves
- When there is a risk that clothing or uniform will become contaminated, or there is close contact with a patient, wear disposable apron

STANDARD INFECTION PREVENTION MEASURES ● 2/2

- Use fresh apron and gloves for each patient and for each different care activity on the same patient
- If risk of extensive splashing, wear full-body fluid-repellent gown
- If there is a risk of splashing into eyes or mouth, wear eye and face protection
- For multi-drug resistant pulmonary tuberculosis, SARS, you must wear an FFP3 mask and must previously have been fit-tested to ensure it is effective
- See Personal protective equipment section of the Infection Prevention Questions and Answers Manual IP01b for the use of FFP3 masks during aerosol generating procedures

Linen, waste and sharps

- Wear appropriate personal protective equipment
- Handle linen and waste correctly
  - place soiled linen in skip at bedside
  - place clinical waste in orange bag
- Needle safety devices should be used where there are clear indications that they will provide safer systems of working for healthcare staff
- Take sharps box (with blue tray) to point of use and dispose of the sharp directly immediately into the sharps container after use
- Never leave sharps for someone not involved in procedure to clear away
- Never re-sheath needles
- Dispose of needles attached to syringes as a single unit
- **Do not** fill sharps containers above the manufacturers marked line which indicates that they are full

Microbes isolated

- If alerted to identification of specific organism, follow appropriate guidelines. See flowcharts in guidelines for **Meticillin-Resistant *Staphylococcus Aureus* (MRSA), Extended Spectrum Beta-Lactamase producing Gram-negative bacilli (ESBL), *Clostridium difficile*** and **Carbapenemase-producing Gram-negative bacilli**

Antimicrobials

- Use antimicrobials rationally. See appropriate guideline in **Medical, Surgical** or **Antimicrobial prescribing** guidelines

INFECTION PREVENTION TEAM

- If in doubt, contact IPT for advice
- Poo help-line
  - during normal working hours: call infection prevention nurses or bleep via call centre (0)
  - out-of-hours: contact on-call microbiologist via call centre (0)

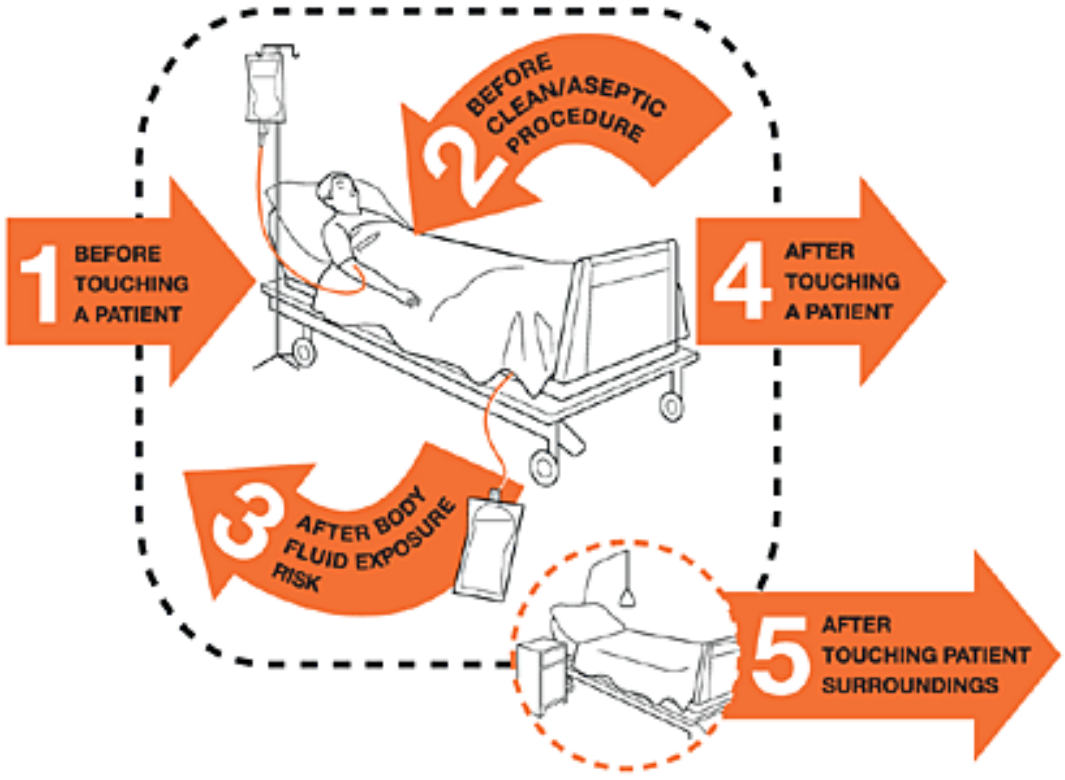
HAND HYGIENE ● 1/4

Hand hygiene is a term used to describe cleaning and/or decontamination of hands by using soap and water, antiseptic wash or by using an alcohol hand rub solution
Good hand hygiene is the most effective way to prevent spread of infection. Use this safe method of working at all times to protect staff, patients and others from infection.
All practitioners are personally accountable for their hand hygiene practices
***Refer to the latest version of the* Hand hygiene section of the Infection Prevention Question and Answers Manual IP01b**

ASSESSMENT OF NEED TO DECONTAMINATE HANDS

Hands must be decontaminated at critical points before, during and after patient care to prevent cross infection of micro-organisms. The World Health Organisation (WHO) "5 moments for hand hygiene" has been adopted as a standard model for hand hygiene compliance guidance and training at University Hospitals of North Midlands

- **Hand decontamination must be carried out at the 5 moments of care regardless of whether or not gloves have been worn**
- before touching a patient
- before and after clean/aseptic procedure
- after body fluid exposure
- after touching a patient
- after touching patient surroundings



- **Hands must also be decontaminated**
- on arrival at and before leaving a ward or department
- after visiting the toilet
- before serving/preparing food or drinks
- after any activity or contact that potentially results in hands becoming contaminated
- on entering and leaving an isolation cubicle
- after removal of gloves

CHOICE OF HAND HYGIENE PREPARATIONS

- Alcohol hand rub: is an effective method of hand decontamination on visibly clean hands but is not recommended when hands are visibly dirty

Alcohol hand rub alone must not be used after caring for patients (or their equipment/environment) who have suspected or known infectious diarrhoea such as* Clostridium *difficile or* Norovirus*, regardless of whether gloves are worn

- Hand washing with liquid soap and water removes dirt, organic matter and transient flora by mechanical action and should be used
- when hands are visibly dirty or visibly soiled with body fluids or other organic matter
- when caring for patients with suspected or confirmed diarrhoea and/or vomiting, patients with *Clostridium difficile* or Norovirus and during outbreaks of these organisms on wards or in bays
- after several consecutive applications of alcohol hand rub
- after visiting the toilet
- Liquid soap alone does not provide sufficient hand disinfection before invasive procedures and surgery
- For aseptic non touch technique (ANTT) it is recommended that hand washing with liquid soap is followed by the use of alcohol hand rub before and, if required, during procedure
- Use of preparations containing antiseptic (chlorhexidine, povidone iodine) is required in situations where prolonged reduction in micro-organisms on the skin is necessary i.e. surgery, some invasive procedures or in outbreak situations

TECHNIQUE FOR HAND HYGIENE

- Bare below elbow for all staff working within clinical areas (e.g. no sleeves below elbow, no wrist watches, wrist jewellery or plaster casts/wrist splints)
- Do not wear false nails, nail extensions, gel nails or nail varnish
- Keep nails short and clean
- Before clinical work shift begins, remove stoned rings, wrist watches or other wrist jewellery
- Cover cuts and abrasions on hands and arms with waterproof dressings

Washing with soap and water

- Turn on taps using elbows if possible
- Wet hands under warm running water before applying soap or antiseptic detergent, lather well and rub vigorously for a minimum of 10–15 sec, paying particular attention to tips of fingers, thumbs and between fingers
- Use technique that covers all surfaces of hands and wrists (see **Figure 1** or Trust Hand hygiene section of the Infection Prevention Question and Answers Manual IP01b)
- Rinse thoroughly
- Turn of taps using elbow where applicable (some taps are sensor operated)
- Dry hands with a disposable paper towel
- Hand dryers are not recommended in clinical areas
- Dispose of paper towel in bin using foot operated mechanism to prevent contamination of hands

Using alcohol-based hand gel

- Apply alcohol-based gel paying particular attention to tips of fingers, thumbs and between fingers, and rub hands together until solution has evaporated and hands are dry
- ensure all areas of hands and wrists are covered and rub hands together (see **Figure 2** or Trust Hand hygiene section of the Infection Prevention Question and Answers Manual IP01b)

SKIN PROTECTION

- Apply an emollient hand cream regularly to protect skin from damaging effects of regular hand washing and use of alcohol-based hand gel

If any lesions or recurrent skin infections, or if any decontamination product causes skin irritation, contact occupational health

Figure 1


How to wash hands
WITH SOAP AND WATER
40-60 secs
1
Wet hands with water
2
Apply one shot of soap
3
Rub hands palm to palm
4
Rub back of each hand with the palm of other hand with fingers interlaced
5
Rub palm to palm with fingers interlaced
6
Rub backs of fingers to opposing palms with fingers interlocked
7
Rub each thumb clasped in opposite hand using rotational movement
8
Rub tips of fingers in opposite palm in a circular motion
9
Rub each wrist with opposite hand
10
Rinse hands with water
11
Use elbow to turn off tap
12
Dry thoroughly with a single-use towel

Figure 2


How to sanitise hands
WITH ALCOHOL SANITISER
20-30 secs
1a
1b
2
Apply one shot of the product in a cupped hand
Rub hands palm to palm
3
4
5
Rub back of each hand with the palm of other hand with fingers interlaced
Rub palm to palm with fingers interlaced
Rub backs of fingers to opposing palms with fingers interlocked
6
7
8
Rub each thumb clasped in opposite hand using rotational movement
Rub tips of fingers in opposite palm in a circular motion
Rub each wrist with opposite hand

USE OF PERSONAL PROTECTIVE EQUIPMENT (PPE) ● 1/2

As it is not always possible to identify individuals with an infection, adopt this safe method of working at all times to protect staff, patients and others from infection.
PPE is equipment to help protect staff, patients and visitors from the risk of infection. It includes items such as gloves, aprons, gowns, masks, eye, facial protection, head cover and fluid repellent footwear e.g. Wellington boots. Refer to the latest Personal protective equipment sections of the Infection Prevention Question and Answers Manual IP01b

Selection of personal protective equipment will follow a risk assessment which will be carried out by the person performing the procedure and must be based on:

- Risk of transmission of the micro-organism to patient or healthcare worker
- Risk of contamination of the healthcare workers clothing or skin by the patient's blood or body fluid
- Suitability of the personal protective equipment for proposed use

GLOVES

When

Wear disposable gloves (see **Choice** below) for:

- Invasive procedures
- Performing aseptic non touch technique (ANTT)
- Contact with sterile sites, non-intact skin or mucous membranes
- Managing surgical wounds
- Anticipated contact or exposure to blood, body fluids, secretions and excretions
- Handling sharp or contaminated instruments
- Application of topical preparations
- Contact with cytotoxic agents
- Contact with chemicals
- When decontaminating equipment

How

- Use non-latex gloves
- Gloves should be put on immediately before required and removed as soon as activity is completed
- Following removal of gloves, decontaminate hands
- Change gloves between care activities for different patients or between different care activities on the same patient
- gloves are single-use items

Choice

- Choice of sterile or non-sterile will depend on the intended procedure. A range of CE-marked gloves of different sizes and suitable for the task should be available in all clinical areas

FLUID-REPELLENT GOWNS AND PLASTIC APRONS

Fluid-repellent gowns

- If there is a risk of extensive splashing of blood and body fluids (e.g. dealing with major trauma or during major surgical procedures, or for certain infections), wear a full-body fluid-repellent gown

Plastic aprons

- If there is a risk that clothing or uniform may be exposed to blood, body fluids, secretions and excretions, wear a disposable plastic apron
- When caring for patients with certain infections e.g. Clostridium *difficile*
- Change plastic aprons between patients and between different care activities on the same patient
- aprons are single-use items

MASKS, EYE AND FACE PROTECTION

When

- Depends on known or suspected infectious status of patient, presenting symptoms and task involved
- Protective eyewear and face shields must be worn when it is anticipated that secretions, excretions or blood may be splashed or sprayed towards the face, for example, during delivery procedures, surgical/invasive procedures, severe trauma or other patient care activities, e.g. suctioning, chest physiotherapy
- Regular spectacles are not considered as eye protection
- During resuscitation/intubation and exubation of a patient with suspected/confirmed serious infection e.g. meningitis
- Masks are single-use items and should be discarded in the clinical waste bins

USE OF PERSONAL PROTECTIVE EQUIPMENT (PPE) ● 2/2

Splash and droplets

- **Droplets**: expelled from the respiratory tract of an infected individual e.g. during coughing and sneezing may fall directly onto mucous membrane of a susceptible individual. A distance of 1 m has been used to define the need for droplet precautions; however, this distance is recommended as the minimum rather than an absolute distance
- Protection: barriers to protect eyes, nose, mouth and upper respiratory tract of those exposed
- **Surgical face masks with eye protection:** provide a barrier to splashes and droplets impacting on the wearer's nose, mouth and respiratory tract. They **do not** provide protection against airborne (aerosol) particles. Surgical masks must be fluid resistant to protect against infection
- Aerosol generating procedures can break droplets into small enough particles that can remain suspended in the air for longer periods of time and travel longer distances; these are called droplet nuclei (see **Airborne transmission**)

Airborne transmission

- Aerosol particles that may contain infectious agents: generated from respiratory tract during coughing, sneezing and during **aerosol generating procedures**, particles can remain in the air for long periods of time and carried over long distances by air currents
- See Personal Protective Equipment section of the Infection Prevention Questions and Answers Manual IP01b for a list of aerosol generating procedures
- FFP3 (respirator) masks provide respiratory protection from airborne transmitted organisms and during aerosol generating procedures; FFP3 masks are available with/without a valve
- Before using a FFP3/respirator mask, it must be verified that each user has a mask that is suitable for the their face shape and that they can put it on so that it leaves no gaps between the mask and their face for air to pass through unfiltered. This process is known as '**fit testing**'
- it is a legal requirement that staff who are required to wear a FFP3 (respirator) mask be fit tested by a competent person and that the results are satisfactory, and those results are recorded and available
- mask fit key trainers are available throughout the Trust. Mask fit testing should form part of the ward/departments local induction training of staff

REMOVAL OF PERSONAL PROTECTIVE EQUIPMENT

Remove personal protective equipment in the following sequence

1. Gloves
2. Apron/gown
3. Decontaminate hands
4. Eye protection
5. Mask/respirator
6. Decontaminate hands

NEEDLESTICK AND SEXUAL EXPOSURE TO HIV/HBV – PEP/PEPSE ● 1/2

BACKGROUND

- Blood-borne viruses (BBV) can be transmitted by:
  - accidental needlestick injury
  - mucocutaneous exposure to infected fluids
  - sexual exposure
  - bites and injuries
- Blood borne viruses include:
  - human immunodeficiency virus (HIV) – least likely
  - hepatitis B virus (HBV) – most likely
  - hepatitis C virus (HCV)
- Any body fluid especially if visibly bloodstained can present a risk of infection
- HIV cannot penetrate intact skin

Risks of viral transmission from different exposures (known HIV or Hepatitis +ve source except community needlestick)

Exposure	Risk
HIV	
Community needlestick (source unknown)	<1 per 100,000
Occupational needlestick injury	3.2 per 1000
Single vaginal intercourse	1–2 per 1000
Single anal intercourse	1–30 per 1000
Mucocutaneous/ocular exposure to blood	1 per 1000
Hepatitis	
Occupational needlestick injury: HBV	230–300 per 1000
Occupational needlestick injury: HCV	0–7 per 1000

RISK ASSESSMENT

- Careful history and examination to assess the risk of presence of HIV, HBV and HCV
- If presenting after sexual exposure, complete **Post Exposure Prophylaxis for Sexual Exposures (PEPSE) case record** (file kept in A-bay)

Low risk

- Mucous membrane or conjunctival contact with blood or body fluids
- Superficial (intradermal) injury associated with needle or instrument contaminated by blood or body fluid
- Human to human bites

Moderate risk

- Skin-penetrating needle contaminated with blood or body fluid
- Wound causing bleeding and produced by sharp instrument visibly contaminated with blood
- Vaginal intercourse with assailant of unknown HIV status

High risk

- Significant exposure to blood or body fluids from source known to be HIV, HCV or HBV infected
- Anal intercourse
- Vaginal or receptive oral intercourse with other risk factor as above with source of unknown status

POST EXPOSURE PROPHYLAXIS (PEP)

HIV

- HIV PEP is most effective if started within 1 hr of exposure, but may be beneficial up to 72 hr after exposure
- Patient should agree to take drugs for a total of 28 days
  - counsel about likely side-effects (see Patient information sheet) and importance of compliance to prescribed regimen
- Adult exposure: advise patient to attend GU medicine clinic (Cobridge Health Centre 0800–1600 hr next working day). Fax patient case record to GU medicine (01782 441821)
- Paediatric high risk exposure: discuss with on-call paediatric registrar and request an appointment to see a paediatric consultant within 72 hr if starting HIV PEP (see **Paediatric** guidelines)

NEEDLESTICK AND SEXUAL EXPOSURE TO HIV/HBV – PEP/PEPSE ● 2/2

Hepatitis

HBV

- Hepatitis B vaccine accelerated course (0, 1, 2 and 12 months)
- Hepatitis B immunoglobulin only if source known to be HBsAg +ve infected

HCV

- No recognised PEP for HCV
- Patient may be counselled that, in event of HCV seroconversion, therapy increasingly successful and it is worth testing for this virus

IMMEDIATE MANAGEMENT

Source: Sexual exposure to HIV

- Complete **Post Exposure Prophylaxis for Sexual Exposures (PEPSE) case record** for all possible HIV exposures. Fax PEPSE case record to GU medicine (01782 441821)
- Advise patient to attend GU medicine clinic (Cobridge Health Centre 0900–1130 hr next working day) for STI/hepatitis screen

Indications for PEPSE include any of following in preceding 72 hr

- Unprotected ano-genital sex with known HIV +ve partner
- Unprotected ano-genital sex with partner from sub-Saharan Africa
- Unprotected ano-genital sex with man who has sex with men
- Unprotected ano-genital sex with partner who is current or ex-IVDU
- Victim of unprotected sexual assault
- Unprotected receptive oral sex with ejaculation with known HIV +ve man

- If any indication found prescribe and dispense PEPSE: Truvada® 1 tablet daily and Raltegravir 400 mg 12-hrly (located in A&E Majors Omnicell)

Source: Needlestick

- Discarded needle and syringe are not useful
- Assess extent of wound and clean thoroughly
- Document circumstances of injury/exposure and the patient's immunisation status

Unknown source

- Counsel about risks of HIV, HBV and HCV transmission
- Offer to take blood for baseline serology (HIV and Hepatitis C, B)
- Discuss risk-benefits of HIV PEP (not currently recommended in Staffordshire)
- Offer accelerated HBV immunisation or if already immunised, booster

Known source: HIV or Hepatitis B positive

- Counsel about risk of HIV, HBV and HCV transmission
- Offer to take blood for baseline hepatitis and HIV serology and FBC, U&E, LFT if antiretroviral therapy is to be started
- **HIV positive source** – recommend HIV PEP: prescribe Truvada® 1 tablet daily and Raltegravir 400 mg 12-hrly (located in A&E Majors Omnicell)
- **Hepatitis B positive source** – offer accelerated HBV immunisation or if already immunised, booster plus:
- HBV immunoglobulin if patient has had ≤1 dose hepatitis B vaccine before
- Follow-up:
- adults: refer to GU medicine for follow-up (send PEPSE case record fax referral)
- child: discuss with on-call paediatric team

HIV INFECTION TESTING • 1/3

INTRODUCTION

- HIV is a treatable medical condition and the majority of those living with the virus in the UK are well
- Many are unaware (approximately 25%) of their HIV infection but their own health remains at risk and they may pass the virus unwittingly to others
- Late diagnosis is the most important factor associated with HIV-related morbidity
- HIV testing should occur in a wide variety of settings and all doctors should be able to obtain informed consent for an HIV test in the same way they do for any other medical investigation

HIV testing remains voluntary and confidential

WHO SHOULD BE OFFERED A TEST?

- Patients presenting with clinical features compatible with HIV, including primary HIV infection, as a differential diagnosis (see **Table**)
- Anyone exposed to HIV risk e.g. needlestick injury, both the person exposed and potential source

Primary HIV infection (PHI)

- Symptomatic PHI occurs in approximately 80% of individuals infected by HIV, typically 2–4 weeks after infection
- Typical symptoms include a combination of any of:
- fever
- rash (maculopapular)
- myalgia
- pharyngitis
- headache/aseptic meningitis
- Resolves spontaneously within 2–3 weeks
- If PHI suspected, contact on-call genito-urinary physician via call centre

Table: Clinical indicator diseases for adult HIV infection

	AIDS-defining conditions	Others where testing should be offered
Respiratory	• Pneumocystis pneumonia • Tuberculosis	• Bacterial pneumonia • Aspergillosis
Neurology	• Cerebral toxoplasmosis • Primary cerebral lymphoma • Cryptococcal meningitis • Progressive multifocal leucoencephalopathy	• Aseptic meningitis • Space occupying lesion of unknown cause • Guillain-Barré syndrome • Transverse myelitis • Peripheral neuropathy • Dementia • Leucoencephalopathy
Dermatology	• Kaposi's sarcoma	• Severe/recalcitrant • seborrhoeic dermatitis/psoriasis • Multidermatomal or recurrent herpes zoster
Gastroenterology	• Persistent cryptosporidiosis	• Oral candidiasis • Oral hairy leukoplakia • Chronic diarrhoea/weight loss of unknown cause • *Salmonella, Shigella* or *Campylobacter* • Hepatitis B/C infection
Oncology	• Non-Hodgkin's lymphoma	• Anal cancer/intraepithelial dysplasia • Lung/head and neck cancer • Seminoma • Hodgkin's lymphoma • Castleman's disease
Gynaecology	• Cervical cancer	• Vaginal intraepithelial neoplasia • Cervical intraepithelial neoplasia Grade 2 or above
Haematology		• Any unexplained blood dyscrasia
Ophthalmology	• Cytomegalovirus retinitis	• Infective retinal diseases

	AIDS-defining conditions	Others where testing should be offered
ENT		• Lymphadenopathy of unknown cause • Chronic parotitis • Lymphoepithelial parotid cysts
Other		• Mononucleosis-like syndrome • Pyrexia of unknown origin • Anyone with a mother who is HIV positive no matter what age • Anyone who has a partner who is HIV positive • Men who have sex with other men • Female sexual contacts of men who have sex with men • Patients reporting use of injecting drugs • Anyone from a country of HIV prevalence >1% • Anyone who has had sex in a country of HIV prevalence >1% • Anyone who has had sex with someone from a country of HIV prevalence >1% • All pregnant women

HOW

Who can test?

- Doctor, nurse, midwife or trained healthcare worker

Pre-test discussion

- Primary purpose of pre-test discussion is to establish informed consent for HIV testing
- Lengthy pre-test HIV counselling is not a requirement unless patient requests or needs this
- Address patient issues and concerns. It is important that information given about the test and the virus is adequate to enable patient to make an informed decision
- If patient refuses test, explore reasons for refusal to ascertain that this is not because of misunderstanding about the virus or the consequences of testing
- If patient raises concerns about insurance cover or criminal prosecution for transmission of the virus as reason for not testing, explore further and correct any factual inaccuracies (see http://www.bhiva.org/guidelines.aspx)
- Some patients may need additional help to make a decision (e.g. English not their first language). It is essential to:
- ensure they have understood what is proposed and why
- establish they understand what a positive/negative HIV result means (some patients could interpret ‘positive’ as good news)
- Children and young people, and those with learning difficulties or mental health problems, may need additional support and time to understand what is proposed and to make a decision (see below)
- Discuss and agree arrangements for communicating result with patient at time of testing (particularly if test performed in outpatient or emergency care setting)

Testing where patient lacks capacity to consent (including unconscious patient)

- See **Consent** guideline – **Valid consent for an adult patient who is found to lack capacity**
- Discuss with consultant in genitourinary medicine or ID service
- Assessment of capacity relates to the specific issue in question (i.e. consent to HIV testing)
- Start from presumption that patient has capacity to make this decision
- Consider whether they understand what decision they are being asked to make and can weigh up the information relevant to the decision
- If patient lacks capacity to consent to an HIV test, consider whether this is temporary or permanent. If temporary, defer testing until they regain capacity, unless testing is immediately necessary to save patient’s life or prevent serious deterioration of their condition
- If lack of capacity likely to be permanent, seek a decision from any person with relevant powers of attorney or follow the requirements of any valid advance statements. If patient has not appointed an attorney or there is no advance directive, HIV testing may be undertaken where this is in patient’s best interests

The source patient in a needlestick injury or other HIV risk exposure

- Consent must be obtained from source patient before testing
- If source patient lacks capacity, discuss with infectious diseases or genitourinary medicine consultant
- The person obtaining consent must be a healthcare worker other than person who sustained the injury (see **Post-exposure prophylaxis** guidance available on Trust intranet: Clinicians>Clinical guidance>Clinical guidelines>Antimicrobial)

Documentation

- Document offer of an HIV test in patient's notes together with any relevant discussion:
- if patient refuses test, document reasons
- Written consent is usually not necessary (no longer necessary on electronic requests)

Confidentiality

- Testing clinician (or team) must give result of HIV test (if positive) directly to patient and not via any third party (including relatives or other clinical teams) unless patient has specifically agreed to this

POST-TEST DISCUSSION

- Clear procedures as to how patient will receive result must be in place, especially where result is positive
- Face-to-face provision of HIV test results is strongly encouraged for:
- ward-based patients
- patients more likely to have an HIV-positive result
- those with mental health issues or risk of suicide
- those for whom English is a second language
- young people <16 yr
- those who may be highly anxious or vulnerable

HIV negative result – post-test discussion

- Inform all patients of genitourinary clinical services and provide telephone number for self-referral
- If still within window period after a specific exposure, discuss need to repeat test at 3 months to definitively exclude HIV infection
- Seek specialist advice from/referral to genitourinary medicine or ID service see Trust intranet: http://uhns/media/744916/HIV%20Service%20UHNM%20Intranet.pdf
- In the following situations:
- those at higher risk of repeat exposure to HIV infection who may require advice about risk reduction or behaviour change, including post-exposure prophylaxis
- if reported as reactive or equivocal, refer to genitourinary medicine or ID service (may be undergoing seroconversion)

HIV positive result – post-test discussion

Non-genitourinary/ID specialist must discuss follow-up programme with infectious diseases/genitourinary specialist before informing patient of positive result

- For all new HIV positive diagnoses, test a second sample
- Testing clinician must give result personally to patient in a confidential environment and in a clear and direct manner
- If patient's first language not English, consider using an appropriate confidential translation service
- Refer to genitourinary medicine or ID service who will arrange appointment within 72 hr
- Genitourinary medicine/ID specialist team will perform more detailed post-test discussion (including assessment of disease stage, proposed treatment and partner notification)

Further information

www.bhiva.org

AGGRESSIVE AND VIOLENT PATIENTS ● 1/4

PREVENTION

- Very minor incidents can escalate into a violent situation. Communicate clearly to minimise escalation

RECOGNITION

Warning signs of impending violence

- Spontaneous self-reporting of angry or violent feelings or fluctuating levels of consciousness with prominent persecutory ideas
- Carers warn of imminent violence:
- increased restlessness, bodily tension, pacing, arousal
- increased volume of speech, erratic movements
- facial expression tense and angry, discontented
- refusal to communicate, withdrawal
- unclear thought processes, poor concentration
- delusions or hallucinations with violent content
- audible threats, or aggressive gestures
- recognition of signs apparent in earlier episodes

Context

- Aggression or agitation can occur in:
- psychiatric illness
- physical illness
- substance abuse
- personality disorder
- confusional state irrespective of underlying cause
- patients who have received drugs affecting CNS

PERSONAL (STAFF MEMBER'S OWN) BEHAVIOUR

- Maintain adequate distance
- Move towards safe place, avoid corners
- Explain intentions to patient and others
- Be calm, self-controlled, confident
- Ensure own body language is non-threatening
- Avoid sudden movements

SAFETY

- Do not attempt to deal with a violent patient on your own
- Keep other patients clear
- Keep other staff clear but within helping distance
- If possible, move patient to a quiet area

ASSESSMENT

Assessment must be by a fully registered doctor (FY2 or above). FY1 doctors are not qualified to assess mental capacity and must not attempt to do so. Inform senior member of medical team (SpR or consultant). If there are signs of impending violence, inform site manager who will identify any staff on duty who have been trained in restraint techniques

Assess using verbal de-escalation

- Engage in conversation, acknowledge concerns and feelings
- Ask for reasons for disquiet, encourage reasoning
- Ask for any weapon to be put down (not handed over)
- If patient too disturbed for such measures, or fails to respond:
- consider physical restraint by trained staff and/or police (see below)

History

- Try to take a history from the patient and those who know the patient
- ask whether this has happened before and how it was handled
- ask about any regular psychotropic medication

Mental state examination

- Carry out a mental state examination by noting:
- general appearance and behaviour of patient
- speech
- attention and concentration
- mood: subjective and objective
- thought: evidence of loosening of association, irrelevant thoughts, delusions, thoughts of self-harm or harm to others
- hallucinations
- evidence of cognitive impairment
- insight

Assess mental capacity

Be aware of Mental Capacity Act (2005)

- Capacity assessment is task/decision specific. The legal definition of someone who cannot make autonomous decisions is one who is unable to undertake the following:
- understand information about proposed treatment, its purpose and why it is being proposed
- retain that information long enough to be able to make a decision
- use or weigh that information as part of decision-making process
- communicate his/her decision – by any means possible (e.g. talking, using sign language or other means)

Where there is any doubt or disagreement whether patient has capacity, an application to the court will be necessary. You must seek advice, in office hours Monday–Friday, from Legal Services department or from medical director or executive director on-call via hospital call centre (0)

Physical examination

- If safe to do so, gain patient's consent and attempt a thorough physical examination, looking for sources of infection and/or neurological deficits
- if unsafe, document reasons and carry out examination once stable, or hand over to subsequent team if transferring patient to another ward or specialty

Assess risk factors for violence

- Young, male, history of violence
- Alcohol or other substance misuse, irrespective of other diagnosis
- Poor compliance with suggested treatments
- Antisocial, explosive or impulsive personality traits
- Active symptoms of schizophrenia or mania, in particular with:
- delusions or hallucinations focused on a particular person
- delusions of control, particularly with a violent theme
- specific preoccupation with violence
- agitation, excitement, overt hostility or suspiciousness

IMMEDIATE TREATMENT

Principles

- If acute mental illness suspected (e.g. schizophrenia or hypomania), refer to the RAID team or on-call psychiatrist via call centre
- If patient elderly with acute confusion, see **Delirium (acute confusional state) in older people** guideline
- If patient has symptoms and signs of alcohol withdrawal, see **Alcohol withdrawal** guideline
- If patient intoxicated, but fit to be arrested and taken into custody, request police assistance (if urgent, dial 9–999; if non-urgent, dial 08453 302010)
- If none of the above applies, options available depend on patient's mental capacity – see **Capacity** section in **Consent** guideline

Capable of making decisions

- Hold patient accountable for his/her actions
- Manage underlying cause of agitation
- **Do not administer medication without patient's consent**

Patient lacks capacity

Always ensure that any intervention used is the least harmful or restrictive of patient's basic rights and freedom, immediately necessary, reasonable, and in their best interest

- Conduct multidisciplinary discussion to decide whether rapid sedation is safe and appropriate
- Take all necessary means to prevent injury to self, other staff or patients, or damage to property
- consider use of physical restraint and/or medication – see below
- Manage underlying cause of agitation

PHYSICAL RESTRAINT

The use of any physical holding is the last resort. Once staff attempt to restrain a patient, a threatening situation may turn violent. Medical and nursing staff should not attempt to physically restrain the individual, but should request assistance from any staff on duty trained in physical restraint techniques and who have completed the clinical holding course/update

Under the Mental Capacity Act for a person lacking capacity, the person taking action must reasonably believe that restraint is necessary to prevent harm to the person who lacks capacity or staff and other patients

- When patients are restrained, it is done under 'common law' to maintain the safety of patient, staff and other patients. Any holding must be reasonable and proportional to the circumstances
- Use restraint only if there are sufficient staff to achieve this effectively and you perceive imminent danger because patient is:
- displaying prolonged and serious verbal abuse, threatening staff, or disrupting ward
- threatening or attempting self-injury
- at risk of prolonged over-activity with risk of exhaustion
- at risk of serious accident to self and/or others
- attempting to abscond if detained under Section and in an open ward. Best practice guidance decrees that there be a minimum of 2 staff to hold someone and 3 staff if the person is held on the floor
- Do not, under any circumstance, inflict deliberate pain
- Wherever possible, avoid holding someone on the floor (particularly in the prone position). Holding in any position should be for the minimum amount of time possible to manage the prevailing or perceived level of risk
- If no suitably trained staff available, or patient is making significant physical attacks or serious efforts to destroy property, leave the scene immediately and request police assistance (dial 9–999 and say clearly 'I am in fear for my safety')

The police will always respond to a call for assistance, but are not allowed to assist in restraining patients for treatment

MEDICATION

If new brain damage suspected, avoid medication until after CT scan.
Check prescription chart for previously prescribed drugs.
Reduce dosages of medication appropriately in the elderly or infirm

If patient is elderly refer to* Delirium (acute confusional state) in older people *guideline instead, especially for doses of medication bearing in mind that olanzapine and risperidone can cause serious side effects including strokes in older patients. Unless dose for elderly is specified below, doses of medication should be halved for older people

- In cases of substance misuse, treat any symptoms suggestive of withdrawal – see **Withdrawal of drug(s) of dependence** guideline
- Try to persuade patient to accept oral medication
- if this is not possible, use parenteral route (**do not mix two drugs in a syringe**)

- Recommended medication options are:
- lorazepam (prefer as first choice) 1 mg oral/IM repeated 6-hrly if necessary – adult maximum dose 4 mg in 24 hr (elderly 0.5–1 mg; maximum 2 mg in 24 hr). For IM injection, dilute lorazepam with an equal volume of water or sodium chloride 0.9%
- Use IM only when oral route not available
- If no response 1 hr after oral lorazepam, give oral olanzapine 10 mg (elderly 5 mg) or risperidone 1–2 mg (elderly 0.5–1 mg)
- If oral medication fails, consider IM treatment. If 1–2 mg of lorazepam (elderly 0.5-1 mg) used, have flumazenil to hand in case of respiratory depression. Alternatives are aripiprazole 9.75 mg, promethazine 50 mg **or**
- As a last resort, **and only after an ECG has been checked**, consider haloperidol 5 mg
- do not use haloperidol in patients with Parkinson's disease, heart disease or if patient is taking other drugs that prolong QT interval; a prolonged QT interval is a contraindication for prescribing haloperidol. The normal range of QTc interval is up to 440 milliseconds. QTc prolongation defined as >450 milliseconds for men and >470 for women
- In elderly patients do not use aripiprazole, promethazine or haloperidol 5 mg – see **Delirium (acute confusional state) in older people** guideline for treatment guidance
- If no response to 2 forms of medication, seek advice from RAID or on-call psychiatry team
- **Do not** prescribe beyond BNF limits, and be aware of the cumulative effect of combination medications and, if using haloperidol, the impact of first-pass metabolism and acute dystonia
- if using haloperidol, have procyclidine available in case of dystonic reaction

SUBSEQUENT MANAGEMENT

- Monitor vital signs
- Record BP, pulse, respiratory rate, hydration, pulse oximeter and level of consciousness as agreed by multidisciplinary team until fully conscious
- Record further care plan

Documentation

- Record incident clearly and fully afterwards
- Complete an adverse incident/Datix report with witness statements

Once stable

- Continue close observation as inpatient for at least 24 hr
- Reassess mental state and review patient's status under Mental Health Act
- Continue management of underlying condition
- When transferring patient between units, send details of:
- incident
- medication management
- subsequent management plan
- any unwanted effects
- any advance directives

FLUID RESUSCITATION ● 1/4

RECOGNITION AND ASSESSMENT

- In all patients at risk of hypovolaemia, make a clinical assessment of degree and type of fluid deficit taking account of clinical trends and context (history and examination)
- Use ABCDE (Airway, Breathing, Circulation, Disability, Exposure) approach – see also NICE **Algorithms for IV fluid therapy, Assessment & Management** http://bit.ly/1Bzp6lj (pathways.nice.org.uk)

Oliguria in an otherwise well patient during early post-operative period in the absence of other signs of volume depletion does not indicate need for IV fluid therapy. It is a normal physiological response to surgery

Table 1: Assessment of fluid deficit (patients are unlikely to exhibit all of the clinical signs)

	FLUID DEFICIT			
Signs	**None**	**Moderate**	**Severe**	**Critical**
Mental status	Normal (GCS 15) – see **Glasgow coma scale** guideline	Mildly anxious (GCS 15)	Anxious/confused (GCS 12–14)	Confused/lethargic/ comatose (GCS <12)
Dry mouth	No	Yes	Yes	Yes
Reduced skin turgor	No	Yes	Yes	Yes
Sunken eyes	No	No	Yes	Yes
Capillary refill time	<2 sec	<2 sec	2–4 sec	>4 sec
Heart rate	<100	>100	>120	>140
Respiratory rate	14–20	20–30	30–35	>35
Blood pressure	Normal	Normal	Decreased	Decreased
JVP when supine	Visible	May not be visible	Not visible	Not visible
Urine output	>30 mL/hr	20–30 mL/hr	5–20 mL/hr	<5 mL/hr

Clinical notes

- Heart rate may be raised for reasons other than hypovolaemia
- increases due to hypovolaemia will be masked in the elderly and by beta-blocker drugs
- Interpret BP in light of any history of hypertension and patient's age. If patient in pain, reductions will be masked
- Review all diuretics. Oliguria may be prevented by diuretics
- Capillary refill time is also increased by other factors (e.g. anxiety, pain, hypothermia, or cold environment). Cool peripheries may indicate a requirement for fluid resuscitation, but peripheries may be warm when fluid resuscitation is required e.g. sepsis

Investigations

- U&E
- Glucose
- FBC
- ESR
- If blood loss suspected, group and save or crossmatch
- If peripheral perfusion is poor, measure:
- arterial/venous blood gases or lactate to detect metabolic acidosis
- CRP
- coagulation studies

INITIAL MANAGEMENT

- Ensure airway patent, breathing adequate and appropriate care of cervical spine
- Give high-flow oxygen via reservoir mask to all patients with shock, major trauma, sepsis, or other critical illness. Aim for SpO_2 94–98% – see **Oxygen therapy in acutely hypoxaemic patients** guideline. In patients with chronic respiratory failure at risk of hypoventilation, ensure early titration of oxygen dose to an SpO_2 of 88–92%, with blood gas measurement to assess for elevated PCO_2
- Manage specific conditions as soon as possible by following appropriate condition-specific guideline in **Medical** or **Surgical** guidelines (see **Specific conditions** following **Table 3: Choice of fluid for resuscitation**)

FLUID RESUSCITATION ● 2/4

Treatment

- Use ABCDE approach and address cause of fluid deficit
- Manage fluid deficit as follows:

All treatment is given as boluses of fluid in addition to, or before starting, maintenance therapy

- See **Tables 2** and **3** for rate and type of resuscitation fluid therapy to be given

Table 2: Initial treatment of fluid deficit

Fluid deficit	Fluid bolus and other management	Other management in addition to addressing cause of fluid deficit
None/mild	Give oral maintenance if possible. Otherwise move to **Maintenance fluid therapy** guideline	
Moderate	500 mL over 15 min, then reassess	• Give oxygen • See **Clinical notes** below • Investigations as above
Severe	500 mL over 10 min, then reassess	
Critical	1000 mL over 5 min, then reassess	• Ensure airway patency • Give oxygen • See **Clinical notes** below • Investigations as above

Clinical notes

- In patients at risk of pulmonary oedema because of heart failure, reduce fluid bolus volume by half, these are complex patients and senior review is necessary

Regular reassessment is required to assess magnitude and duration of response to initial treatment, and to avoid iatrogenic fluid overload
Note: Spinal cord injured patients may be hypotensive despite adequate filling

Choice of initial fluid

Resuscitate using initial fluid therapy recommended in Table 3, use blood products if indicated by major haemorrhage/coagulopathy. Continue prescribed maintenance fluid therapy concurrently with resuscitation therapy but disregard maintenance volume administered in assessment of required resuscitation volume.
Hypotonic or potassium-rich maintenance fluid is inappropriate/dangerous when given in large volumes required for resuscitation

Table 3: Choice of fluid for resuscitation

Fluid deficit	Initial fluid
• Severe vomiting • Brain injury	Sodium chloride 0.9%
• Severe diarrhoea • Gastrointestinal fistula • Poor intake (many medical patients) • Serum potassium ≥5.5 mmol • Loss of fluid of plasma constituency or severe patient stress (majority of surgical patients) resulting from: ◦ blood loss ◦ surgery ◦ injury ◦ systemic inflammatory response ◦ burns ◦ increased insensible losses due to fever or environmental factors ◦ increased losses from respiratory tract in acute respiratory failure (includes acute severe asthma) ◦ epidural anaesthesia	Balanced crystalloid e.g. compound sodium lactate (Hartmann's) solution

Specific conditions

- If patient has massive haemorrhage from any cause, follow **Massive haemorrhage pathway** on Trust intranet>Clinicians>clinical guidance>blood and blood products>general documents>procedures
- If renal failure suspected, discuss with critical care or renal physicians
- If coagulopathy suspected, involve haematologist

If patient has any of the following conditions, follow appropriate condition-specific guideline in **Medical** and **Surgical guidelines**

- Diabetic ketoacidosis and hyperosmolar hyperglycaemic state
- Acute adrenal insufficiency
- Acute upper gastrointestinal haemorrhage
- Hypo/hypernatraemia
- Acute cardiac failure
- Acute liver failure
- Established acute kidney injury (acute renal failure)
- Diabetes mellitus and requirement for fluids to cover surgery
- Post-operative haemorrhage. For intra-operative patients only, **Choice of intravenous fluid for intra-operative resuscitation of acute hypovolaemia flowchart** is available on Trust intranet Clinicians>Clinical services>Anaesthesia and theatres
- Hypercalcaemia
- Recent retention of urine

Monitoring

- Reassess using **Recognition and assessment** above. See **Table 1**
- Manage continuing persistent fluid deficit with further fluid boluses as per **Initial management** above
- Hourly urine output (renal failure likely if <0.5 mL/kg/hr)
- If >2000 mL required in 1 hr, patient has signs of shock or there is doubt about requirement for continuing fluid resuscitation, seek expert help
- If >4 L of fluid required in 24 hr or blood loss suspected, send repeat FBC, clotting screen and ensure group and save sample is in date or crossmatched blood is available

MANAGEMENT OF POTASSIUM

Never infuse fluids containing >5 mmol/L potassium rapidly (compound sodium lactate contains 5 mmol/L and can, therefore, be infused rapidly). Consideration should be given to using isotonic sodium bicarbonate in hyperkalaemia to encourage intracellular shift of potassium). If a patient requiring rapid fluid boluses for resuscitation is also hypokalaemic, prescribe potassium separately in their maintenance fluid regimen or, if hypokalaemia severe (serum potassium <3 mmol/L), follow* Hypokalaemia *guideline

OUTCOME

- Reassess as indicated in **Table 1** and give further fluid boluses as required

Signs of hypovolaemia do not resolve

- If patient shows only transient recovery despite fluid boluses totalling 2000 mL in 1 hr, (or 1000 mL in elderly patients), perform arterial blood gas analysis to detect metabolic acidosis secondary to inadequate tissue perfusion and/or endogenous catecholamines
- request senior review to consider referral to critical care, advice on specific treatment including possible insertion of CVP line

Signs of hypovolaemia resolve

- Commence or continue maintenance fluid regimen. See **Maintenance fluid therapy** guideline
- Reassess for clinical signs of hypovolaemia at 30 min intervals until signs of hypovolaemia have resolved for at least 2 hr and there are no signs of continuing losses
- a significant proportion of patients will have only a transient response to fluid bolus

ADDITIONAL INFORMATION

Further reading on balanced physiological solutions in the presence of hyperkalaemia can be found at:

- http://www.pulmcrit.org/2014/09/myth-busting-lactated-ringers-is-safe.html
- http://www.derangedphysiology.com/main/core-topics-intensive-care/manipulation-fluids-and-electrolytes/Chapter%202.3.4/response-1l-hartmanns-compound-sodium-lactate

MAINTENANCE FLUID THERAPY ● 1/3

HOW TO USE THIS GUIDELINE

In all patients at risk of hypovolaemia, make a clinical assessment of degree and type of fluid deficit. See* Fluid resuscitation *guideline

Specific conditions

If patient has any of the following conditions, follow appropriate condition-specific guideline in **Medical** or **Surgical** guidelines:

- Diabetic ketoacidosis
- Hyperosmolar hyperglycaemic state
- Acute adrenal insufficiency
- Acute upper gastrointestinal haemorrhage
- Hypo/hypernatraemia
- Acute cardiac failure
- Acute liver failure
- Acute kidney injury (acute renal failure)
- Diabetes mellitus and requirement for fluids to cover surgery
- Post-operative haemorrhage
- Hypercalcaemia
- Recent retention of urine

Clinical application of guidance

- Undertake a careful initial assessment of each patient's fluid and electrolyte needs. Take into account:
  - history of limited intake/absorption, thirst, abnormal losses, comorbidities
  - examination of pulse, capillary refill, JVP, peripheral or pulmonary oedema, postural hypotension (see **Fluid resuscitation** guideline – **Table 1**)
  - clinical monitoring NEWS, fluid balance charts, weight
  - investigations: FBC, U&E
- Ensure regular reassessment to monitor clinical response to treatment
- In all patients requiring IV fluid (unless stable on long-term IV fluid therapy), ensure daily senior review of fluid and electrolyte status and management plan
- If patient has complex fluid or electrolyte replacement or abnormal distribution issues, seek senior help and see **Continuing excess losses** section of this guideline
- In particular, in the following conditions seek senior advice as guidance may need to be modified:
  - chronic cardiac failure
  - chronic renal failure
  - chronic liver failure – seek advice of liver specialist
  - hyperkalaemia (K^+ >6.0 mmol/L) – see **Hyperkalaemia** guideline
  - neurosurgical/neurological pathology. Avoid free water (fluids with inadequate sodium) and control blood sugar level. Seek expert help
  - frail elderly/malnourished – see **Refeeding syndrome** in **Artificial nutritional support** guideline in the **Surgical** guidelines
- Prescribe intravenous fluid therapy in the patient prescription chart

Indication for use of parenteral fluid therapy

If possible, use enteral replacement. Re-evaluate need for parenteral fluids at least twice daily

- Patient unable to ingest or absorb fluid and electrolyte requirements via enteral route

MAINTENANCE

If patient requires additional resuscitation fluid after commencing maintenance regimen, follow guidance in* Fluid resuscitation *guideline

- If patient has continuing excess losses, replace them, in addition to the maintenance fluid, by following the **Continuing excess losses** section at the end of this guideline
- If patient has other sources of fluid and electrolyte intake from drugs e.g. IV nutrition, blood and blood products (excluding resuscitation/replacement of excess losses), reduce the maintenance prescription accordingly. Use diabetic regimes instead of fluid maintenance where applicable

MAINTENANCE FLUID THERAPY ● 2/3

Total volume of maintenance fluid required (oral and parenteral) in 24 hr is 25–30 mL/kg
Table 1: Volume of fluid over 24 hr and in mL/hr

Approx. male height		Approx. female height		Ideal body weight (kg)*	No fever present (25 mL/kg/24 hr)			Fever present (30 mL/kg/24 hr)		
Feet	cm	Feet	cm		L/24 hr	1 L over approx.	mL/hr	L/24 hr	1 L over approx.	mL/hr
4'8"	142	4'10"	147	40	1	24 hr	42	1.2	20 hr	50
4'10"	147	5'0"	152	45	1.125	21 hr	47	1.35	18 hr	56
5'0"	152	5'2"	157	50	1.25	19 hr	52	1.5	16 hr	63
5'2"	157	5'4"	162	55	1.375	17 hr	57	1.65	15 hr	69
5'4"	162	5'6"	167	60	1.5	16 hr	63	1.8	13 hr	75
5'6"	167	5'9"	175	65	1.625	15 hr	68	1.95	12 hr	81
5'9"	175	5'11"	180	70	1.75	14 hr	73	2.1	11 hr	88
5'11"	180	6'1"	185	75	1.875	13 hr	78	2.25	11 hr	94
6'1"	185	6'3"	190	80	2 L	12 hr	83	2.4	10 hr	100
6'3"	190	6'5"	198	85	2.125	11 hr	89	2.55	9 hr	106
6'5"	198	6'7"	195	90	2.25	11 hr	94	2.7	9 hr	113

* Use ideal body weight or actual body weight, whichever is lower. See **Ideal body weight** guideline

- Note that 1000 mL over 8 hr is not indicated simply for maintenance, even for the largest pyrexial patients
- It is beneficial to deliver daily maintenance requirement over day-time hours, this is more physiological and will promote sleep and wellbeing. Increase rate and limit time that infusion should run accordingly
- Give as much fluid volume as possible orally or (if inserted) via nasogastric or other enteric tube. Give remainder IV or, in selected medical patients, SC
- **If signs of fluid overload in any patient,** review need for IV fluids. If essential, restrict fluid input to maximum 1 L/24 hr or reduce input by 50%

Choice of fluid – principles

- Choice depends on patient, and on sodium and potassium levels

Patient

- Stressed patients (e.g. post-operative, septic) are at risk of complication from excessive:
  - chloride (hyperchloraemic acidosis caused by sodium chloride 0.9%)
  - free water (acute hyponatraemia, seizures, brain damage and death, if glucose solutions with inadequate sodium content are used)
- Co-morbidities – see specific conditions in **How to use this guideline** above
- Many unstable patients may need maintenance fluids and require repeated fluid boluses for resuscitation

Content of maintenance fluid (especially hypotonic or high potassium-content) is inappropriate/dangerous when given in large volumes required for resuscitation. Do not increase rate of maintenance fluids to resuscitate. Prescribe and administer resuscitation fluid separately

Adult fluid, electrolyte and glucose requirements

Water

- 25–30 mL/kg/day

Sodium

- 50–170 mmol/day (1–2 mmol/kg/day)

Potassium

- 25–85 mmol/day (1 mmol/kg/day)
- Patients with excessive lower GI losses or enteric fistula may have losses requiring more significant replacement. See **Continuing excess losses** below

Chloride

- 80–120 mmol/day (1–1.5 mmol/kg/day)

Glucose

- 50–100 g/day to limit starvation ketosis, but this does not address nutritional needs (see **Artificial nutritional support** guideline in the **Surgical** guidelines)

Choice of maintenance fluid when no hypovolaemia and near normal renal function

- If any of the following biochemical disorders is present, follow appropriate **Hyponatraemia/Hypernatraemia** and/or **Hypokalaemia/Hyperkalaemia** guideline:
- **hyponatraemia** – Na^+ <135 mmol/L
- **hypernatraemia** – Na^+ >150 mmol/L
- **hyperkalaemia –** K^+ >6.0 mmol/L
- **hypokalaemia** – plasma K^+ <2.5 mmol/L with persistent losses/poor absorption or plasma K^+ either persistently <3.0 mmol/L or <3.0 mmol/L and combined with new tachyarrhythmia or muscle weakness
- Otherwise, for the 'general' patient, on day 1 prescribe sodium chloride 0.18% with glucose 4% with potassium chloride 20 mmol/L in the volumes listed in **Table 1** (NICE Guideline CG174)
- monitor electrolytes regularly and adjust quantity and content of maintenance fluid used as indicated by most recent biochemical results

CONTINUING EXCESS LOSSES

- If patient has continuing excess losses from any source (e.g. vomiting, nasogastric tube losses, diarrhoea, fistulae, stoma, drains, continuing blood loss – melaena, polyuria, sweating, lactation), measure volume of losses and replace volume using an appropriate fluid (see below) in addition to maintenance regimen

Choice of fluid

- Depends on type of fluid lost (biochemical analysis of fluid may be helpful), and impact upon haematocrit, biochemistry and serum protein
- replace vomiting or gastric tube losses. If GI losses >1500 mL, check chloride level. If patient hypochloraemic, use sodium chloride 0.9% +/- potassium chloride
- replace diarrhoea/small bowel/bowel preparation losses with compound sodium lactate (Hartmann's) solution

Always use commercially produced pre-mixed bags of any fluid with potassium chloride.
NEVER add potassium chloride to infusion bags.
Rapid infusion of bags containing potassium 40 mmol/L causes dangerous arrhythmias.
Suggestion – place a handwritten label on any bag containing potassium, warning staff NOT TO INCREASE INFUSION RATE

MONITORING

Chart

Hourly

- Urine output if continuing excess losses or patient haemodynamically unstable

6-hrly

- BP – if patient haemodynamically unstable, increase frequency

Daily

- Fluid balance chart
- Serum U&E
- Body weight

Examine daily

- Check for peripheral oedema
- Auscultate lung fields

FLUID OVERLOAD

If signs of fluid overload appear and parenteral fluid remains necessary, restrict fluid input to maximum 1 L/24 hr or reduce input by 50%

As soon as possible, re-establish oral fluids and remove indwelling intravenous lines

Avoid injection of local anaesthetic into inflamed or infected tissues
Do NOT inject intravenously (except prilocaine during Bier's block – adults only)

LOCAL ANAESTHETICS (LA)

Drug	Dose[1]	Notes
Maximum dose stated covers all indications. Doses dependent on site of injection, procedure used and status of patient. For recommended doses see BNF/BNFC		
Local infiltration		
Lidocaine Formulation in ED: • 1% (10 mg/mL) • 1% with adrenaline [1:200,000]	• 3 mg/kg (max 200 mg) • 7 mg/kg with adrenaline (max 500 mg) • NB licensed only for children aged >12 yr	• Aspirate first to ensure not IV injection • First choice for most procedures • Short-acting agent available with or without adrenaline • Adrenaline: delays onset of action, but prolongs duration of anaesthetic effect • **avoid** in severe IHD, hypertension, thyrotoxicosis, heart block and unstable cardiac rhythms • **contraindicated** in peripheral vascular disease, or if compromised blood supply • do **not** apply to end vessels e.g. fingers, toes, nose, ears, lips – can cause tissue necrosis • Onset of action: 5–10 min • Duration of action: 60–90 min (120–240 min with adrenaline)
Levobupivacaine Formulation in ED: • 0.25% (2.5 mg/mL) • 0.5% (5 mg/mL)	• 2 mg/kg (max 150 mg, AND 40 mL) • Max rate of injection 7.5–30 mg/min	• Aspirate first to ensure not IV injection • Long-acting local anaesthetic • Four times more potent than lidocaine or prilocaine but toxicity limits use to blocking nerves and infiltration • **Not licensed for use in children** • Onset of action:15–30 min • Duration of action: 120–200 min
Prilocaine Formulation in ED: • 0.5% preservative free (unlicensed)	• 3 mg/kg (max 240 mg) in Bier's block	• Low toxicity • Contraindicated in congenital or idiopathic methaemoglobinaemia • First line choice for Bier's Block • Onset of action: 5–10 min • Duration of action: 60–90 min
Topical agents		
Lidocaine hydrochloride **LMX 4®** lidocaine 4%		• Does not vasoconstrict • for dose guidance in children see BNFC • Onset of action 30 min
Local anaesthetic cream (e.g. Denela® – lidocaine 2.5%, prilocaine 2.5%) **Instillagel 2%** (20 mg/mL)		• Onset of action 30–60 min
Tetracaine **Ametop® 4% gel**	• Max 5 tubes applied at separate sites at single time	• Effective local anaesthetic for topical application • Do not apply to inflamed, highly vascular or traumatised skin • Causes vasodilation and irritation of skin • Onset of action: 30 min (venepuncture) or 45 min (venous cannulation) • Duration of action: 4–6 hr
Eye drops 0.5% minims	• 1–2 drops before evaluation of eye or every 5–10 min up to 3 instillations	• Onset of action: 25 sec • Duration of action: ≥15 min
Alternative eye drops:		Proxymetacaine 0.5% or Oxybuprocaine 0.4%

[1] Use reduced doses in children (see BNFC), debilitated, elderly or acutely ill patients; in obese patients (i.e. 20% over ideal body weight), calculate dose based on ideal body weight (IBW)

Contraindications to local anaesthetics

- Allergy to amide-type (lidocaine, prilocaine, levobupivacaine) or ester-type (tetracaine) anaesthetics or their components
- Severe hypotension, complete heart block

Injecting local anaesthetics

Consider following to reduce pain on injection:

- Warm to room temperature
- Inject slowly, in small incremental doses, using small calibre needle
- Prior use of topical anaesthesia (e.g. local anaesthetic cream – Denela®) at injection site
- Offer Entonox® during infiltration of local anaesthetic
- Lidocaine 1% may be buffered 9:1 with sodium bicarbonate 8.4% (e.g. remove 1 mL of 1% lidocaine from 10 mL vial, and add 1 mL sodium bicarbonate 8.4% to vial). Use buffered lidocaine immediately due to reduced stability
- Consider mixing lidocaine 1% with longer acting levobupivacaine in equal volumes to lengthen period of effectiveness

TREATMENT OF LOCAL ANAESTHETIC TOXICITY

Local anaesthetic toxicity may occur some time after an initial injection, observe patient for at least 30 min following injection

- Symptoms of toxicity follow a predictable progression with CNS features occurring before CVS depression
- CNS – feeling of inebriation, perioral/tongue tingling, light headedness, visual disturbance, paraesthesia, nausea and vomiting, muscle twitching or tremors, unconsciousness, seizures, respiratory failure and coma
- CVS – hypotension, sinus bradycardia, arrhythmia and cardiac arrest (cardiotoxicity potentiated by acidosis, hypercapnia and hypoxia)

Management of toxicity

- Stop administration of anaesthetic immediately
- Call for help
- Monitor vital signs (including 12 lead ECG)
- Insert IV cannula
- Even if asymptomatic, observe for 4 hr
- Ensure adequate oxygenation and blood pressure by providing supportive therapy
- Treat seizures (see **Status epilepticus** in **Medical** guidelines)
- If cardiac arrest occurs, consider administration of lipid emulsion (initial bolus 1.5 mL/kg of 20% intralipid over 1 min **and** start an infusion (see AAGBI guidelines available in ED and on trust intranet: Clinicians>Support services>Pharmacy>Department>Medicines information). Bolus dose may be repeated twice at 5 min intervals
- Continue CPR throughout treatment with lipid emulsion
- Recovery from LA-induced cardiac arrest may take >1 hr
- Follow-up: exclude pancreatitis following intralipid treatment, daily amylase assays for 2 days
- Prilocaine can cause methaemoglobinaemia – refer to Toxbase for treatment

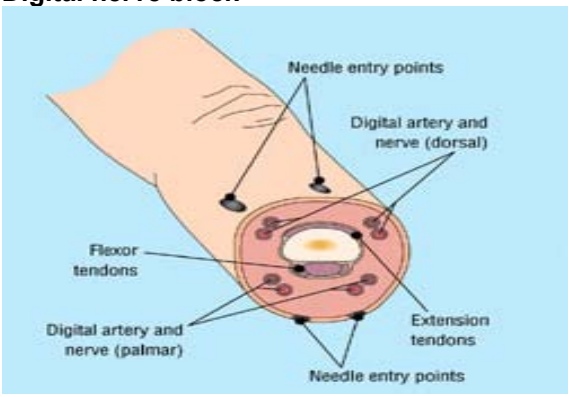
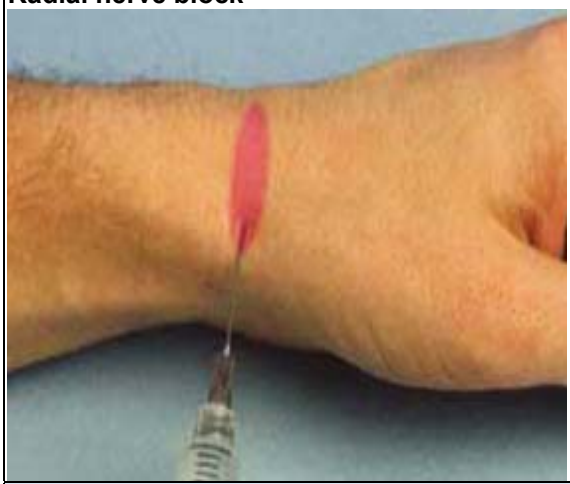
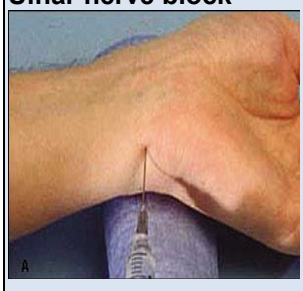
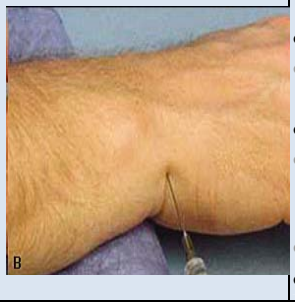
PERIPHERAL NERVE BLOCKS

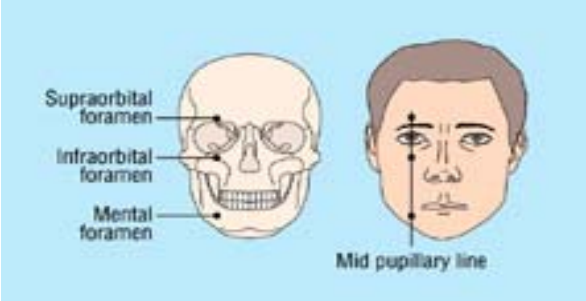
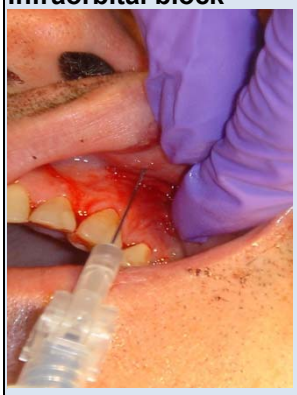
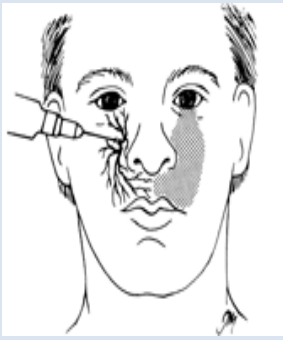
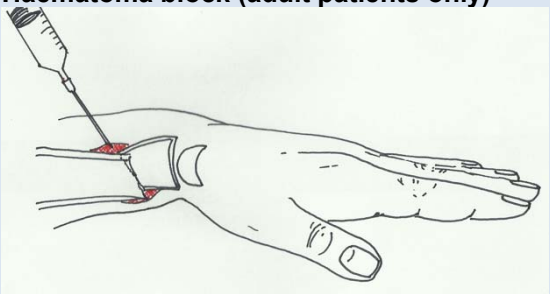
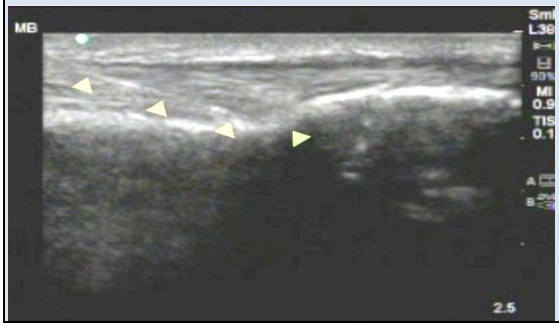
DO NOT attempt these procedures unless you have been trained and assessed as competent

- Blocking a nerve is often more efficient than infiltration, and large areas can be blocked with one injection
- You need a thorough knowledge of the anatomy of the nerve so that you know exactly where you are putting your needle, and what structures are at risk
- Do not aim to directly enter the nerve with the needle as this will cause paraesthesia and may damage the nerve

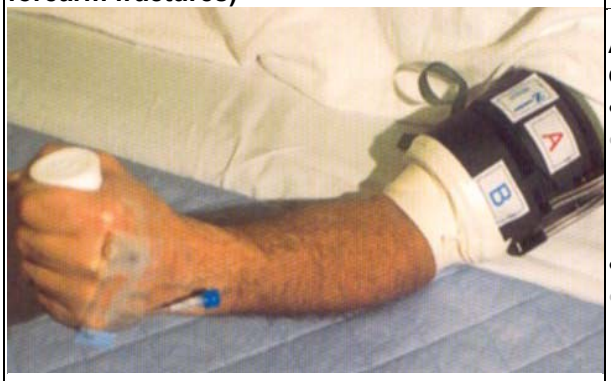
Equipment

- 24 G needle
- 5 mL syringe
- Local anaesthetic (LA)
- Gloves
- Antiseptic skin cleansing solution

Block	Clinical information
Digital nerve block 	• Usually numbs entire digit distal to injection • **Anatomy:** ◦ common digital nerves run between the metacarpals in the hand, and divide into digital nerves just before reaching the web spaces ◦ fingers: digital nerves lie in close proximity to digital arteries • **Procedure:** ◦ approach nerves from the dorsal side ◦ insert needle lateral to phalanx, at a slight medial angle, to approach nerve ◦ aspirate and inject a small volume of LA and withdraw needle while slowly injecting • Onset of action: 5–10 min
Median nerve block 	• Usually numbs radial three and a half digits, and corresponding half of palm • **Anatomy:** ◦ median nerve is superficial, and found between the tendon of flexor carpi radialis (FCR) and palmaris longus (PL) at the level of the wrist ◦ note: palmaris longus absent in 15% of people • **Procedure:** ◦ approach nerve from the proximal wrist crease between tendons of FCR and PL ◦ aspirate and inject a small volume of LA • Onset of action: 10–20 min
Radial nerve block 	• Usually numbs skin on dorsal and radial half of hand • **Anatomy:** ◦ radial nerve splits into several branches just proximal to the anatomical snuff box (ASB) bordered by the tendon of extensor policis longus (medial) and tendons of abductor pollicis brevis and longus (lateral) • **Procedure:** ◦ approach nerve just proximal to the ASB, aiming to infiltrate the area shown ◦ aspirate and inject a small volume of LA whilst withdrawing needle • Onset of action: 10–20 min ***CAUTION: Avoid injecting LA into cephalic vein which runs in the region of the ASB***
Ulnar nerve block  	• Usually numbs ulna, one and a half digits, and corresponding part of palm • **Anatomy:** ◦ in forearm the ulna nerve travels adjacent to the ulna artery • **Procedure:** ◦ approach nerve at level of the proximal palmar crease, between ulna artery and tendon of flexor carpi ulnaris (FCU) ◦ aspirate and inject small volume of LA • Onset of action: 5–10 min

Block	Clinical information
Supraorbital block 	• Usually numbs majority of forehead on infiltrated side • **Anatomy:** ◦ supraorbital and supratrochlear nerves (both branches of trigeminal nerve) emerge at the supraorbital foramen • **Procedure:** ◦ infiltrate above line of the eyebrows, from the midline, to just lateral to the mid-pupillary line ◦ aspirate and inject a small volume of LA • Onset of action: 5–10 min
Infraorbital block  	• Usually numbs majority of the cheek on infiltrated side • **Anatomy:** ◦ infraorbital nerve provides nerve supply to lower eyelid, mid-face, much of the nose, whole upper lip, and gum. Enters face through infraorbital foramen, in the mid-pupillary line • **Procedure:** ◦ best approach is intraoral, as avoids several painful skin punctures. Approach is a line that runs between first and second premolars at apex of the superior vestibule of the mouth. ◦ aspirate and inject a small volume of LA • Onset of action: 5–10 min
Mental nerve block  	• Usually numbs majority of chin on infiltrated side • **Anatomy:** ◦ cutaneous branch of inferior alveolar nerve, which supplies skin of the lower lip and gum through the mental canal • **Procedure:** ◦ best approach is intraoral in mid-pupillary line, or in same plane as the space between first and second premolars ◦ aspirate and inject a small volume of LA • Onset of action: 5–10 min
Haematoma block (adult patients only)  	• Technique frequently employed for anaesthesia during reduction of distal radius (Colles) fractures ◦ only effective during acute management (<24 hr), when hematoma not coagulated • **Anatomy:** ◦ infiltration of LA agent within fracture site serves to block nerve fibres of surrounding soft tissues and the periosteum around the fracture • **Procedure:** ◦ cleanse wrist with antiseptic skin cleansing solution ◦ use ultrasound to locate fracture site (step in the cortex of the radius) • use ultrasound guidance with a 21 G needle to withdraw blood from fracture and replace with LA agent. Inject 10–15 mL of 1% lidocaine directly into fracture site and allow 10–15 min for onset of action

Block	Clinical information
Bier's block (IV regional anaesthesia for distal forearm fractures)	***Carry out procedure in an area with patient monitoring and resuscitation equipment***



Contraindications

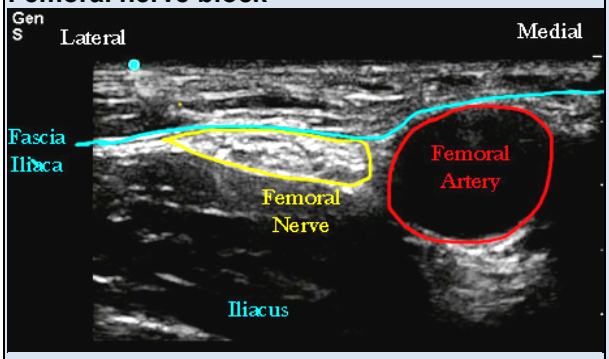
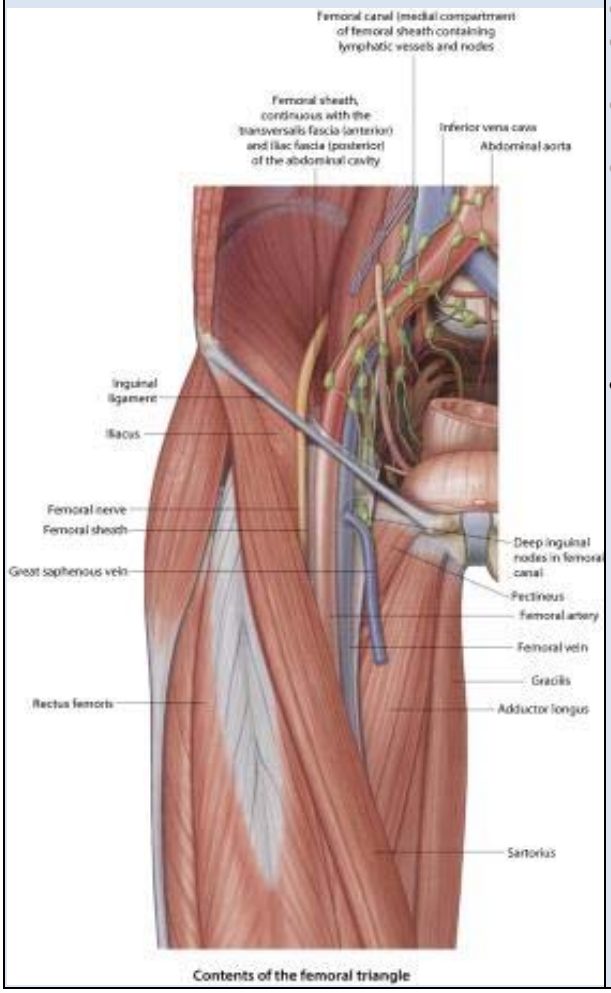
- Allergy to local anaesthetic
- Bilateral procedure needed
- Uncooperative or confused patient
- Epilepsy
- Infection/inflammation/damaged skin of the limb
- Lymphadenopathy
- Methaemoglobinaemia
- Monckberg's Calcinosis
- Morbid obesity
- Peripheral vascular disease
- Raynaud's phenomenon
- Scleroderma
- Severe hypertension
- Sickle cell disease/trait
- Complete heart block

Table: Prilocaine dose

Weight (kg)	Dose (3 mg/kg)	Volume of prilocaine 0.5% preservative free (mL)
40	120	24
50	150	30
60	180	36
70	210	42
≥80	240	48

A bier's block documentation sheet and written consent **must** be completed for every patient

- **Anatomy:**
- administration of IV anaesthetic solution in an isolated limb (by means of a double pneumatic tourniquet cuff) serves to anesthetise extremity distal to cuff
- **Procedure:**
- 2 practitioners must be present for entire procedure, one of whom is a doctor competent in airway and resuscitation
- last oral intake (solids) ideally 4 hr ago
- alert X-ray department before commencing procedure about need for post reduction film
- weigh patient (kg) before procedure and prescribe appropriate dose of prilocaine 0.5% preservative free (see **Table: Prilocaine dose**)
- patient monitoring: ECG and pulse oximeter
- insert IV access on normal side (18 G cannula) **and** injured side distally (24 G cannula/butterfly needle)
- check ischaemic cuff for leaks: inflate for 5 min
- record blood pressure
- place double cuff tourniquet on upper arm
- elevate injured limb for 3 min to exsanguinate
- inflate cuff to 100 mmHg above systolic BP, or 300 mmHg (whichever greater). Record time of inflation, check for absence of radial pulse
- slowly inject prilocaine preservative free (prepared according to patient weight) and record time of injection
- warn patient about cold/hot sensation and mottled appearance of arm
- onset of action 5 min. Check after 5 min, may have touch but not pain, and if inadequate, flush cannula with 10–15 mL sodium chloride 0.9%, then remove cannula
- lower arm: tourniquet **must** be checked for leaks and observed at all times
- observe patient for signs of toxicity
- perform procedure, obtain and check X-ray
- cuff must remain inflated for a minimum of 20 min and a maximum of 45 min
- if satisfied with post-reduction position of fracture, deflate cuff
- record time of deflation
- observe patient and limb closely for signs of delayed toxicity until fully recovered
- check limb circulation before discharge

Block	Clinical information
Femoral nerve block   Contents of the femoral triangle	• Femoral nerve is the largest branch of lumbar plexus (L2–4). It innervates the skin of anterior thigh, plus deeper structures such as quadriceps femoris, most of the femur and knee joint • **Anatomy:** • located immediately lateral to femoral artery. Femoral nerve covered by the fascia iliaca and separated from the artery and vein by a portion of psoas muscle and ligamentum ileopectinum, which impedes spread of blind paravascular infiltration of LA • **Procedure:** • place patient supine with leg slightly abducted • cleanse groin with antiseptic skin cleansing solution • use ultrasound to locate femoral artery at the level of the inguinal ligament • use ultrasound guidance with a 21 G needle, aspirate and inject 0.5–1 mg/kg of levobupivacaine 0.25% (2.5 mg/mL) medially, close to the artery, and then more laterally towards tip of the triangle. Target triangle (yellow line) should be seen to expand as solution instilled • Onset of action: 15–30 min

Block

Fascia iliaca block for femoral neck fractures

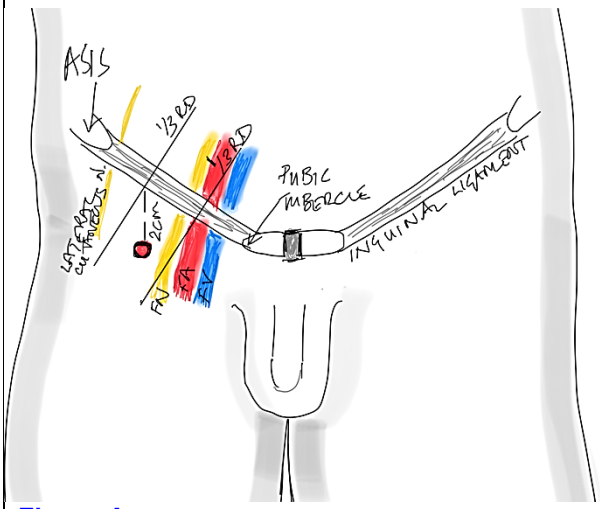


Figure A.

Contraindications

- Anticoagulation
- Previous femoral bypass surgery
- Inflammation or infection over the injection site
- Allergy to local anaesthetics

Weight	Volume of levobupivicaine 5% (5 mg/mL)	Volume of sodium chloride 0.9%
<50 kg	10 mL	10 mL
>50 kg	20 mL	20 mL

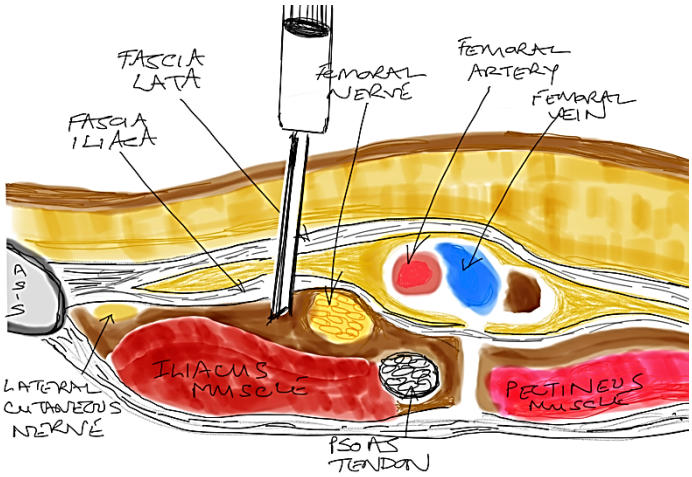


Figure B.

Clinical information

Equipment

- A blunted or short bevel needle
- Skin antiseptic solution
- Syringe
- Levobupivicaine 0.5% (5 mg/mL) – see **Table**

Landmark procedure

- Identify the anterior superior iliac spine (ASIS) and the pubic tubercle
- Draw a line between these 2 points
- Divide the line into 1/3^{rds}
- Mark the point 2 cm caudal from the junction of the lateral and middle 1/3rd (Figure A. red dot). The femoral pulse should be palpable 1–2 cm medial to the intended injection point
- Prepare skin with antiseptic
- Using a blunted needle pierce the skin at a right angle to its surface
- Advance needle until 2 distinct pops are felt as it perforates the fascia lata then the fascia iliaca
- Reduce angle to 30° to skin and advance needle a further 1–2 mm
- Aspirate before injection and after every 5 mL to ensure no perforation of vascular structures

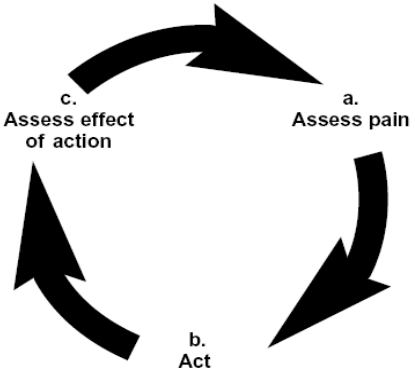
Onset of action: 10–15 min

PAIN MANAGEMENT ● 1/4

AIMS

- To provide optimal and most appropriate analgesia
- To involve patients in their own pain management
- To facilitate accurate assessment, optimise recovery and early mobilisation

ASSESSMENT



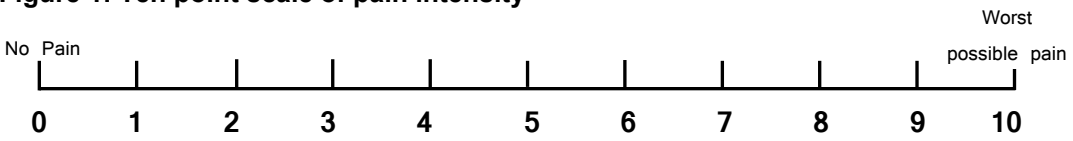
a. Assess pain: ask patient to score their pain intensity (use 10 point scale located in Emergency department record – see **Figure 1**). Verify type and location of pain

b. Act: choose appropriate analgesia for type and severity of pain. See **Route of administration** below for advice

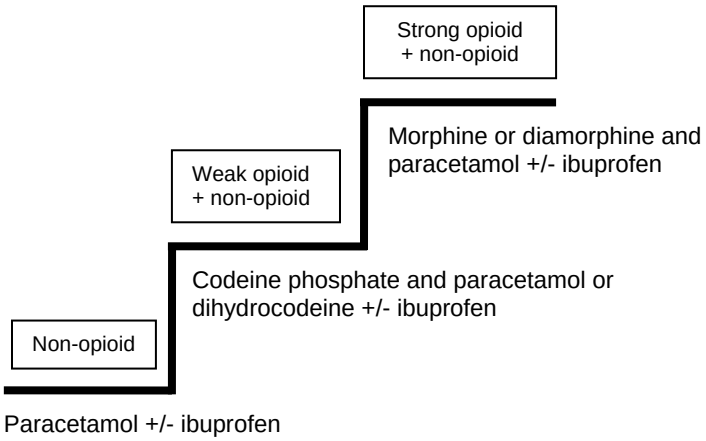
c. Assess effect of action: reassess and administer further analgesia as necessary

- Utilise the analgesic ladder to guide initial choice of drugs
- Utilise most appropriate modality including use of splints, slings and regional nerve blocks
- Monitor patient for any adverse effects

Figure 1: Ten point scale of pain intensity



ANALGESIC LADDER



BASIC PRINCIPLES

Try to gain patient's confidence

- If possible examine non-affected limb first, explaining in a simple manner, do not lie
- Explain that a particular procedure (digital nerve block, sighting of IV cannula etc.) will be initially painful but things will improve afterwards
- Be patient in getting appropriate staff to help with examination or application of splinting

Splintage

- Splintage is an important additional analgesic support (e.g. Thomas splints for femoral shaft fractures)
- Long bone fractures (resulting in obvious pain and deformity) will benefit from a back slab plaster of Paris (POP) before being sent for X-ray

ADULT MANAGEMENT

Local anaesthetic block techniques

- A variety of blocks can be easily learnt and used in ED environment. They include femoral, radial, ulna, median and digital nerve blocks – see **Local anaesthetics** guideline

Analgesia

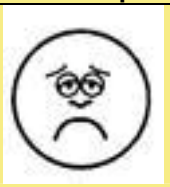
- A combination of different classes of oral analgesia using a stepwise approach (see **Analgesic ladder**) may be more effective and produce fewer side effects than high dose monotherapy
- Regular analgesia is more effective than when given as required

Indication	Oral analgesia (onset of action typically 45 min)	Parenteral analgesia
Mild pain Score 1–3	• **Non-opioid** ◦ paracetamol 1 g oral 4–6 hrly (max 4 g in 24 hr) ◦ ibuprofen 400 mg 8-hrly	
Moderate pain Score 4–6	• **Weak opioid** ◦ codeine phosphate 30–60 mg 4–6 hrly (max 240 mg in 24 hr) ◦ dihydrocodeine 30 mg 4–6 hrly (max 240 mg in 24 hr) • **Strong opioid** ◦ short-acting morphine sulphate (e.g. Oramorph®) 5–10 mg 4-hrly	**Paracetamol IV** • Suitable for patients: ◦ in moderate-severe pain of musculoskeletal origin (e.g. hip fracture) ◦ in whom IV opiates may result in undesirable effects (e.g. acute confusion in the elderly) • Weigh patient (kg) – **essential** for accurate dosing • **Adult/adolescent weighing >50 kg**: 1 g by infusion over 15 min 4–6 hrly, **max** 4 g in 24 hr • **Adult/adolescent weighing 10–50 kg**: 15 mg/kg by infusion over 15 min 4–6 hrly, **max** 60 mg/kg in 24 hr • **If risk of paracetamol toxicity, reduce dose to max 3 g in 24 hr** • Risk of paracetamol toxicity increased by: ◦ prolonged fasting or dehydration ◦ chronic malnutrition (low reserves of hepatic glutathione) ◦ excessive alcohol use ◦ hepatic impairment ◦ renal insufficiency (creatinine clearance <30 mL/min)
Severe pain Score 7–10		• Entonox® may be effective as a short-term measure – although frequent or prolonged use should be avoided **Opiates IV** • Suitable for patients: ◦ in severe pain secondary to trauma ◦ who have a marked deformity/dislocation of a bone/joint requiring manipulation ◦ in severe pain and likely to be admitted • Head injury: patient can be given IV opiate therapy provided it is titrated and they are monitored closely for: ◦ respiratory depression ◦ hypotension and reduced conscious level ***Suggested dose*** • Morphine 100–200 micrograms/kg 4-hrly • Titrate total dose to patient's need ◦ achieved by giving small aliquots (1–2 mg/min) ***Dilute IV morphine to concentration of 1 mg/mL. Label syringe CLEARLY***

CHILD MANAGEMENT

Children can be very difficult to assess in terms of their analgesic requirements and there is a limited variety of suitable agents. Adherence to basic principles (see **Basic principles** above) and a common sense approach will result in a child receiving prompt and effective analgesia

ASSESSMENT

	No pain	Mild pain	Moderate pain	Severe pain
Faces scale score				
Ladder score	**0**	**1–3**	**4–6**	**7–10**
Behaviour	• Normal activity • No reduced movement • Happy	• Rubbing affected area • Decreased movement • Neutral expression • Able to play/talk normally	• Protective of affected area • Reduced movement/quiet • Complaining of pain • Consolable crying • Grimaces when affected part moved/touched	• No movement or defensive of affected part • Looking frightened • Very quiet • Restless/unsettled • Complaining of lots of pain • Inconsolable
Injury example	• Bump on head	• Abrasion • Small laceration • Sprain ankle/knee • Fracture fingers/ clavicle • Sore throat	• Small burn/scald • Finger tip injury • Fracture forearm/ elbow/ankle • Appendicitis	• Large burn • Fracture long bone/dislocation • Appendicitis • Sickle crisis

Weigh child

- **Children must be weighed before prescription and administration of analgesia.** If this is not possible an approximation of the weight is given by using following formulas:
  (Age + 4) x 2 = weight kg
  or
  (Age x 3) + 7 = weight kg
- alternatively use Broselow® tape
- children's BNFC also contains information on estimated weights for age

Local anaesthetic

- Local blocks (e.g. digital/femoral nerve blocks), are extremely effective in children – see **Local anaesthetics** guideline
- Take care not to exceed maximum doses – always calculate the maximum volume that can be used before commencing procedure – see **Local anaesthetics** guideline
- Take steps to reduce the pain of infiltration whenever possible – see **Local anaesthetics** guideline

Analgesia

- **Ensure child weighed before calculation and prescription of dose required**

<table>
<tr><th>Indication</th><th>Oral analgesia
Suitable for patients with mild-moderate pain
Onset of action typically 45 min</th><th>Parenteral analgesia</th></tr>
<tr><td>Mild pain
Score 1–3</td><td>• Children with less severe pain, can be prescribed paracetamol (15 mg/kg 6-hrly) and/or ibuprofen (10 mg/kg 8-hrly) suspension</td><td></td></tr>
<tr><td>Moderate pain
Score 4–6</td><td>As for mild pain plus:
Opiates
• Short-acting morphine sulphate (e.g. Oramorph®): child aged >1 yr 200–300 microgram/kg 4-hrly
• Codeine phosphate (aged 12–18 yr only): 30–60 mg 6-hrly; (maximum 240 mg daily for 3 days)</td><td>Rectal analgesia
• Children with painful soft tissue injuries may benefit from a more powerful non-steroidal or, if child nauseated, alternative route
• Diclofenac suppositories provide excellent prolonged analgesia. Dose: 1 mg/kg 8-hrly
• Explain to parents reasons/advantages for giving analgesia via this route</td></tr>
<tr><td>Severe pain
Score 7–10</td><td></td><td>• Entonox may be effective as a short-term measure in children old enough to use it
• Utilise IV or intranasal opiates for children in severe pain e.g. with obvious long bone fractures/significant burns requiring admission

Intranasal diamorphine (unlicensed)
• Dose: 100 microgram/kg 4-hrly (maximum 10 mg)
• Delivery: dilute 10 mg of diamorphine with required amount of water for injection (see Injection volumes below), administer 0.2 mL of final solution onto nasal mucosa using syringe and atomiser
• Monitor observations for 20 min after administration

Injection volumes
<table>
<tr><th>Weight (kg)</th><th>Volume of sterile water to be added to 10 mg of diamorphine (mL)</th></tr>
<tr><td>10</td><td>1.9</td></tr>
<tr><td>15</td><td>1.3</td></tr>
<tr><td>20</td><td>1.0</td></tr>
<tr><td>25</td><td>0.8</td></tr>
<tr><td>30</td><td>0.7</td></tr>
<tr><td>35</td><td>0.6</td></tr>
<tr><td>40</td><td>0.5</td></tr>
<tr><td>50</td><td>0.4</td></tr>
<tr><td>60</td><td>0.3</td></tr>
</table>
IV Morphine
• Child aged >6 months–12 yr: 100 microgram/kg over 5 min, 4-hrly
• Titrate total dose to patient's need
• Monitor closely for respiratory depression, hypotension and reduced conscious level</td></tr>
</table>

PREVENTION OF CONTRAST INDUCED ACUTE KIDNEY INJURY ● 1/2

RECOGNITION AND ASSESSMENT

- Contrast induced acute kidney injury (CI-AKI) accounts for approximately 12% of all cases of hospital-acquired renal failure; defined when 1 of the following criteria is met:
- serum creatinine rises >26 µmol/L within 48 hr
- serum creatinine rises 1.5 fold from baseline value, which is known or presumed to have occurred within 1 week
- urine output is <0.5 mL/kg/hr for >6 consecutive hr
- If a baseline serum creatinine within 1 week is not available, use the lowest creatinine value recorded within 3 months of episode of AKI
- Creatinine typically peaks 3–5 days after contrast administration and returns to baseline within 2 weeks
- Only 1 in 200 patients requires renal replacement therapy
- AKI alert will be generated on all inpatients who have U&E and measure in line with the NHS England safety alert (June 2014)

IMMEDIATE TREATMENT

There is no specific treatment – management is supportive – see **Acute kidney injury (acute renal failure)** guideline

PREVENTION

- Extremely important as contrast induced acute kidney injury is associated with:
- risk of permanent renal impairment (in up to 30% of patients who develop CI-AKI)
- a greater than 5-fold increase in mortality
- prolonged hospital stay

Risk factors

Fixed (non-modifiable)

- Pre-existing renal insufficiency
- eGFR <60 mL/min increases risk significantly
- Diabetes mellitus
- Aged >75 yr
- Congestive cardiac failure [New York Heart Association (NYHA) Class 3–4 or ejection fraction <49%]
- Acute myocardial infarction
- Cardiogenic shock
- Renal transplantation
- Cirrhosis of the liver
- Myeloma

Modifiable risk factors

- Volume of contrast medium used
- Hypotension/volume depletion/sepsis
- Intra-aortic balloon pump
- Anaemia and blood loss
- ACE inhibitors
- Diuretics
- Nephrotoxic antimicrobials
- NSAIDs

PROPHYLAXIS

Requesting imaging

- When requesting imaging procedures that may require use of intravascular (particularly
- intra-arterial) contrast medium, indicate baseline serum creatinine or eGFR on the request. If patient acutely sick, notify imaging department if serum creatinine (eGFR) has changed since the request was made and ensure up to date result requested

If eGFR <60 mL/min

- Review need for use of contrast and suitability of alternative media in discussion with radiologist and consultant in charge of patient's care
- vascular imaging may be possible using CO_2 as alternative contrast medium
- use of iso-osmolar contrast medium and reduced volumes may reduce risk
- to maximise image quality and reduce contrast dose a sodium chloride 0.9% flush should be used by imaging department

In patients at the extremes of age and body size with severe malnutrition, paraplegia, tetraplegia, known skeletal muscle disease or rapidly changing renal function, interpret eGFR with caution as it may underestimate the severity of renal impairment

Imaging with contrast essential

All patients

- Ensure adequate oral intake
- If patient nil-by-mouth or unable to drink adequately, give IV fluids before angiography
- Patients who are nil-by-mouth for planned anaesthesia to drink clear fluids until 2 hr before anaesthesia
- Review medication and, where clinically appropriate, omit potentially nephrotoxic drugs (see **Modifiable risk factors**) on day of scan

Additional preventative measures for high-risk patients

- Inpatients with eGFR <60 mL/min requiring any iodinated contrast
- Outpatients with eGFR <60 mL/min requiring intra-arterial contrast media
- Outpatients with eGFR <30 mL/min for any iodinated contrast scan
- Give sodium bicarbonate 1.26% 3 mL/kg (actual body weight) IV over 1 hr pre-contrast, followed by sodium bicarbonate 1.26% 1 mL/kg/hr IV for 6 hr post-contrast
- hydration with IV fluids is important in prevention of CIN. Omit/reduce diuretics on day of scan. If patient already on intravenous fluid replacement with sodium chloride 0.9% this is acceptable as prevention for CI-AKI
- if patient is on metformin and has eGFR ≤50 mL/min, omit it on day of scan and do not re-instate it for 48 hr afterwards
- if sodium bicarbonate 1.26% polyfusor not available, sodium bicarbonate 1.4% can be substituted. Prolonged regimes using intravenous sodium chloride 0.9% 12 hr pre- and post-contrast at a minimum of 1 mL/kg/hr is acceptable

Repeat exposure

- If further exposure to contrast agents required, because of need for repeat/additional procedure, and patient has no major risk factors, delay exposure for >48 hr – if major risk factors present, delay for >72 hr

MONITORING

- Daily monitoring of renal function for 48–72 hr after procedure

PROCEDURAL SEDATION ● 1/3

- Procedural sedation: a technique of administering sedatives or dissociative agents with/without analgesics to induce a state that allows the patient to tolerate unpleasant procedures while maintaining cardiorespiratory function
- Before using sedation, check all other options are inappropriate/exhausted [i.e. reassurance, distraction, analgesia, local and topical anaesthesia, Entonox® (50:50 nitrous oxide:oxygen mixture), intranasal diamorphine]
- Consider use of adjuncts including Entonox® and analgesic agents to augment procedure and decrease amount of sedation required

INDICATIONS

- Short potentially painful procedures (e.g. reduction of joint dislocations and fractures)

PREPARATION

DO NOT attempt to carry out either sedation or procedure unless you have been trained and assessed as competent

- Organise staff
- at least 3 staff are required: a doctor trained to manage sedation to the level required for the procedure with appropriate airway management skills, a clinician to perform procedure and a nurse to monitor and support
- do **not** proceed unless trained in use, contraindications, interactions and adverse effects of drug selected for sedation. See **Table 1**
- Manage patient in area equipped with oxygen, suction, reversal agents, and advanced life support medications and equipment
- Consider the use of appropriate adjuncts (e.g. opiates for analgesia)

Assessment

- Assess pain and analgesia before and during the procedure when sedated
- Document: co-morbidities, full drug history, allergies, intended procedure (site and side), presence of dentures, pregnancy status, contact lenses and period of starvation
- Avoid sedation if patient:
- cannot lie flat
- is breathless at rest
- has oxygen saturation <93% on air
- If patient has impaired consciousness use sedation with extreme caution
- American Society of Anesthesiologists (ASA) grade assessment
- patients with ASA grade 4 or 5 are not suitable for sedation in emergency department

ASA grade assessment	
1	Normal healthy
2	Mild systemic disease
3	Severe systemic disease
4	Severe systemic disease that is a constant threat to life
5	Moribund will die without procedure

Patient

- Patient should fast for 3 hr before procedure for deep and dissociative sedation
- IV access
- Obtain and record consent for sedation and procedure to be undertaken

PROCEDURE

Patient management

- Give supplemental oxygen

Monitor

- Take and record observations regularly, at 10 min intervals (before, during and after procedure)
- Monitor ECG, BP, respiratory rate and SpO_2
- Deep sedation and dissociative sedation require end tidal CO_2 monitoring
- Document sedation score; patient should maintain verbal contact, with respiratory rate of >8 breaths/min throughout procedure

Levels of sedation

Sedation level	Conscious level	Communication	Cardiovascular effect	Respiratory effect
Minimal	Awake	Normal verbal	No effect	No effect
Moderate	Depression	Responds to verbal command	Maintained	Spontaneous ventilation
Deep	Difficult to arouse	Responds to repeated/ painful stimulation	Maintained	May require assistance
General anaesthetic (GA)	Unrousable	None	May be impaired	Airway assistance and ventilation
Dissociative	Trace-like cataleptic state	None	Cardiovascular stable	Spontaneous ventilation
Respiratory rate:	<8 breaths/min (consider normal respiratory rate as this is higher in children)			

Documentation

- Complete sedation record, prescription chart and audit documentation

Recovery

- Following procedure, continuous observation of patient by a trained member of staff until fully alert (dependent on drug, dose and route used – see **Table 1**)
- When awake, admit to CDU/children's assessment unit for period of post-procedure observation

DRUGS FOR SEDATION

- See **Table 1** (prescriber: ensure contraindications and cautions are reviewed **before** administration – see BNF/BNFC)
- Titrate doses against patient requirements/desired level of sedation
- Drugs and techniques used should carry a margin of safety wide enough to render loss of consciousness unlikely
- Be aware of potentially synergistic effects of sedatives and analgesics – use single agent only in non-painful procedures
- Give opioids first and allow time to be maximally effective before sedative is used
- Ensure relevant antidotes (e.g. naloxone, flumazenil) and oxygen are immediately available before commencing procedure

***For obese patients (actual body weight >120% ideal body weight), use ideal body weight (IBW) – see* Ideal body weight guideline**

Table 1

Drug	Dose (IV)	Notes
Ketamine Dissociative sedation Procedural sedation (unlicensed indication)	• Adult ◦ initial: 0.5 mg/kg over 1 min ◦ maintenance: 0.25–0.5 mg/kg over 1 min, repeat every 2–5 min • Children aged 1 month–18 yr: ◦ 1–2 mg/kg should produce 5–10 min sedation (max dose 2 mg/kg)	• Only 200 mg/20 mL and 500 mg/10 mL vials may be used undiluted – other products should be diluted to a maximum concentration of 50 mg/mL with sodium chloride 0.9% • Analgesic and sedative • Action NOT reversible • Causes respiratory depression, hypertension, tachycardia, rash, hallucinations, delirium, skeletal muscle movement resembling seizure • Laryngospasm • Hypersalivation: may be mitigated by concurrent use of atropine IV (adults: 300–600 microgram, children: see BNFC) • Vomiting • Emergence hallucinations (older children/adults), agitation and vivid dreams; may be mitigated by use of benzodiazepines • Ataxia • Raised intracranial pressure • CI: Pregnancy, porphyria **Onset of action:** 1–2 min heralded by nystagmus and loss of response to verbal command **Duration of action:** 10–15 min

Table 1 Cont'd

Drug	Dose (IV)	Notes
Midazolam Procedural sedation	• Adult: ◦ initial: 2–2.5 mg by slow IV injection (approximately 2 mg/min), increased if necessary in steps of 1 mg; usual total dose 3.5–5 mg (max 7.5 mg) • Elderly: reduce doses by 50% • Children ◦ initial: 25–50 microgram/kg by slow IV injection over 3–5 min ◦ max total dose: aged 1 month–6 yr 6 mg; aged 6–12 yr 10 mg; aged 12–18 yr 7.5 mg ◦ intranasal instillation: aged 1 month–18 yr 200–300 microgram/kg	• Sedative only • 1 mg/mL midazolam is the only strength permitted for use in sedation • Action reversed with flumazenil • Recommended observation post procedure: 90–120 min • May cause respiratory depression or hypotension, especially when combined with opiates • Cardiovascular depression: bradycardia • Amnesia, confusion and ataxia • Paradoxical excitement and aggression (especially in children and elderly) **Onset of action:** 1–2 min (maximum effect 5–10 min) **Duration of action:** 30–60 min
Propofol Procedural sedation ***Do not use in children without anaesthetist present***	• Conscious sedation ◦ initial: 0.5 mg/kg over 1–5 min ◦ maintenance: 0.25 mg/kg by slow IV injection every 3–5 min	• Use 1% (10 mg/1 mL) emulsion only • Sedative only • Action NOT reversible • Recommended observation post procedure: 60–90 min • Short-acting agent with rapid onset and recovery phase • Contraindicated in peanut or soya allergy • Causes respiratory depression and hypotension • Bradycardia • Convulsions • May produce pain on IV injection **Onset of action:** <1 min **Duration of action:** 3–10 min
Fentanyl Analgesia during procedures	• Adult ◦ initial: 50–100 microgram (max 200 microgram) by IV injection over 3–5 min, then 25–50 microgram as required • Children (aged 1 month–12 yr) ◦ initial: 1–3 microgram/kg by IV injection over 3–5 min, then 1 microgram/kg as required	• Analgesic only • Action reversed by naloxone • Recommended observation post procedure: 60–90 min • May cause respiratory depression, dysphoria, hallucinations • Drowsiness • Nausea and vomiting • Hypotension • Urticaria and pruritus **Onset of action:** 1–2 min **Duration of action:**10–20 min

Dose and duration of action based on normal drug elimination (non-elderly patient with normal renal and hepatic function)

DISCHARGE

- Once patient able to ambulate and converse at pre-sedation levels
- Give conscious sedation advice sheet to patient (or guardian) advising rest, quiet and supervised activity for remainder of day
- Advise patient not to drive, operate machinery, work, smoke, drink alcohol or make any legally binding decisions for next 24 hr

TETANUS INFECTION – TREATMENT (ADULTS) ● 1/1

2 main goals in treating tetanus

- To prevent further spread of the neurotoxins (poisons) into the nerve tissue
- To provide relief from symptoms of muscle spasms and stiffness

RECOGNITION OF TETANUS INFECTION

- Symptoms usually begin 1 week after infection (range 3–21 days)
- sore throat with dysphagia (early)
- headache
- fever
- sweating
- muscle stiffness and spasms (may be localised to site of infection/inoculation)
- Later generalised muscle rigidity, apnoea and autonomic dysfunction (labile heart rate and BP) occur
- If tetanus is suspected take a serum sample (at least 3 mL), but do not delay treatment pending results

IMMEDIATE TREATMENT

- Clinical management includes:
- wound debridement
- antimicrobial agents with reliable activity against anaerobes (e.g. metronidazole 500 mg IV 8-hrly), contact consultant microbiologist
- intravenous tetanus immunoglobulin (TIG) or human normal immunoglobulin (Vigam)
- vaccination with tetanus toxoid following recovery
- All requests for human normal immunoglobulin need to be managed in accordance with the **Trust immunoglobulin policy**
- An immunoglobulin request form **must** be completed by a consultant before any immunoglobulin can be dispensed from pharmacy. Form can be found on the Trust intranet>Clinicians>Support services>Pharmacy>Immunoglobulin. It is important that no information is missing

Product	Treatment
Tetanus immunoglobulin (250 unit vial, 100 units/mL)	150 units/kg IM (multiple sites, max 1 vial per site) – not recommended due to the extremely large number of injections required (42 vials for a 70 kg person)
Vigam® (IV human normal immunoglobulin) 5 g/100 mL	Volume of Vigam® required to achieve equivalent recommended treatment dose of 5,000–10,000 units of tetanus immunoglobulin is approximately 250–500 mL. Can be infused over a period of 3–6 hr [see Summary of Product Characteristics (SPC) for administration details www.emc.medicines.org.uk] (unlicensed use) Dose (by weight): <50 kg 5,000 IU or 250 mL, >50 kg 10,000 IU or 500 mL

Discuss the options

- Multiple IM injections of tetanus immunoglobulin vs IV infusion of normal immunoglobulin (Vigam®)
- If Vigam® contraindicated (e.g. renal impairment or diabetes), consider using Privigen® IV, discuss with on-call pharmacist

Further information

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/441356/IMW166.02_Tetanus_information_for_health_professionals_v1.4__2_.pdf

TETANUS PREVENTION ● 1/2

- Most cases of tetanus occur in patients with a history of only partial immunisation
- Clean wounds have a low probability of harbouring tetanus spores and of developing anaerobic and acidic conditions that promote spore germination
- Immunisation in the UK means that anyone born after 1961 should be fully immunised unless there was a specific reason not to do so

PATIENTS AT RISK

- Unvaccinated or incompletely immunised or intravenous drug users
- Immunosuppressed patients: manage as incompletely immunised against tetanus regardless of immunisation status

TETANUS-PRONE WOUNDS

- Wounds or burns that show a significant degree of devitalised tissue (e.g. due to crush injury) or a puncture-type injury, particularly where there has been contact with soil or manure
- Wounds containing foreign bodies
- Wounds or burns that require surgical intervention that is delayed for >6 hr **or** in patients who have systemic sepsis
- Compound fractures
- Thorough cleaning of wounds is essential. If wound, burn or injury fulfils the above criteria and considered high risk, test for tetanus antibody and if negative give human tetanus immunoglobulin for immediate protection, irrespective of tetanus immunisation history of the patient (see **Tetanus prophylaxis: supply**). This is a precautionary recommendation since there is insufficient current evidence to support other alternatives

Tetanus antibody testing kits

Tetanus antibody testing kits should not be used to rule out tetanus infection which is a clinical diagnosis

- Tetanus antibody testing kits (available in Emergency Department) should be used for all patients with tetanus-prone wounds before giving vaccine or immunoglobulin, whether patient believes they are immune or not. Many patients who believe they are up to date with their immunisations prove to be wrong on formal testing, as immunity decreases with age. If the test is positive there is no need to give either vaccine or immunoglobulin

PREVENTIVE TREATMENT AFTER A WOUND

Tetanus immunisation status	Clean wound	Tetanus-prone wound	
	Vaccine	Vaccine	Human tetanus immunoglobulin
Fully immunised, i.e. has received a total of 5 doses of vaccine at appropriate intervals	None required	Perform tetanus antibody test to confirm immunity, especially in the elderly population	Only if high risk*
Primary immunisation complete, boosters incomplete but up to date	None required (unless next dose due soon and convenient to give now). Advise patient to check status with GP	Perform tetanus antibody test to confirm immunity, especially in the elderly population	Only if high risk*
Primary immunisation incomplete or boosters not up to date, or any immunocompromised patient	A reinforcing dose and further doses as required to complete recommended schedule to ensure future immunity. Advise patient to check status with GP	Perform tetanus antibody test. If negative give first dose and further doses as required to complete recommended schedule to ensure future immunity	Yes: if antibody test negative and vaccine required then give one dose of human tetanus immunoglobulin in a different site to where the vaccine was given
Not immunised or immunisation status unclear	An immediate dose followed, if records confirm the need, by completion of a full 5 dose course to ensure future immunity. Advise patient to check status with GP	Perform tetanus antibody test. If negative give an immediate dose followed, if records confirm need, by completion of a full 5 dose course to ensure future immunity	Yes: if antibody test negative and vaccine required then give one dose of human tetanus immunoglobulin in a different site to where the vaccine was given

* High risk: heavy contamination with material likely to contain tetanus spores and/or extensive devitalised tissue

TETANUS PREVENTION ● 2/2

- Further information is available from the Department of Health Green Book https://www.gov.uk/government/publications/tetanus-the-green-book-chapter-30

Tetanus prophylaxis: supply

	Product	Prophylaxis dose
Immunoglobulin		
All patients, regardless of age	Tetanus Immunoglobulin (250 unit vial)	250 units IM immediately **or** if >24 hr since injury, heavy contamination, or following burns, 500 units
	Subgam® (if tetanus immunoglobulin unavailable)†	750 mg IM immediately (if aged <10 yr 500 mg) **or** if >24 hr since injury, heavy contamination, or following burns, 1.5 g. Unlicensed use
Vaccines		
Primary course aged <10 yr	Infanrix®-IPV+Hib or Pediacel®	0.5 mL IM immediately
Booster aged 3–10 yr	Repevax®	0.5 mL IM immediately
All patients aged >10 yr	Revaxis®	0.5 mL IM immediately

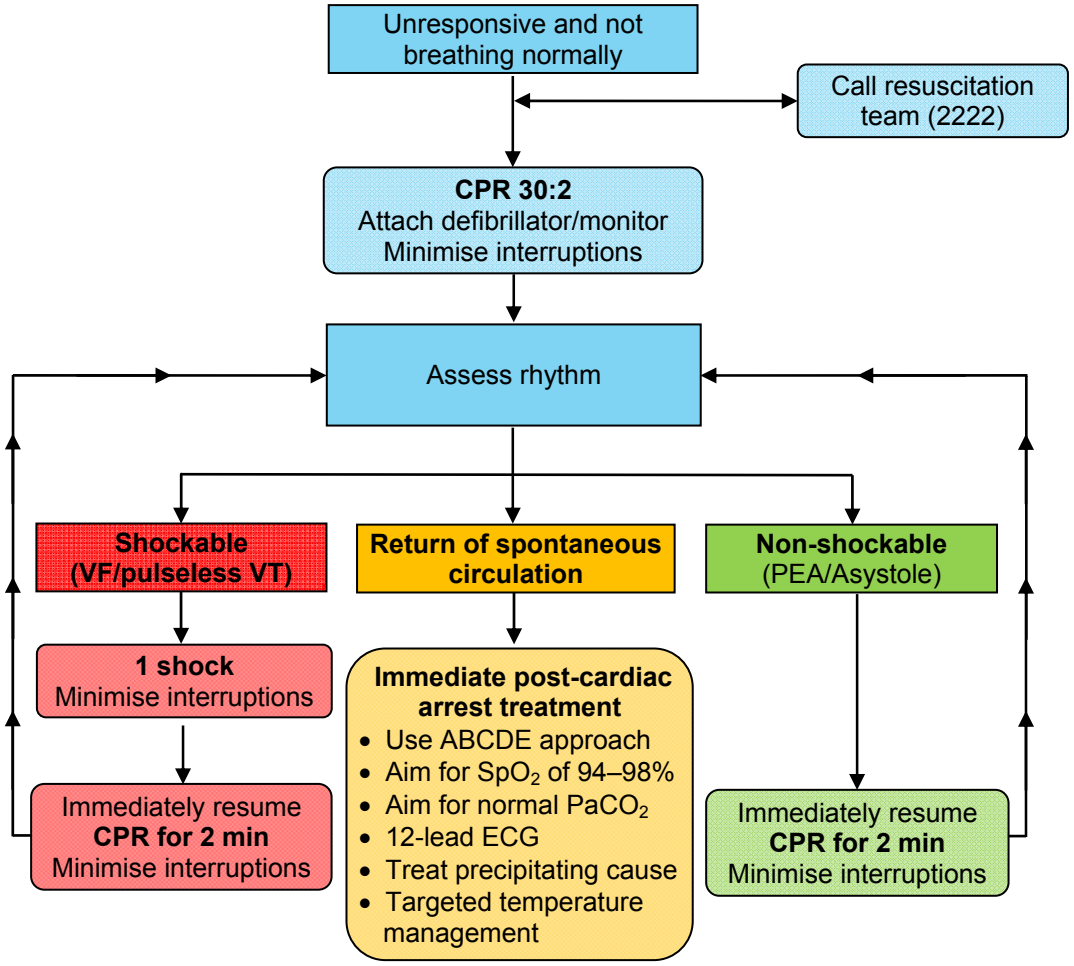
† Use of Subgam® for tetanus prophylaxis according to the above guidelines, **while there is no tetanus immunoglobulin available**, does not require the completion of human normal immunoglobulin supply forms

CARDIOPULMONARY RESUSCITATION – LIFE SUPPORT PROCEDURE ● 1/2

PROCEDURE FOR IN-HOSPITAL RESUSCITATION

This algorithm is an aide-memoire for hospital personnel trained in Advanced Life Support (ALS). For full review of ALS – see Trust intranet: Clinicians>Clinical services>Accident and Emergency

Adult advanced life support algorithm



During CPR

- Ensure high quality chest compressions
- Minimise interruptions to compressions
- Give oxygen
- Use waveform capnography
- Continuous compressions when advanced airway in place
- Vascular access (intravenous or intraosseous)
- Give adrenaline every 3–5 min
- Give amiodarone after 3 shocks

Treat reversible causes

- Hypoxia
- Hypovolaemia
- Hypo-/hyperkalaemia/metabolic
- Hypothermia
- Thrombosis – coronary or pulmonary
- Tension pneumothorax
- Tamponade – cardiac
- Toxins

Consider

- Ultrasound imaging
- Mechanical chest compressions to facilitate transfer/treatment
- Coronary angiography and percutaneous coronary intervention
- Extracorporeal CPR

CARDIOPULMONARY RESUSCITATION – LIFE SUPPORT PROCEDURE ● 2/2

DEFIBRILLATION ENERGIES

- Deliver the first shock with an energy of at least 150J
- Shock energy for a particular defibrillator should be based on manufacturer's guidance

DRUG DELIVERY

Peripheral administration

- Drugs administered peripherally must be followed by a flush of at least 20 mL sodium chloride 0.9% to aid entry into central circulation

Adrenaline

Shockable rhythm

- Give first dose of adrenaline 1:10,000 (100 microgram/mL) 1 mg (10 mL) by IV/IO injection after delivery of third shock
- give subsequent doses of adrenaline after alternate 2-min loops of CPR (which equates to every 3–5 min) for as long as cardiac arrest persists

Non-shockable rhythm

- Give adrenaline 1 mg IV/IO as soon as intravascular or intraosseous access is achieved
- give subsequent doses of adrenaline after alternate 2-min loops of CPR (which equates to every 3–5 min) for as long as cardiac arrest persists

Amiodarone

- Amiodarone 300 mg by IV/IO injection from a prefilled syringe or diluted in 20 mL glucose 5% to be given after third shock
- if VF/VT persists, or recurs, an additional dose of amiodarone 150 mg can be given by IV/IO injection after 5 defibrillation attempts

POST-ARREST MANAGEMENT

- Immediate goals of post-resuscitation care are to:
- provide cardiorespiratory support to optimise tissue perfusion, especially to brain
- transport patient to appropriately equipped critical care unit
- attempt to identify precipitating causes of arrest
- initiate measures to prevent recurrence (e.g. anti-arrhythmic therapy). See **Cardiac arrhythmias** guideline

Establish cause of cardiac arrest and treat underlying diagnosis – if in doubt, seek advice from on-call medical SpR

- Patients with ventricular tachycardia or ventricular flutter/fibrillation, occurring ≥48 hr after acute myocardial infarction or with no obvious reversible factors, should be considered for implantation of an implantable cardioverter defibrillator (ICD). Seek advice of cardiology team

IMMEDIATE POST-ARREST INVESTIGATION

- Blood gases
- U&E, glucose
- Chest X-ray
- 12 lead ECG

DISCHARGE AND FOLLOW-UP

- Dependent upon underlying cause

CARDIOPULMONARY RESUSCITATION CLINICAL JUSTIFICATION ● 1/2

Cardiopulmonary resuscitation (CPR) is mandatory when any person suffers a cardiorespiratory arrest unless there is a valid 'Do not attempt resuscitation' (DNAR) order written in patient's medical record

Discuss DNAR status with patient, if mentally competent, and/or family and carers and document in the medical record. If an emergency, document but discuss with them as soon as possible. Document clearly – see below for format

DO NOT ATTEMPT RESUSCITATION (DNAR)

- DNAR applies solely to CPR
- It does not affect any other aspect of treatment

Anticipate the likelihood of cardiopulmonary arrest and, if CPR may be inappropriate, discuss DNAR status with patient

Clinical justification

- A DNAR order is 'in the best interests of the patient' if one or more of the following applies:
- patient is irreversibly close to death
- despite successful CPR, there would be an unacceptably high probability of death or severe brain damage
- length and quality of life after resuscitation are unlikely to be valued by patient
- patient, who is mentally competent has expressed consistent desire not to be resuscitated

ETHICS AND CONSENT

Consent process must be followed before DNAR order.
Make sure you document the decision-making process at the time it happens, in detail.
Read the* Consent *guideline carefully and follow the steps contained therein

DOCUMENTATION

- Once decision not to attempt resuscitation has been made, **most senior doctor** present must:
- complete Trust **white** DNAR decision-making form and place in patient's medical record at the chronological point the decision was made
- complete Trust **red** DNAR proforma and place at front of medical record
- Once decision not to attempt resuscitation has been made, **most senior nurse** present must:
- write 'not for cardiopulmonary resuscitation' prominently in nursing record
- sign entry and write name and post in capitals
- Senior doctor and nurse must inform ward team

Trust Red DNAR proforma is a flag to highlight that a DNAR decision has been made and is not part of the medical record. However, a copy should be kept in the patient's medical record.
Complete the decision-making form and document the DNAR order in the nursing record

Review

- Doctor making decision to review the DNAR order writes prominently in the medical record at the chronological point the decision is reviewed

Patient admitted to UHNM or community hospital with community DNAR order

- Review DNAR status as soon as is clinically possible
- Complete Trust **white** DNAR decision-making form and place in patient medical record at the chronological point the decision is made
- Update **red** DNAR proforma to indicate review has taken place

DNAR decision rescinded

- Doctor making the decision to rescind the DNAR order must:
- document decision clearly in patient medical record
- cross through the Trust **white** DNAR decision-making form and write 'RESCINDED' prominently ensuring the clinical information is not obscured
- remove the Trust **red** DNAR proforma from medical record, and destroy
- Most senior nurse present updates and documents in nursing records and informs all other members of the healthcare team of the change in status

DISCHARGE

- If patient discharged with active DNAR order, insert **red** DNAR proforma into patient's discharge documentation. The DNAR order remains active during patient transfer and until reviewed by person taking responsibility for patient's healthcare
- DNAR order will be reviewed in an appropriate timescale, which will generally be within 14 days of discharge. This process has been agreed across the North Staffordshire healthcare community

Discharge to community

- Complete **North Staffordshire resuscitation communication sheet** found on Trust Intranet: Clinicians>Clinical services>Accident and Emergency>Resus>North Staffordshire DNACPR Communication Sheet. Fax, with a photocopy of the Trust **white** DNAR decision-making form to receiving GP
- document date, time and destination of fax in medical record
- Send **original** resuscitation communication sheet and photocopy of Trust **white** DNAR decision-making form with GP discharge letter. Red DNAR proforma must remain with patient
- Ward staff or discharge liaison team must inform community nurses/care home staff and ambulance service (if booking transport) immediately (by word of mouth) of DNAR order

Discharge to combined healthcare or community hospital

- Leave **red** DNAR proforma in patient medical record
- Before discharge, communicate resuscitation status to receiving care team and, when booking transport, to the ambulance service

APLS – CARDIORESPIRATORY ARREST • 1/3

MANAGEMENT

- Stimulate patient to assess for signs of life and call for help
- Establish basic life support: Airway – Breathing – Circulation
- Connect ECG monitor: identify rhythm and follow **Algorithm**
- Control airway and ventilation: preferably intubate
- Obtain vascular access, peripheral or intraosseous (IO)
- Change person performing chest compressions every few minutes

Airway (A)

- Inspect mouth: apply suction if necessary
- Use either head tilt and chin lift or jaw thrust
- Oro- or nasopharyngeal airway
- Intubation (see **Tables** for endotracheal tube sizes)

BOYS			
Age	Guide Weight (kg)	ET tube	
		Int diameter mm	Length cm
Birth	3.5	3.0/3.5	9
1 month	4.5	3.5	9
3 months	6.5	3.5	10
6 months	8	4	12
12 months	9.5	4.5	13
18 months	11	4.5	13
2 yr	12	4.5	13
3 yr	14	5	14
4 yr	16	5	14
5 yr	18	5.5	14
6 yr	21	5.5	15
7 yr	23	6	15
8 yr	25	6	16
9 yr	28	6.5	16
10 yr	31	6.5	17
11 yr	35	6.5	17
12 yr	43	7.5	18
14 yr	50	8	21
Adult	70	8	24

GIRLS			
Age	Guide Weight (kg)	ET tube	
		Int diameter mm	Length cm
Birth	3.5	3.0/3.5	9
1 month	4.5	3.5	9
3 months	6	3.5	10
6 months	7	4	12
12 months	9	4.5	13
18 months	10	4.5	13
2 yr	12	4.5	13
3 yr	14	5	14
4 yr	16	5	14
5 yr	18	5.5	14
6 yr	20	5.5	15
7 yr	22	6	15
8 yr	25	6	16
9 yr	28	6.5	16
10 yr	32	6.5	17
11 yr	35	6.5	17
12 yr	43	7.5	18
14 yr	50	8	21
Adult	70	8	24

- If airway cannot be achieved, consider laryngeal mask or, failing that, cricothyrotomy

Breathing (B)

- Self-inflating bag and mask with 100% oxygen
- Ventilation rate
  - unintubated: 2 inflations for every 15 compressions
  - intubated:10–12/min, with continuous compressions
- Consider foreign body or pneumothorax

Circulation (C)

- Cardiac compression rate: 100–120/min depressing lower half of sternum by at least one third (4 cm infant, 5 cm child, 6 cm adult): push hard, push fast
- Peripheral venous access: 1–2 attempts (<30 sec)
- Intraosseous access: 2–3 cm below tibial tuberosity (see **Intraosseous infusion** guideline)
- Use ECG monitor to decide between:
  - a non-shockable rhythm: asystole or pulseless electrical activity (PEA) **or**
  - a shockable rhythm: ventricular fibrillation or pulseless ventricular tachycardia

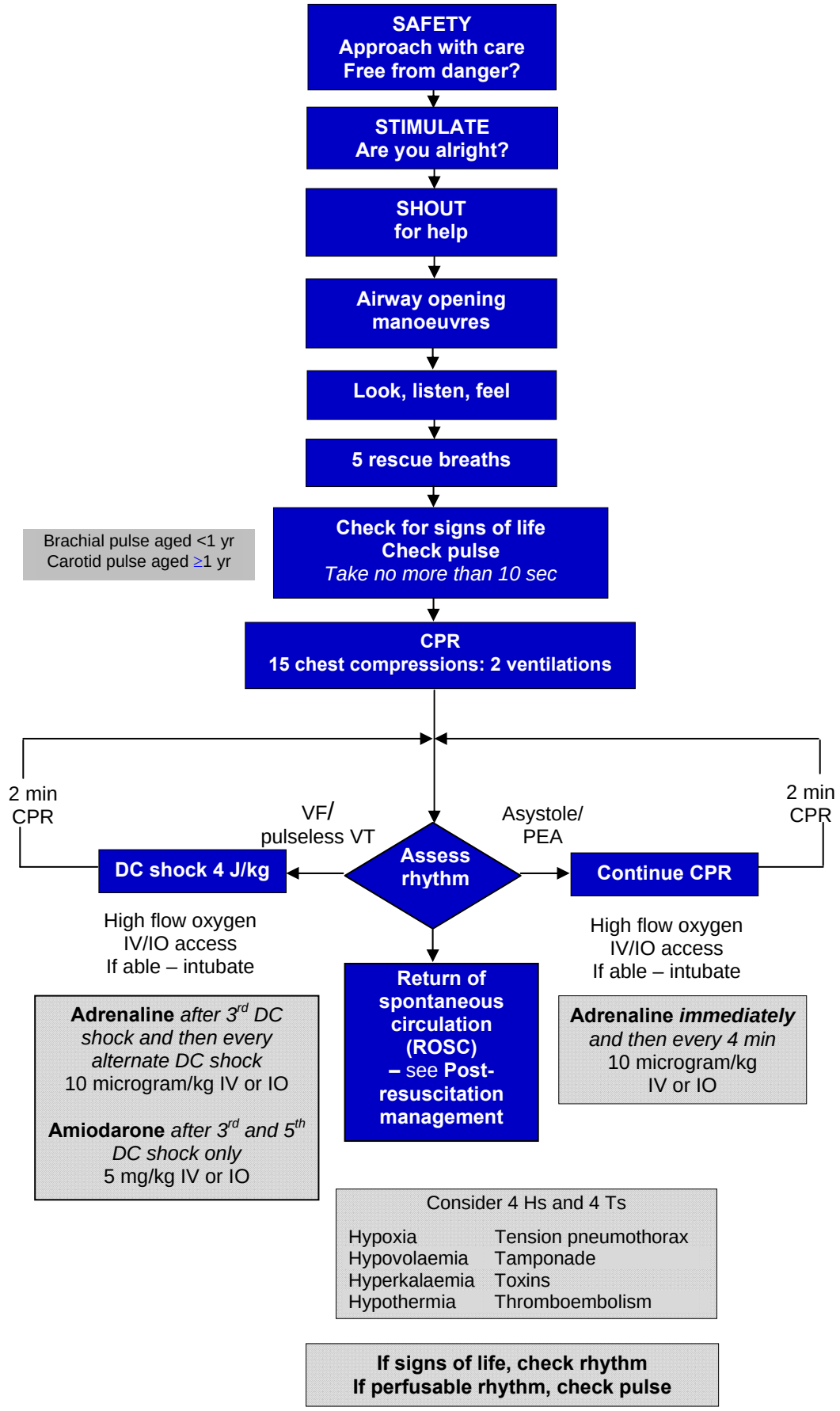
Algorithm for managing these rhythms follows:

- If arrest rhythm changes, restart **Algorithm**
- If organised electrical activity seen, check pulse and for signs of circulation

Adrenaline doses

Route	Aged <12 yr	Aged 12 yr–adult	Notes	
IV rapid bolus/ intraosseous	10 microgram/kg (0.1 mL/kg of 1:10,000)	1 mg (10 mL of 1:10,000 or 1 mL of 1:1,000)	Initial and usual subsequent dose	If given by intraosseous route flush with sodium chloride 0.9%

APLS – CARDIORESPIRATORY ARREST ● 2/3



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Defibrillation

- Use hands-free paediatric pads in children, may be used anteriorly and posteriorly
- Resume 2 min of cardiac compressions immediately after giving DC shock, without checking monitor or feeling for pulse
- Briefly check monitor for rhythm before next shock: if rhythm changed, check pulse
- Adrenaline and amiodarone are given after the 3rd and 5th DC shock, and then adrenaline only every other DC shock
- Automatic external defibrillators (AEDs) do not easily detect tachyarrythmias in infants but may be used at all ages, ideally with paediatric pads, which attenuate the dose to 50–80 J

PARENTAL PRESENCE

- Evidence suggests that presence at their child's side during resuscitation enables parents to gain a realistic understanding of efforts made to save their child. They may subsequently show less anxiety and depression
- Designate 1 staff member to support parents and explain all actions
- Team leader, not parents, must decide when it is appropriate to stop resuscitation

WHEN TO STOP RESUSCITATION

- No time limit is given to duration of CPR
- no predictors sufficiently robust to indicate when attempts no longer appropriate
- cases should be managed on individual basis dependent on circumstances
- Prolonged resuscitation has been successful in:
- hypothermia (<32°C)
- overdoses of cerebral depressant drugs (e.g. intact neurology after 24 hr CPR)
- Discuss difficult cases with consultant before abandoning resuscitation

POST-RESUSCITATION MANAGEMENT

Identify and treat underlying cause

Monitor

- Heart rate and rhythm
- Oxygen saturation
- CO_2 monitoring
- Core and skin temperatures
- BP
- Urine output
- Arterial blood gases and lactate
- Central venous pressure

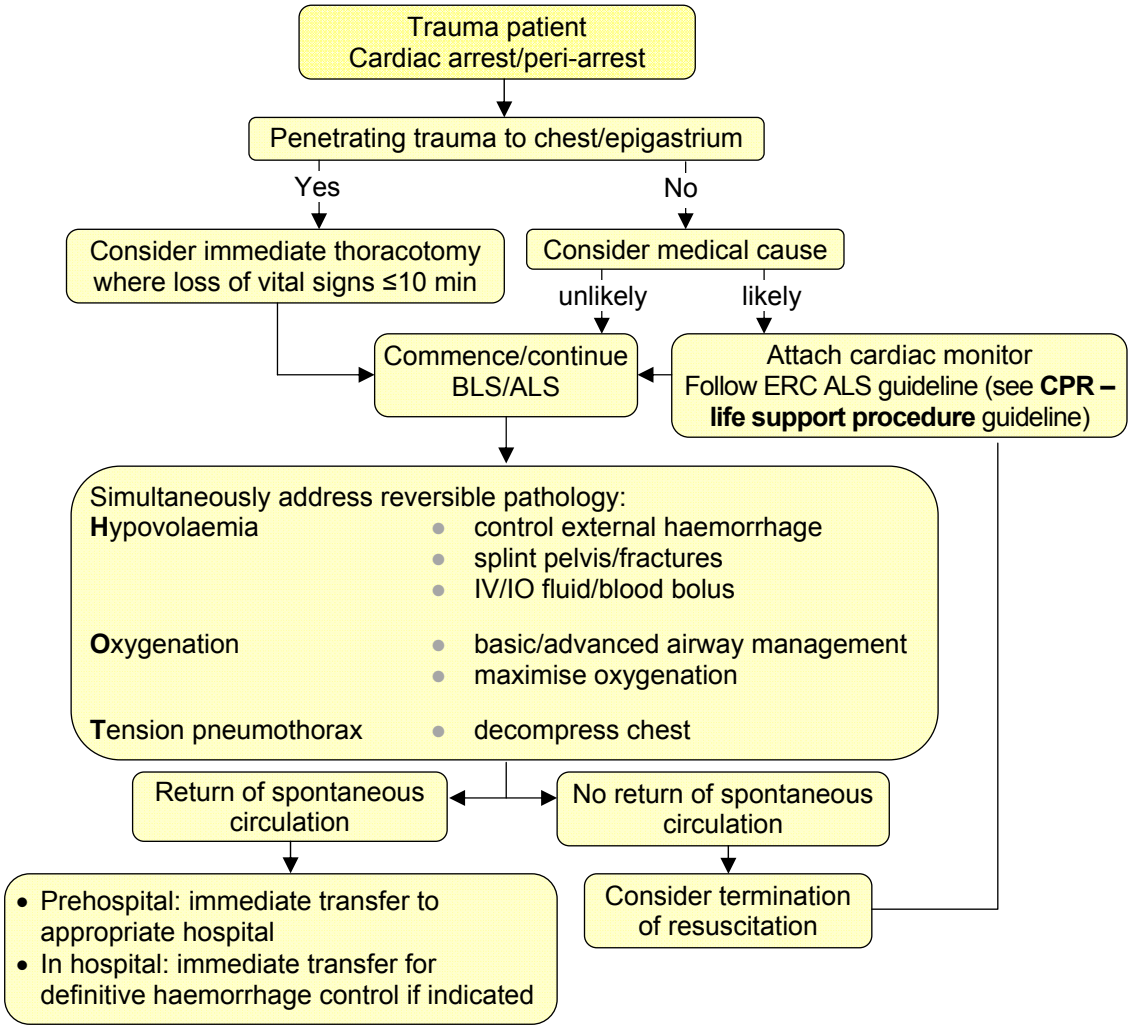
Request

- Chest X-ray
- Arterial and central venous gases
- Haemoglobin and platelets
- Group and save serum for crossmatch
- Sodium, potassium, urea and creatinine
- Clotting screen
- Blood glucose
- LFTs
- 12-lead ECG

- Transfer to PICU
- Hold team debriefing session to reflect on practice

TRAUMATIC CARDIAC ARREST ALGORITHM ● 1/1

This algorithm is an aide memoire for hospital trauma teams trained in the mamangement of traumatic cardiac arrest. When the primary cause of the cardiac arrest is **not** believed to be trauma, the European resuscitation council ALS guidelines should be utilised (see **CPR – Life support procedure** guideline)



Abbreviation key:

BLS	basic life support	ALS	advanced life support	ERC	European Resuscitation Council
IV	intravenous	IO	intraosseous		

Hypovolaemia

- Pre-alert blood bank, activate **Major haemorrhage policy** – see Trust intranet clinicians/clinical-guidance/blood-and-blood-products
- Control haemorrhage and administer blood products (see **Major haemorrhage pathway (MHP)** guideline)

Tension Pneumothorax

- Perform bilateral thoracostomies to decompress the chest

Thoracotomy

- Pre-alert cardiothoracic team to attend the trauma call if penetrating trauma to the chest or abdomen is suspected
- Perform FAST (focused assessment with sonography for trauma) scan to assist detection of cardiac tamponade and assess for myocardial contractility
- Performance of chest compressions must not delay evacuation of cardiac tamponade

POST-ARREST MANAGEMENT

- Immediate goals of post-resuscitation care are to:
- achieve haemorrhage control through damage limitation surgery or interventional radiology
- optimise tissue perfusion once haemorrhage is controlled
- avoid acute coagulopathy of trauma by maintaining normothermia and avoiding acidaemia

VERIFICATION OF DEATH ● 1/2

PROCEDURE

- Assess patient's condition against following criteria:
  - no heart beat heard over 5 minutes
  - no carotid pulse felt over 5 minutes
  - no breath sounds heard and no chest movement seen over 5 minutes
  - pupils fixed and dilated
  - corneal reflex absent

Information to be recorded in patient's medical notes

- Date and time of examination of body
- Entry stating that:
  - no heart beat heard over 5 minutes
  - no carotid pulse felt over 5 minutes
  - no breath sounds heard and no chest movement seen over 5 minutes
  - pupils fixed and dilated
  - corneal reflex absent
- Patient verified as dead
- Signature, name and designation of verifier

LEGAL ISSUES

- A doctor who has attended a deceased person during his/her last illness is required to issue a medical certificate stating cause of death 'to the best of his/her knowledge and belief'
- To issue a certificate, doctor is not obliged to view the body but good practice requires that, if he/she has any doubt about fact of death, he/she should satisfy himself/herself in this way
- As the doctor is not obliged in law to see the body in order to issue a certificate, appropriately trained nurses may expand their role into verification of expected death
- It is the hospital doctor's responsibility to:
  - inform the Coroner where necessary
  - issue death certificate
  - inform deceased's GP

THE CORONER

When registering the death at the registration office, ask whether Coroner must be informed. The registrar is regularly updated with Coroner's requirements. Circumstances of death about which Coroner must be informed include:

- **Unknown cause:** cause of death is unknown
- **? Natural causes:** It cannot readily be certified that the cause of death is due to natural causes
- **No medical attendance:** deceased either not attended by a doctor during his last illness **or** was not seen within the last 14 days
- **Suspicious/violent:** suspicious circumstances **or** a history of violence
- **Accident:** death due to some form of accident (e.g. fall, road traffic collision, incident at work or in the home etc.) Consider whether an old injury may have caused/contributed to death years later
- **Self neglect/neglect by others:** any suggestion of self-neglect/neglect by others – can include lack of medical care (e.g. bed sores not properly treated. If bed sores are level 1 or 2 these do not need reporting – unless other reasons for doing so)
- **Prison/police custody:** death occurred during/shortly after release from prison, young offenders institution or police custody (even if cause of death due to natural causes)
- **Mental Health Act 1983:** deceased detained under the Mental Health Act. There is no longer a requirement to report deaths of persons who were subject of a DoLS
- **Abortion:** death linked to an abortion (includes both maternal deaths and infant deaths where infant has drawn breath, even if abortion legally performed under the Abortion Act)
  - stillbirths do not need to be reported if doctor satisfied that infant has not drawn breath
- **Self harm:** death may have been due to the actions of the deceased, overdose, solvent abuse, alcohol related deaths, self-injury etc.

VERIFICATION OF DEATH ● 2/2

- **Industrial disease:** give details if the deceased had industrial/disability/war pensions. Pensions for white finger and hearing loss do not qualify under this section
- pneumoconiosis/chronic bronchitis and emphysema/pulmonary fibrosis (including Farmer's Lung)/mesothelioma/asbestosis – give details of any known employment and smoking history
- chronic obstructive pulmonary/airways disease – only report if a history of coal mining
- **Recent operations/procedures/medicines:** It may be wise to report any death where there is an allegation of medical mismanagement
- report deaths which are suspected to be due to/exacerbated by medical intervention/medicines (e.g. GI bleeds due to warfarin, aspirin, NSAIDs etc. pseudomembranous colitis due to antibiotics, or deaths attributable to chemotherapy, immunosuppressive drugs, steroids etc.
- deaths where there has been surgery under general anaesthesia within 12 months of death or where more distant surgery has led to the death
- do not report minor surgical procedures (e.g. gastroscopies, endoscopies, biopsies, cataracts etc.) unless complications arose from procedure
- **Admission within 24 hr:** death occurs within 24 hr of admission to hospital (unless admission was for terminal care)
- **Falls, fractures, cerebral haemorrhage, CVA, CVD:**
- any fractured limbs within 12 months of death
- cerebral, subdural or extradural haemorrhage **unless** certifying doctor satisfied that haemorrhage due to entirely non-traumatic reasons e.g. CVA, CVD. **But** if bleed due to/exacerbated by drugs e.g. warfarin, heparin etc. report death
- falls without serious injury which have not contributed to death do not need to be reported
- **Cancer related deaths:**
- bladder cancer in a person born before 1935 (especially if any suggested link with Michelin) or where dye works may be implicated
- carcinomatosis – unknown primary
- neutropenic sepsis from chemotherapy treatment
- **Failures, obstructions, bronchopneumonia, sepsis and peritonitis:** any which are not adequately qualified. Unqualified cardiac arrest, congestive cardiac failure and brain hypoxia are similarly unacceptable unless adequately qualified
- **Old age:** an acceptable cause of death in a person aged ≥80 yr but generally better to include co-morbidities in part 2 if no specific medical cause of death which would better describe the death and therefore does **not** need to be reported
- **Miscellaneous:** any death where there are unusual or disturbing features

The Coroner must be contacted to discuss any case where there is doubt regarding any of the above circumstances

- All staff are advised to read 'Guidance for doctors certifying cause of death' from the Office for National Statistics Death Certification Advisory Group, April 2005 www.gro.gov.uk/medcert

A copy of 'Reportable deaths – a guide' can be obtained from the Coroner (01782 234777)

ROLE OF MHP

- Ensures rapid delivery of appropriate blood components during major haemorrhage
- Improves communication between clinical area and transfusion laboratory staff
- Provides tailored products for clinical situation (see MHP adult, paediatrics, obstetrics)

Activate MHP

- Activate **MHP via bleep 175** (dial 78 – 175 – extension number – #)
- If active/suspected major bleeding associated with systolic BP<90 mmHg +/- pulse rate >120 bpm **or** if ongoing severe bleeding e.g. 150 mL/min
- Allocate MHP team roles
- For inpatients ascertain availability of crossmatched or group-specific blood
- See MHP team roles and communication lead crib sheet on intranet

County hospital

- Activate MHP on bleep 4571 (dial 88 – 4571 – extension number – #) from 0630–midnight
- Out-of-hours contact UHNM as above
- Send appropriately trained staff to transfusion laboratory to collect components
- Coordinate urgent transfer to UHNM where appropriate

GENERAL PRINCIPLES

1. Stop the bleeding

- Use physical methods to control haemorrhage wherever possible e.g. pelvic binder, tourniquet, fracture reduction
- Apply dressings: Gamgee® pad with pressure, topical haemostatic agents (Celox™ gauze)
- Alert and mobilise surgical, anaesthetic, gastroenterology and/or interventional radiology teams immediately as dictated by clinical situation
- Give **intravenous tranexamic acid** (within 3 hr of injury) and correct potential/established coagulopathy e.g. reverse anticoagulant effects
- Transfer patient to operating theatre/radiology intervention suite and undertake '**early appropriate care**' e.g. surgery, endoscopy, interventional radiology

2. Resuscitate patient and perform relevant investigations

- Administer high flow **oxygen**
- On activation/arrival obtain blood for **urgent laboratory tests** (crossmatch; FBC; PT, APTT, fibrinogen; U&E, LFT, bone profile – request 'massive haemorrhage' bloods on iCM) and **near patient testing** (arterial blood gas, thromboelastography where available)
- Ensure crossmatch sample taken **before** administration of group O red cells
- Use positive patient ID at all stages and label samples from patient's wristband
- In adults keep systolic blood pressure (SBP) ≥80 mmHg (aim ≥90–100 mmHg if co-existent serious brain injury suspected)
- In uncontrolled bleeding consider permissive hypotension (deliberate under-resuscitation) until haemorrhage controlled
- **Limit crystalloid usage to 500 mL** – replace blood volume using blood components
- Avoid vasopressors
- Keep patient warm (≥36°C) using Bair Hugger™ and by warming all fluids – rapid infusion of red cells causes hypothermia which impairs coagulation
- Ensure **normocalaemic** – titrate IV calcium chloride 10% against ionised calcium result
- Titrate resuscitation against base excess/lactate – often a better real-time marker
- **Imaging:** Immediate chest X-ray, pelvic X-ray, CT scan (or potentially FAST scan, USS or OGD) likely necessary to influence critical decision making – often appropriate to perform CT scan while patient still shocked as diagnosis of injury greatly improves ease of therapy
- If not responding after initial resuscitation, reconsider cause of shock (e.g. tamponade) or source of bleeding (e.g. retroperitoneal)
- Repeat laboratory testing every 30–60 min until haemostasis controlled

3. Transfuse blood components

- Alert transfusion laboratory of MHP activation on bleep 175 (dial 78-175-extension number-#) as soon as MHP activated (use same number during MHP or at stand-down)
- Allocate single **communication lead** to liaise with transfusion laboratory during MHP
- Transfusion laboratory will contact Sodexo and **dedicated MHP porter** will be allocated
- Take crossmatch sample **before** transfusion of group O red cells – may interfere with grouping

- Group specific red cells will be issued on receipt of a **single sample** – absence of a confirmed ABO blood group will not delay blood component issue in the emergency setting (contrast to UHNM's '2-sample transfusion policy')
- Use plasma upfront in massive haemorrhage (not obstetrics) ensuring a **FFP:RBC ratio of at least 1:2**
- Administer RBC and FFP simultaneously (or alternate administration)
- Administer each unit over 5–10 min as clinically indicated and adhering to Transfusion SOP

4. Administration of blood components

- Use a blood warmer as soon as possible after MHP activation to avoid hypothermia
- Group O RhD negative RBC are a finite resource and their use should be minimised wherever possible (see **Emergency 'flyers'** below)
- Use group specific RBC (i.e. ABO and RhD matched) as soon as possible (available within 15 min of sample receipt in laboratory or sooner if valid G&S available)
- MHP packs aim to provide appropriate components to prevent coagulopathy developing
- Consider additional components according to clinical situation/results – **inform laboratory early** as platelets or specific components may need to be ordered from NHSBT in Birmingham (blue light guaranteed delivery within 1 hr 45 min)
- Consider blood salvage early – contact on-call anaesthetist/surgeon

Table 1: Standard components provided by transfusion laboratory on MHP activation

MHP	Blood components	Comments
Pack 1	4 units RBC	Group O RhD neg (female), group O RhD pos (male), group specific (where blood group known)
	4 units FFP*	Pre-thawed FFP provided in trauma only – standard FFP thaw time <20 min (SD-FFP Octaplas® provided if non-trauma and date of birth after 1.1.1996)
Pack 2	4 units RBC	Group specific (or as above where blood group still unknown)
	4 units FFP*	FFP or SD-FFP
	1 ATD platelets*	
Pack 3	4 units RBC	Group specific (or as above where blood group still unknown)
	4 units FFP*	FFP or SD-FFP
	1 ATD platelets*	
	2 pools cryoprecipitate*	

*Patients born after 01/01/1996 (or estimated date of birth after 01/01/1996 in trauma) will receive pathogen inactivated components from the earliest opportunity i.e. solvent detergent plasma (Octaplas®) and methylene-blue treated cryoprecipitate (MB-Cryo), in addition to apheresis platelets

EMERGENCY 'FLYERS'

- Group O RhD negative blood or 'flyers' are a finite resource and should only be used where clinically indicated i.e. group O RhD negative patients and emergency situations, if required, whilst awaiting group specific blood
- For inpatients, check availability of crossmatched or group-specific blood (available almost immediately if valid G&S in lab) **before** using emergency 'flyers'
- Where G&S sample unavailable, preferentially use group O RhD positive RBC for males until group specific RBC available
- Patient's unique ID (NHS/hospital/ED number) must be entered in fridge kiosk when removing 'flyers' to provide traceability
- In addition the A5 form included with group O RhD negative unit must be fully completed and sent back to transfusion laboratory as soon as possible
- Inform transfusion laboratory immediately (by telephone) when emergency 'flyers' have been used so that these can be replaced
- Location of group O RhD negative blood is detailed in **Table 2**

Table 2: Location of Group O RhD negative red blood cells (emergency 'flyers')

Royal Stoke – A&E resus	2 units
Royal Stoke – Theatres 1–5 and Theatre Hub	2 units
Royal Stoke – Main issue fridge	2 units
Royal Stoke – Maternity delivery suite	2 units (suitable for paediatrics) 1 neonatal unit
County – Main issue fridge	6 units

MHP TARGETS

- Massive transfusion is guided by clinical situation as laboratory parameters may be unavailable and/or unrepresentative of current clinical situation
- Use near-patient testing of coagulation wherever possible to guide targeted component use
- Optimise coagulation by preventing/correcting hypothermia, hypocalcaemia, acidosis
- Once haemostasis secured uphold restrictive transfusion thresholds and replenish iron stores

Table 3: Aims of MHP resuscitation

	Target	Comments
Hb	70–90 g/L (once haemostasis secured)	80–100 g/L where known cardiovascular disease/elderly frail
Plts	>50 × 10^9/L in major bleeding >100 × 10^9/L in multiple trauma	Order platelets once <100 × 10^9/L
PT/APTT	Ratio <1.5	
Fibrinogen	>1.5 g/L (>2.0 g/L obstetrics)	
Ionised Ca^{2+}	>1.1 mmol/L	
Lactate	<2 mmol/L	
pH	>7.35	
Normothermic	≥36°C	Use blood warmer and Bair Hugger™

MHP STAND-DOWN

- Fit patient's vital signs will normalise with small fluid increments whilst they are still vastly hypovolaemic and hypoperfused
- Once resuscitation complete (or situation becomes futile) contact transfusion laboratory on bleep 175 to **'stand-down MHP'**
- Cancel unnecessary requests in progress
- Return surplus blood components and ensure traceability by completing documentation/end-fating units
- Once haemostasis secured uphold restrictive transfusion thresholds, ensure appropriate VTE prophylaxis and replenish iron stores

SPECIFIC SITUATIONS

Trauma

- Establish patient ID, generate ID documentation/stickers and **attach patient wristband asap**
- Confirm patient ID wherever possible through positive patient ID
- Where transfusion administered in transit, register patient with EMRTS unique identifiers
- Where ID unknown, indicate if **estimated date of birth after 01/01/1996** – impacts on blood components provided by laboratory
- Any unused components transferred with patient should go straight to blood bank – ensure transport box remains unopened so cold chain can be confirmed
- If units are required immediately a clinical decision may be made to use blood components that have arrived with the patient
- Where transfusion has occurred before UHNM admission, further administration of blood components must take into account units already transfused
- Prime rapid infusers with saline
- Administer tranexamic acid 1 g IV as soon as possible (within 3 hr of event) followed by 1 g by infusion over 8 hr
- Only use group O RhD negative 'flyers' where unable to wait 5–10 min for pack 1 arrival
- Ensure crossmatch sample taken **before** transfusion of group O RBC – may interfere with grouping
- Enter patient unique ID to release 'flyers' to ensure traceability
- Send single crossmatch sample as soon as possible to enable group specific red cells to be issued
- 4 units pre-thawed FFP (shelf life <5 days) allocated to patient on trauma MHP activation
- If trauma 'code red' – consider additional 4 units FFP to maintain 1:1 ratio FFP:RBC (evidence suggests may reduce death from exsanguination but no impact on overall survival)
- Once patient name/details established, send urgent repeat G&S sample although keep original unknown patient ID until patient stabilised
- See **Adult MHP flow chart** below

Paediatrics

- Provide (estimated) weight at time of MHP activation
- Keep SBP ≥70 mmHg + [2 × age] without exceeding adult values
- Appropriate component volumes according to weight will be provided by the laboratory and special blood requirements adhered to wherever possible

- In trauma administer tranexamic acid 15 mg/kg (max 1000 mg) bolus followed by 2 mg/kg/hr (max 125 mg/hr) by IV infusion until haemorrhage controlled
- In trauma use pre-thawed FFP until pathogen-inactivated plasma available
- Clinically assess after every 10 mg/kg aliquot (max 250 mL) of RBC/FFP
- Maintain ionised calcium >1.0 using calcium gluconate 0.3 mL/kg IV over 10 min
- Consider tranexamic acid outside of trauma setting (dosage as above)
- **Inform the transfusion laboratory in advance** where high risk of neonatal haemorrhage
- Emergency neonatal compatible unit available in maternity fridge – to access unit enter maternal surname and time of birth
- See **Paediatric MHP flowchart** on Trust intranet

Obstetrics

- Major post-partum haemorrhage (PPH) defined as blood loss >1000 mL
- At term, changes in haemostasis occur to minimise risk of PPH – but as a consequence, increase the risk of thrombosis
- Tranexamic acid, administered as soon as possible after bleeding onset, reduces death due to bleeding in women with PPH with no adverse effects
- Low fibrinogen levels are associated with an increased risk of progression to severe PPH and should be maintained >2.0 g/L
- Early plasma usage, extrapolated from massive haemorrhage in trauma, may inadvertently lead to haemodilution of clotting factors (FFP fibrinogen concentration approx. 2.4 g/L vs physiological fibrinogen concentration of 6–8g/L at term)
- Once haemostasis secured uphold restrictive transfusion thresholds, ensure appropriate VTE prophylaxis and replenish iron stores
- Refer to full ASQUAM guidelines
- See **MOH flowchart** on Trust intranet

CORRECTING COAGULOPATHY

- Patients on warfarin (or alternative vitamin K antagonist) administer vitamin K 5 mg IV and 25 IU/kg prothrombin complex concentrate (PCC – Octaplex®) before INR result available (post sampling) – available directly from transfusion laboratory
- Where metallic prosthetic heart valves *in situ* ensure risks/benefits of anticoagulation/reversal fully discussed and documented and discuss future anticoagulation with cardiothoracic unit
- Patients on dabigatran administer idarucizumab (Praxbind®). Patients on apixaban or rivaroxaban should receive tranexamic acid and potentially PCC – discuss with on-call haematology
- Ensure anticoagulant medication stopped
- If established coagulopathy e.g. liver disease – request additional 4 units FFP +/- cryoprecipitate as per laboratory parameters and ensure vitamin K replete
- See anticoagulant reversal guidelines

ACUTE GI HAEMORRHAGE

- Be cautious not to over-transfuse, especially in lower GI bleeds
- Unless haemodynamically unstable, reassess Hb after every unit transfused
- A restrictive target threshold of 70–90 g/L is indicated, especially in chronic liver disease (CLD) patients with Child-Pugh A and B
- Ensure iron stores are replenished in addition to any transfusion
- Early use of platelets/increased use of plasma may be indicated in CLD patients with pre-existing abnormal results – **inform transfusion laboratory early**
- Consider use of tranexamic acid
- See **Acute upper GI haemorrhage** in **Medical** guidelines

FLOW CHARTS

- For MHP flowcharts **see Trust intranet** – clinicians >clinical guidance>blood and blood products> Major haemorrhage pathway (MHP) and other transfusion flowcharts (suitable for printing)
  - adult major haemorrhage including trauma – flowchart
  - paediatric major haemorrhage including trauma – flowchart
  - major obstetric haemorrhage pathway (read with ASQUAM guidelines) – flowchart
  - major haemorrhage pathway (MHP) team roles
- Activating the MHP – crib sheet for the 'MHP communication lead' for initial and subsequent contact with transfusion laboratory
  - quick guide to accessing blood components

MAJOR HAEMORRHAGE PATHWAY (MHP) • 5/5

Flowchart: Major haemorrhage pathway (MHP) UHNM – Adult including trauma

Significant blood loss e.g. 150 mL/min **or** blood loss with haemodynamic instability e.g. SBP<90 mmHg, HR>110 bpm

Resuscitate
- ABC + oxygen 15 L
- Fluid warmer (saline prime) Bair-Hugger™
- Continuous cardiac monitoring

Baseline tests: Lab XM6u, FBC, PT, APTT, fibrinogen, U&E, LFT, Ca
Point of care: ABG, +/- TEG/ROTEM

Notify transfusion laboratory RSUH bleep 78-175-ext- # (County 4757/bleep 4751<midnight)
'Activate MHP adult/MHP adult trauma'
State *'MHP adult (+/- trauma), location, full patient details, team contact numbers, request pack 1'*

Major haemorrhage team roles
Team Leader: Coordinate management
Communication lead: Liaise with lab/other services
Scribe: Document management/blood product usage
Runner: Deliver samples/collect blood products

NB. Dedicated Sodexo porter ordered by transfusion lab at time of activation

- **Allocate team roles** and inform consultant +/- anaesthetist
- **MHP Pack 1 available in 5–10 min**; only use 'flyers' (group O RhD negative RBC) if transfusion required immediately (see locations in box above right). Enter patient unique ID to access units
- **Use cell salvage** if available and not contraindicated (250 mL = 1 unit red cells)
- **Administer MHP Pack 1** (contains O neg/O pos/group specific/crossmatched – depending on sample availability in transfusion lab and patient demographics). Alternate RBC:FFP administration if single IV access. Move to group specific/crossmatched RBC as soon as available
- **Monitor** every 30–60 min (as per baseline tests)

Bleeding controlled?

YES → **'Stand down MHP'**
- Notify transfusion laboratory
- Return unused products and document usage
- Uphold restrictive Hb thresholds +/- oral/IV Fe
- DVT prophylaxis when haemostasis secured

NO → Administer MHP Pack 2 and evaluate response/monitor

YES → 'Stand down MHP'

NO → Administer MHP Pack 3 and evaluate response/monitor

YES → 'Stand down MHP'

NO → Provide 'goal directed therapy' and evaluate response

MHP	Blood products
Pack 1	Red cells 4 units FFP 4 units[1]
Pack 2	Red cells 4 units FFP 4 units[2 3] Platelets 1ATD
Pack 3	Red cells 4 units FFP 4 units[2 3] Platelets 1 ATD Cryo 2 pools

Location group O RhD neg RBC 'flyers':
A&E resus
Main issues fridge (pathology)
Hub theatres
Theatres 1–5
Maternity delivery suite
County main issues fridge
Time to group specific red cells: **<15 min**
(time from sample receipt – sooner if G&S available in lab)

Stop the bleeding

Therapeutic interventions (consider)
- Tranexamic acid 1 g IV stat + 1g IV over 8 hr (in trauma <3 hr)
- Vitamin K 10 mg IV if liver disease
- 25 u/kg PCC (<3000 u) + if warfarinised vitamin K 5 mg
- If anticoagulated with DOAC discuss haemostatic agents with haematology
- Topical haemostatic agents
- Terlipressin 2 mg IV + IV Abx if suspected variceal bleed
- If ionised Ca <1.1 give CaCl 10% 10 mL

Surgical interventions
- Early appropriate care

Radiological interventions
- Embolisation

Endoscopy
- Variceal banding

Manual interventions
- Tourniquet/external pressure

Aims of therapy
- Hb 70–90 g/L (once haemostasis secured)
- Plts >50 x10^9/L (order if <100 x10^9/L)
- PT/APTT ratio <1.5
- Fibrinogen >1.5 g/L
- Ionised Ca^{2+} >1.1 mmol/L
- Normokalaemic
- Normothermic ≥36°
- pH>7.35
- Lactate <2 mmol/L

[1] Pre-thawed FFP will be provided for trauma MHP
[2] SD-FFP if (estimated) date of birth ≥01/01/1996
[3] Additional FFP may be required – see guidelines

ADVERSE REACTIONS TO BLOOD TRANSFUSION ● 1/5

BACKGROUND

- Human error is responsible for 1 in 3 transfusion related deaths
- Use Positive Patient Identification (PPID) at every step of the transfusion pathway to uphold patient safety. Ask patient to state his/her name and date of birth whilst checking against patient's wristband
- Patients must be encouraged to report any symptoms experienced during or following a transfusion

ACUTE TRANSFUSION REACTIONS (ATRS)

- **Acute transfusion reactions (ATRs)** occur during or <24 hr following a transfusion
- **Transfusion associated circulatory overload (TACO)** is the commonest cause of morbidity and mortality relating to transfusion
- For all suspected ATRs
  - temporarily stop the transfusion
  - confirm product against PPID and ensure component integrity
  - perform full set of observations including fluid balance
- Categorise ATRs according to symptom severity to facilitate appropriate management and investigation
- Report moderate and severe ATRs via the trust DATIX system
- DATIX reporting enables appropriate investigation and reporting to SHOT/MHRA
- See **Flowchart: Recognition and primary management of ATR**, **Table 1** and **Table 2**

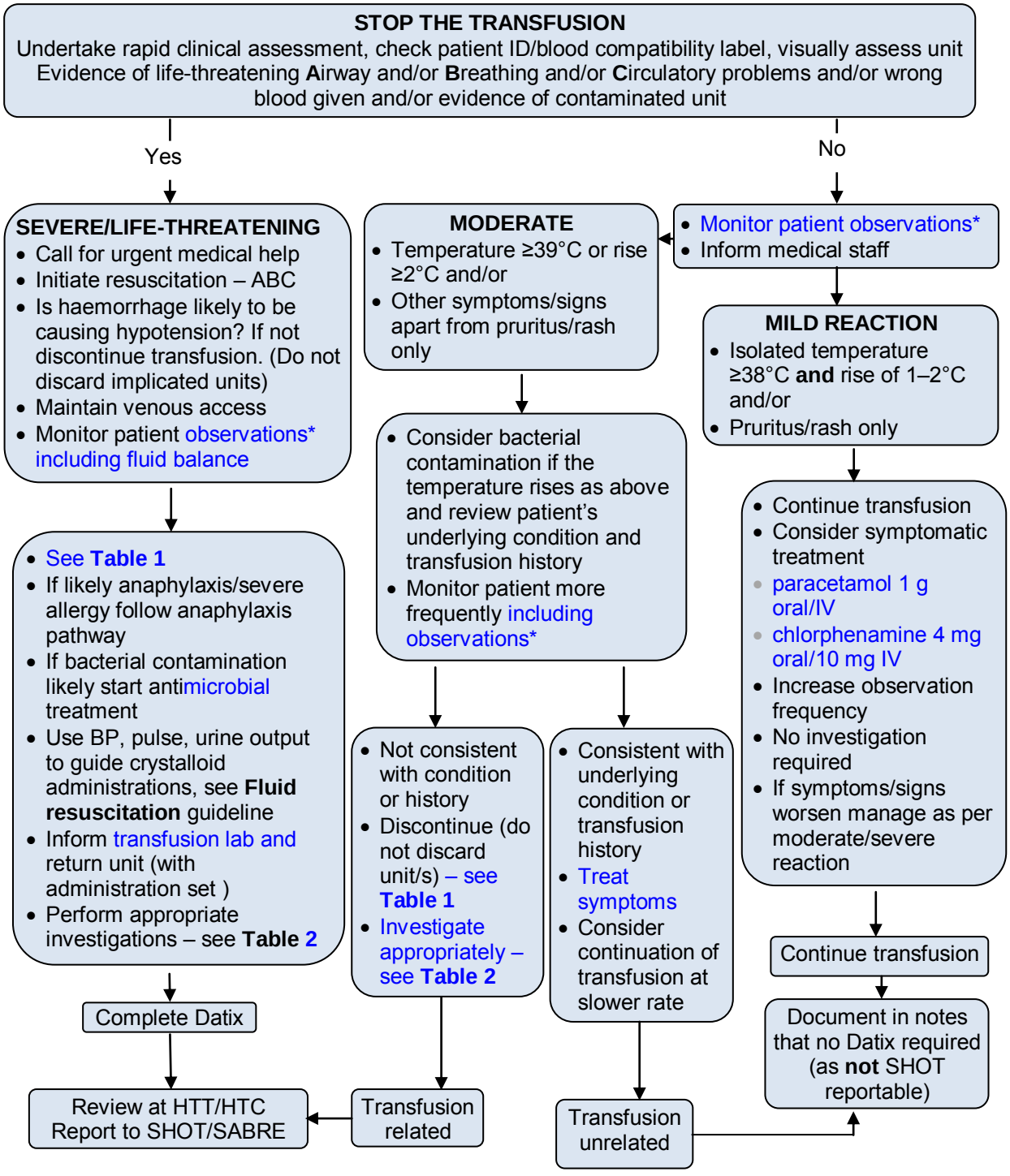
DELAYED ADVERSE REACTIONS

- Delayed haemolytic transfusion reactions (DHTR) occur >24 hr after transfusion in a patient who has been previously allo-immunised to a red cell antigen by blood transfusion or pregnancy
- Timings of G&S samples should reflect patient's current immune status although allo-antibodies may be undetectable in pre-transfusion screening
- Provide irradiated blood components where necessary to prevent transfusion-associated graft vs host disease (TaGVHD); where viable lymphocytes engraft and mount a fatal immune response in susceptible patients
- Viral transfusion transmitted infections are now very rare in developed countries
- Transmission of variant Creutzfeldt-Jakob disease (vCJD) remains a concern hence those patients born after 1/1/1996 should receive non-UK, virally inactivated plasma products; all patients who have received blood components or products must be informed that they can no longer be a blood donor

Delayed adverse reaction	Signs/symptoms
Delayed haemolytic transfusion reaction (DHTR)	Jaundice, fever, anaemia/poor increment, haemoglobinuria, possibly renal failure. Occurs <14 days post transfusion
Allo-antibody formation	Nil, but may have implications for future transfusion practice
Post-transfusion purpura (PTP)	Bleeding, thrombocytopenia 5–12 days post transfusion
Post-transfusion viral infection	Confirmation depends on extensive testing
Transfusion associated graft vs host disease (TaGVHD)	Fever, rash, diarrhoea, liver dysfunction, cytopaenia typically 7–14 days post transfusion – fatal
Iron overload	Deposition in liver, heart and endocrine organs resulting in organ failure (years)

RECOGNITION AND PRIMARY MANAGEMENT OF ATRs

Patient exhibiting possible features of an acute transfusion reaction, which may include: Fever, chills, rigors, tachycardia, hyper- or hypotension, collapse, flushing, urticaria, pain (bone, muscle, chest, abdominal), respiratory distress, nausea, general malaise



* Temperature, pulse, BP, respiratory rate, oxygen saturations, urine output and fluid balance

Table 1: Management of moderate/severe ATRs

Symptom	Management
ALL moderate/severe ATRs (generic management)	• Stop infusion immediately and replace giving set • Inform doctor and blood transfusion laboratory • Check patient identity and blood unit for compatibility using PPID • Check temperature, pulse, BP, respiratory rate and fluid balance • Resuscitate with crystalloid infusion according to **Fluid Resuscitation** guideline +/- furosemide IV aiming for SBP>100 mmHg, urine output >0.5 mg/kg/hr and euvolaemia • Send appropriate investigations (see **Table 2**) • Return all used blood components (with giving set) to transfusion laboratory with details of the reaction • Alert critical care outreach teams where appropriate • Contact transfusion team or on-call consultant haematologist where appropriate • Complete an adverse incident report/Datix • Contact renal team where ABO incompatible transfusion
Anaphylaxis	• See **generic management** above • Adrenaline 500 microgram IM (0.5 mL of 1:1000) • Chlorphenamine 10 mg IM or slow IV • Hydrocortisone 200 mg IM or slow IV • Salbutamol 5 mg nebulised (if bronchospasm) • See **Anaphylaxis** guideline • Alert critical care outreach teams
Fever/sepsis	• See **generic management** above • Refer to **Sepsis, severe sepsis and septic shock** guideline • Alert critical care outreach teams where appropriate • Contact on-call consultant microbiologist where appropriate
Acute respiratory distress (non- anaphylaxis)	• See **generic management** above • Administer high flow oxygen – see **Oxygen therapy in acutely hypoxaemic patients** guideline • Administer diuretics with careful monitoring if ATR consistent with fluid overload (TACO) • Urgent mechanical ventilatory support may be needed in transfusion-related acute lung injury (TRALI) – worsened by diuretics • Alert critical care outreach teams where appropriate • Contact transfusion team or on-call consultant haematologist where appropriate
Hypotension	• See **generic management** above • If clinical condition dictates, transfuse compatible red cells e.g. during major haemorrhage • Alert critical care outreach teams
Allergy	• Chlorphenamine 10 mg IM or slow IV • Consider other measures as per anaphylaxis according to symptom severity

Table 2: Investigation of moderate/severe ATRs

Symptom	Differential diagnosis		Investigations	Colour tube
	Transfusion-related	Non-transfusion related		
ALL moderate/ severe ATRs (except allergic reactions with platelets/FFP)	• See below as guide	• See below as guide	• PT, APTT, fibrinogen • U&Es, LFTs • FBC & blood film • 'Transfusion reaction' and DAT • Haemoglobinuria	• Blue • Yellow/gold • Purple • Pink • Urine
Fever ≥39°C and/or >2°C rise and/or other symptoms • chills, rigors, myalgia, nausea, vomiting and/or loin pain	• Haemolysis • Bacterial contamination • Febrile non-haemolytic transfusion reaction (FNHTR)	• Sepsis • Underlying condition	• Blood cultures – peripheral and any lines • LDH and haptoglobin • Return units to transfusion lab (NHSBT will culture)	• Blood culture • Yellow/gold
Anaphylaxis	• Transfusion-related anaphylaxis	• Anaphylaxis - other e.g. drugs	• Mast cell tryptase levels – serial: immediate, 3 hr and 24 hr • IgA level (if <0.07 g/L and no hypo-gammaglobulinaemia, contact transfusion lab to exclude IgA antibodies)	• Plain • Yellow/gold
Allergic symptoms affecting ≥2 organ systems	• Allergy – transfusion related	• Allergy – other e.g. drugs	• IgA level (if <0.07 g/L and no hypo-gammaglobulinaemia, contact transfusion lab to exclude IgA antibodies)	• Yellow/gold
Hypotension Isolated decrease ≥30 mmHg resulting in SBP <80 mmHg	• Anaphylaxis • Haemolysis • Bacterial contamination	• Ongoing major haemorrhage • Underlying condition e.g. sepsis • Anaphylaxis (non-transfusion related)	• Investigate as per fever • If suspected severe allergy investigate as per anaphylaxis	• See above
Acute respiratory distress	• Anaphylaxis • Haemolysis • TACO • TRALI • Transfusion associated dyspnoea (TAD)	• Cardiac • Respiratory • Metabolic • Other	• Blood gas analysis • Chest X-ray • ECG • LDH and haptoglobin • If suspected severe allergy investigate as per anaphylaxis • If suspected TRALI discuss with transfusion team	• ABG • CXR • ECG • Yellow/gold • See above • Pink + red

- 'Haemolysis' refers to acute intravascular haemolysis i.e. an acute haemolytic transfusion reaction (AHTR)
- Rapid onset of loin/abdominal pain, a 'feeling of impending doom' and/or warmth along vein may represent an acute haemolytic transfusion reaction e.g. ABO incompatible transfusion
- In an unconscious patient, the first indication of ATR may include tachycardia, hypotension, bleeding

ALLERGIC TRANSFUSION REACTIONS AND FUTURE MANAGEMENT

- Most common with platelets (particularly apheresis) and plasma
- Occur early during transfusion (within 15 min for mild allergic, often within few minutes for severe)
- Increased incidence in patients with a history of hay fever (but not causal)
- Mild (>80% allergic reactions are mild) – affecting skin only e.g. rash, itching, hives
- Anaphylactic reactions affecting ≥2 organ systems can vary in severity from mild to life-threatening (vast majority the former)
- Risk of recurrence is very low (approximately <1:50 and even in 'frequent reactors' <1:20, although reactions may cluster)
- For management of future transfusions in patients with a history of allergic reactions see **Table 3**

Table 3: Management of future transfusions in patients with a history of allergic reaction

Allergic symptom severity	Management of future transfusions
Mild	• **No** role for pre-medication • Administer antihistamine if reaction re-occurs
Moderate	• **No** evidence for routine pre-medication • Monitor patient closely • Consider slower administration • Use pooled platelets in PAS • Administer antihistamine if reaction re-occurs • Consider pre-medication with non-sedating, long-acting antihistamine if history of chronic recurring reactions
Severe	• Avoid transfusion wherever possible (see **Red cell transfusion** guideline – **Alternatives to transfusion**) and uphold PBM strategies • Use plasma reduced products (i.e. pooled platelets in PAS or SD-FFP) • Pre-medicate with histamine H_1 (chlorphenamine or non-sedating antihistamine) and H_2 (cimetidine, ranitidine) receptor antagonists (**not** hydrocortisone) • Consider washed RBC/platelets (discuss with transfusion consultant/NHSBT) – especially if history of life-threatening reaction • If IgA antibodies – consider components from IgA deficient donors (discuss with transfusion consultant/NHSBT) • Administer slowly in closely monitored unit

- If pre-medication deemed appropriate consider non-sedating antihistamine, especially where patient known to have side-effects from chlorphenamine
- There is **no role for hydrocortisone pre-medication** – steroids are thought to be useful to suppress late phase reactions (so no role in anaphylaxis prophylaxis – consider administration if patient experiences moderate-severe allergic reaction)

CRYOPRECIPITATE ● 1/1

BACKGROUND

- Made by thawing UK donor FFP at 4°C (collected from UK volunteer whole blood donors), to produce a concentrated plasma product rich in fibrinogen, Factor VIII and von Willebrand factor
- Available as single-donor units (mean 43 mL) or pools of 5 units (mean 189 mL)
- Pools contain fibrinogen mean 1552 mg/pack (specification >700)
- Stored in controlled freezer at <−25°C for <36 months
- Once requested cryoprecipitate will be thawed at 37°C taking <20 min (use within 4 hr of thawing, **do not refrigerate**)
- Fibrinogen concentrate, a virally inactivated pooled plasma product, may be an available alternative (discuss with haematology team)

INDICATIONS

Discuss need for cryoprecipitate with haematologist before ordering (except MHP)

- Clinically significant bleeding and fibrinogen <1.5 g/L (<2 g/L in obstetric bleeding)
- Fibrinogen <1 g/L and pre procedure/surgery
- Bleeding associated with thrombolytic therapy
- Inherited hypofibrinogenaemia where fibrinogen concentrate is unavailable
- Consider in renal failure associated with abnormal bleeding where DDAVP is contraindicated or ineffective

DOSE

- Cryoprecipitate: dosed in pools (or mL/single donor packs in low body weight patients) – prescribe on fluid prescription of the drug chart
- Treatment dose of cryoprecipitate is 2 pools in an adult patient (or 1 unit per 5–10 kg body weight)
- Assess every patient for risk of transfusion associated circulatory overload (TACO) and manage appropriately e.g. rate, diuretics, frequency of observations

ADMINISTRATION

- Transfuse as soon as possible after thawing using a standard blood giving set with a 170-200 micron filter
- If delay is unavoidable, store at ambient temperature and use within 4 hr
- Routinely administer each pool over 30–60 min (10–20 mL/kg/hr)
- Monitor patients closely for fluid overload (TACO) and allergic reactions (including TRALI)
- Any blood component connected to patient's IV access is regarded as 'transfused' for traceability purposes – even if unit was subsequently (partially) wasted

ASSESSING RESPONSE TO TRANSFUSION

- 2 pooled units are expected to increase fibrinogen by 1 g/L
- Assess patients clinically during cryoprecipitate transfusion to assess bleeding symptom severity and for adverse events; especially signs/symptoms of respiratory distress (e.g. TACO, TRALI) and allergic reactions
- Assess laboratory parameters after each treatment dose of cryoprecipitate – PT/APTT and Clauss fibrinogen, plus near patient thromboelastography (TEG, ROTEM) where available

Methylene blue (MB) treated cryoprecipitate

- Virally inactivated, single donor, non-UK sourced plasma product potentially indicated for patients born after 01/01/1996 to minimise risk of transmission of vCJD
- Reduced fibrinogen and FVIII activity (dose dependent on individual donor)
- See also pathogen inactivated FFP (Octaplas®) – under **Fresh frozen plasma (FFP)** guideline

FRESH FROZEN PLASMA (FFP) ● 1/2

BACKGROUND

- Single donor FFP from male UK volunteer whole blood donors
- 1 unit mean volume = 275 mL (mean Factor VIII 0.83 – specification >0.7)
- Stored in controlled freezer at <−25°C for <36 months
- Once requested FFP will be thawed at 37°C taking <20 min
- Once thawed, stored in blood fridge at 4–6°C for <24 hr
- **Pre-thawed FFP** (5 day shelf-life) is available for MHP – **trauma cases only**

Solvent Detergent FFP (SD-FFP) or Methylene Blue Treated FFP (MB-FFP) should be given to those born after 1st January 1996

PATHOGEN – INACTIVATED FFP

- Indicated in patients born after 01/01/1996 to reduce the risk of transmission of vCJD
- Inactivates encapsulated viruses and bacteria
- Solvent detergent plasma (Octoplas LG®); standardised volume 200 mL, <1520 donors per batch, mean FVIII 0.8 (specification >0.5), mean fibrinogen 2.6 (1.5–4.0). Stored in controlled freezer at <-18°C for <4 yrs (transfuse immediately after thawing)
- Methylene-blue treated FFP (MB-FFP); non-UK sourced, single-donor (43 mL) with reduced fibrinogen and FVIII activity

INDICATIONS

- Evidence supporting FFP use is sparse. Prophylactic plasma transfusions appear to be associated with increased patient morbidity
- PT/APTT ratios reflect coagulation function in vitro, not what actually happens in the body (as they measure clotting - not the natural inhibitors; protein C, protein S, antithrombin)
- FFP is not indicated to reverse warfarin, unless PCC is contraindicated/unavailable

Discuss need for FFP with haematologist before ordering (except MHP)

- Upfront in major haemorrhage until bleeding is under control (at least 1:2 ratio FFP:RBC (consider 1:1 in 'code red' trauma and vascular surgery) with the exception of obstetrics) (see **Major haemorrhage policy** on Trust intranet>Clinicians>Clinical guidance>Blood and blood products>Procedures)
- Clinically significant bleeding associated with coagulopathy (PT ratio/INR>1.5) in the absence of major haemorrhage
- Prophylactic plasma use is dependent on the cause of the abnormal clotting results, PT/APTT ratio and the bleeding risk of the procedure – **consider** if PT ratio/INR>1.5 pre invasive procedure with risk of clinically significant bleeding
- **Not** routinely indicated in chronic liver disease (CLD) with INR ≤2.0 pre-procedure. Remember patients with CLD and prolonged INRs may still be hypercoagulable. See **Acute liver failure with encephalopathy** guideline, **Coagulopathy**
- Replacement of single coagulation factor deficiencies, where a specific or combined factor concentrate is unavailable e.g. factor V deficiency
- Thrombotic thrombocytopenic purpura (TTP) in conjunction with plasma exchange – use SD-FFP/ Octoplas LG®
- Acute disseminated intravascular coagulation (DIC) in the presence of bleeding and abnormal coagulation results

DOSE

- Fresh frozen plasma (FFP) – dosed in units [or mL in low weight patients or those at high risk of transfusion associated circulatory overload (TACO)] – prescribe on fluid prescription of the drug chart
- Adult treatment dose of FFP is **12–15 mL/kg = 4–6 units**
- Octaplas treatment dose 12–15 mL/kg dosed in mL (200 mL per unit)
- Assess every patient for risk of TACO and manage appropriately e.g. rate, diuretics, frequency of observations

FRESH FROZEN PLASMA (FFP) ● 2/2

ADMINISTRATION

- Transfuse as soon as possible after thawing using a standard blood giving set with a 170–200 micron filter
- Routinely administer each unit FFP over 30 min ('stat' if MHP)
- If delay is unavoidable, store at controlled temperature (4–6°C for <24 hr) or complete within 4 hr of thawing if stored at ambient temperature
- Monitor patients closely for fluid overload (TACO) and allergic reactions (including transfusion related acute lung injury (TRALI)
- Any blood component connected to the patient's IV access is regarded as 'transfused' for traceability purposes – even if the unit was subsequently (partially) wasted
- Octaplas: administer at ≤1 mL/kg/min ('stat' if MHP)

ASSESSING RESPONSE TO TRANSFUSION

- Therapeutic doses of plasma (15 mL/kg) typically raise clotting factor levels by 20%
- Plasma is unlikely to correct INR to below 1.8
- Assess and document bleeding severity score (see **Guiding principles of transfusion including administration** guideline – Table 2)
- Assess laboratory parameters after each treatment dose of FFP (PT/APTT and Clauss fibrinogen, plus near patient thromboelastography (TEG, ROTEM) where available)
- Assess and document adverse events; especially signs/symptoms of respiratory distress (e.g. TACO, TRALI) and allergic reactions

For further information refer to

- Trust policy C03 for full transfusion guidelines and relevant SOPs
- Trust intranet>Clinicians>Clinical guidance>Blood and blood products

GUIDING PRINCIPLES OF TRANSFUSION INCLUDING ADMINISTRATION ● 1/5

For more detailed information refer to Trust Policy C03

BACKGROUND

- **Blood components** are derived from volunteer whole blood UK donors and include red cells, platelets, fresh frozen plasma (FFP), cryoprecipitate and granulocytes
- **Blood products** are medicinal products manufactured from non-UK sourced, pooled plasma e.g. Octaplas®, fibrinogen concentrate, IVIg, albumin
- Blood transfusion is potentially hazardous and should only be undertaken when the benefits to the patient outweigh the risks
- Most adverse events are the result of administrative and clerical errors
- **Alternatives to transfusion should be used wherever possible**
- Clinical management depends on the **underlying cause** of the anaemia/thrombocytopaenia/deranged clotting and the **clinical situation**
- National audits in England consistently show inappropriate use of all blood components; 15–20% of red cells and 20–30% of platelets/plasma
- Recipients of any blood components (or products) cannot be blood donors (as risk vCJD)

PATIENT BLOOD MANAGEMENT (PBM)

- Patient Blood Management (PBM) is a multidisciplinary approach to providing individualised, evidence-based transfusion practice for patients who may need a blood transfusion
- PBM minimises inappropriate and/or avoidable transfusion, supports best patient outcomes and allocation of finite NHS resources
- The '3-pillars' of PBM can be summarised as:
- **Maximise erythropoiesis** – identify, investigate and treat anaemia
- **Reduce bleeding** – anticoagulant management, surgical techniques, therapeutic agents
- **Optimise tolerance of anaemia** – oxygenation, disease management, restrictive transfusion thresholds

ASSESSMENT

- Anaemia is defined by WHO as Hb <130 g/L in men and Hb <120 g/L in non-pregnant women
- All anaemic patients should be identified and investigated to elicit underlying causes and treat where possible – see Trust policy C03 and medical guidelines
- Decision to transfuse should be based on the whole clinical picture; including cause of the abnormal results, current and historic laboratory parameters, symptom severity, underlying co-morbidities, clinical situation, bleeding risk of any procedure, risk of adverse events and patient choice
- Transfusion decisions may be made by a doctor or non-medical prescriber (who has undertaken additional relevant training and competency assessment)
- All patients must be risk-assessed for transfusion associated circulatory overload (TACO)
- Always assess and document severity of anaemia symptoms and/or bleeding (see **Table 1** and **2**)

Table 1: Anaemia severity grading score

Severity score	Anaemia symptoms
Mild	Fatigue, shortness of breath on exertion
Moderate	Shortness of breath at rest, palpitations
Severe	Chest pain, symptoms of heart failure

Table 2: Modified World Health Organisation bleeding score (Stanworth et al 2013)

Bleeding grade	Description of bleeding
Grade 1	• Petechiae/purpura localised to 1 or 2 dependent sites, or sparse/non-confluent • Oropharyngeal bleeding, epistaxis <30 min duration
Grade 2	• Melaena, haematemesis, haemoptysis, fresh blood in stool, musculoskeletal bleeding, or soft tissue bleeding not requiring red cell transfusion within 24 hr of onset and without haemodynamic instability • Symptomatic oral blood blisters, i.e. bleeding/causing major discomfort. Multiple bruises, each >2 cm or any one >10 cm • Petechiae/purpura that is diffuse • Visible blood in urine • Abnormal bleeding from invasive or procedure sites • Unexpected vaginal bleeding saturating >2 pads in a 24 hr period • Bleeding in cavity – fluids evident macroscopically • Retinal haemorrhage without visual impairment
Grade 3	• Bleeding requiring red cell transfusion specifically for support of bleeding within 24 hr of onset and without haemodynamic instability • Bleeding in body cavity – fluids grossly visible • Cerebral bleeding noted on computed tomography (CT) without neurological signs and symptoms
Grade 4	• Debilitating bleeding including retinal bleeding and visual impairment • Non-fatal cerebral bleeding with neurological signs and symptoms • Bleeding associated with haemodynamic instability (hypotension, >30 mmHg change in systolic or diastolic blood pressure) • Fatal bleeding from any source

'SINGLE UNIT POLICY'

- In the absence of active bleeding, use the minimum number of units required to achieve a target threshold
- **Each unit transfused is a treatment decision** – i.e. 1 unit RBC, 1 ATD platelets
- Assess every patient **clinically after each unit** transfused
  - have the symptoms/signs of anaemia (or thrombocytopaenia) resolved?
  - is there evidence of fluid overload (TACO)?
- Check Hb/platelet increment after each unit transfused (except in active bleeding, chronically transfused outpatients or where target threshold cannot realistically be achieved)
  - FBC can be performed at 15 min post transfusion
- Grade anaemia symptom severity especially if transfusing above recognised Hb thresholds

'TWO-SAMPLE RULE'

- Transfusion of ABO-incompatible blood is potentially fatal and occurs as a result of human error(s) in sampling/patient identification
- In the **non-emergency setting**, blood components will only be issued when patient's blood group has been confirmed via 2 independent samples e.g. a historic record
- Most recent G&S sample result will state if a second sample is required before issue of blood components (although need for a second G&S will not delay the processing of a crossmatch sample)
- Second sample (where required) should be obtained **at a different time point using positive patient identification (PPID) at all stages**

CONSENT

- Valid consent for blood transfusion must be obtained and documented in the clinical record before transfusion. Consent should include:
  - **indication** for transfusion
  - **benefits** e.g. symptom relief of heart failure/angina
  - **risks** including acute transfusion reactions, human error, fluid overload and delayed transfusion reactions (including antibody formation and transfusion related infections e.g. bacterial, viral, other)
  - **alternative treatments** available e.g. iron supplementation
  - that patient can **no longer be a blood donor**
- If patient is unconscious or unable to receive this information, obtain consent retrospectively/from patient's legal guardian

- Consent stickers should ideally be used for each transfusion episode (comes with first unit)
- At discharge, transfusion decisions, outcomes and adverse events should be included in the discharge summary
- Give patient information leaflets (PILs) to patients before transfusion (or retrospectively where not possible)

Jehovah's witnesses: Transfusion without consent is a gross physical violation. Discuss consequences of not transfusing. Record discussion in the medical notes and include a copy of the signed advanced decision document.
For further advice contact the JW hospital liaison committee tel 07831 773793 (24 hr)
Use 'No blood' logo wristband – available from the transfusion team or blood bank

PRESCRIPTION

- Blood components/products can be prescribed by doctors or non-medical prescribers who have undergone additional training/competency assessment
- Blood components should be prescribed on the fluid prescription of the drug chart
- Ensure the prescription includes;
- all **core patient identifiers** (full name, Date of birth, NHS number)
- **component** type e.g. red cells, platelets
- **volume** e.g. 1 unit, 1 ATD
- specified **rate** (min) e.g. 120 min – taking into account risk of fluid overload/TACO
- **special blood requirements** (SBR) e.g. irradiated, HbS neg, Rh matched
- additional medications e.g. diuretics
- It is the prescriber's responsibility to share information on SBR with the transfusion laboratory
- If unsure, refer to policy C03 and/or discuss with transfusion team
- From May 2017 all blood components will be hepatitis E negative, although Hep E frozen products may remain in circulation for some time

REQUESTING BLOOD COMPONENTS

- Request form must be fully and legibly completed by a doctor or registered practitioner
- Full (accurate) patient identifiers must be used including NHS number (only RSUH currently accepts the hospital number)
- Person obtaining sample must sign the request form
- Compatibility testing must be representative of patient's current immune status

Patient transfused or pregnant within:	Valid G&S not to be taken more than:
3 days–3 months	72 hr before transfusion
>3 months	1 week before transfusion

- Timings of G&S validity may differ in chronically transfused patients with no allo-antibodies
- Telephone requests can be made to
- convert a G&S into a crossmatch (where valid G&S available)
- order non red cell blood components
- Always indicate the **urgency** of your request
- Use BloodTrack to identify if blood components are available for collection and to electronically generate demand slips (alternatively contact Sodexo with full patient details)

BLOOD SAMPLING FOR TRANSFUSION

- Patient must be wearing an approved wristband with full patient identifiers
- **Carry out positive patient identification (PPID):** Ask patient to state their full name and date of birth – check details given verbally by the patient match those on the wristband
- Check details on wristband identically match those on request form
- Take blood: 6 mL pink EDTA tube
- Fully label the sample bottle at the bedside **against the wristband** (no stickers allowed)
- Samples should only be labelled and signed by the person who has obtained the sample
- Illegible, misspelt or incorrect samples will be rejected by the laboratory (UHNM operates a 'Zero tolerance policy' i.e. no changes to labelling are permissible after sample receipt)
- Send G&S or crossmatch sample to lab with corresponding fully-completed request form

Use PPID and label from the wristband at the bedside

UNKNOWN PATIENTS

- Minimal acceptable sample labelling comprises of temporary unique hospital number, gender and estimated date of birth (to indicate if special blood requirements indicated)
- Once unknown patient has been identified, new transfusion samples will be required
- Take crossmatch sample before administration of any blood components
- In the emergency setting, ABO specific blood will be issued in the absence of a confirmed blood group i.e. the 'Two-sample rule' does **not** apply in the emergency setting

COLLECTION/RECEIPT

- Blood components can only be collected by staff competency-assessed to do so
- **BloodTrack** is used to identify availability and location of blood components, to print demand slips and to log removal/placement of the components in designated blood fridges
- In areas without a satellite fridge, only one unit should be collected at a time (except renal dialysis unit and MHP activation)
- Receiving doctor/registered practitioner must check correct component has been delivered, arrive unit on BloodTrack enquiry and complete compatibility form (pink slip) with date/time received
- Transport blood components in designated transport bags, available from transfusion laboratory (or validated transport boxes where indicated)

Never store blood components in a non-designated refrigerator

ADMINISTRATION

- Blood components are viewed as medicines for administration purposes and prescribed medicines should only be administered by a medical officer, registered nurse, registered sick children's nurse or registered midwife
- Student nurses and trainee ODPs can be involved in the checking and administration of blood components under the direct supervision of a registered practitioner and must have their signatures countersigned
- Perfusionists may connect blood as directed by the anaesthetist who will take overall responsibility for the checking and administration of blood components
- Transfusions at night may proceed where there is a clear clinical indication, sufficient staffing levels to allow for safe monitoring of the patient and the patient's wishes have been taken into consideration

BEDSIDE CHECKS

- Two **independent** bedside checks must be undertaken by registered practitioners
- Ask patient to state his/her surname, first name and date of birth and check these details match those on patient's wristband [= **carry out positive patient ID (PPID)]**
- **Check details** on patient's wristband (including NHS number) match full details on the prescription chart **and** the compatibility label (attached to unit)
- Check unique donation number and blood group on compatibility label matches that on unit
- Check unit complies with any special requirements on the prescription e.g. irradiated
- **Check quality** of blood component – inspect for leaks, discolouration and/or clots, check expiry date (to midnight on date of expiry)
- Record start/finish time/date on the compatibility form or 'pink slip' – this does **not** form part of the checking process
- **If any discrepancies found, do not transfuse**

Transfuse units as soon as possible
Complete within a maximum of 4 hr from leaving controlled storage

INFUSION

- Always use a standard blood transfusion giving set with **170-200 micron integral filter**
- Routinely change giving set every 12 hr or 3 units (sooner if delay between units anticipated) and use a new giving set for platelets (to avoid platelet clumping)
- Use an **electronic infusion pump** where available
- Administration times should be specified and may vary according to indication
- Use a **blood warmer** if clinically significant cold antibodies, as soon as possible after activation of the massive haemorrhage protocol (MHP) and in all patients undergoing elective or emergency surgery requiring ≥500 mL fluids including blood components

- **Monitor patients closely** for fluid overload (TACO) and allergic reactions (including TRALI)
- Any blood component connected to patient's IV access is regarded as 'transfused' for traceability purposes, even if unit was subsequently (partially) wasted
- **Pack-label stickers –** use on the prescription chart to aid traceability

MONITORING

- Explain procedure and advise patient to report any signs/symptoms of possible acute transfusion reactions
- Routine transfusion observations (temperature, pulse, BP, respiratory rate, oxygen saturations):
  - <60 min pre-transfusion
  - at 15 min
  - <60 min of completion
- Perform observations more often where patient is unconscious, unable to report adverse events, at high risk of TACO or if an acute transfusion reaction is suspected
- Maintain a fluid balance chart and monitor IV access
- Observe the patient throughout the transfusion as appropriate monitoring ensures early recognition of potential transfusion related adverse events

DOCUMENTATION

- It is a legal requirement to maintain a record of the fate of each donated unit for 30 years
- We require 100% compliance (transfusion team waste many hours chasing 'missing' units)
- **Compatibility form** (or '**pink slip'**) – record date/time of commencement (and completion) of each unit and both signatures of the doctor/registered practitioner who administered/checked unit
- **Prescription chart** – as per pink slip (NB unique donation number stickers on pack label)
- **BloodTrack** – end fate unit as 'transfused'. Any blood component connected to patient's IV access is regarded as 'transfused' for traceability purposes – even if unit was subsequently (partially) wasted
- County Hospital – sign and return pack labels to transfusion laboratory
- **Medical notes** – evaluate patient after each unit (clinically and laboratory results) and document outcome of transfusion and any adverse events. Include in discharge summary

STORAGE

- Each blood component is stored under 'optimal' conditions (see individual sections for details)
- Store red cells in designated blood refrigerators **only** (do **not** refrigerate platelets or cryoprecipitate)
- Administer components as soon as possible after receipt
- If unable to transfuse, return units to transfusion laboratory asap (within 30 min of leaving cold storage) so product can be safely re-issued to another patient
- Transfer boxes/disposable transport bags are validated for transport **not** for storage

CONTACT NUMBERS TRANSFUSION TEAM

Role	Availability	Contact no.
RSUH transfusion laboratory	Staffed 24/7 Use bleep <0900 hr or >1700 hr	74946/8 Bleep 390
County transfusion laboratory	Staffed 0600–2315 hr requests outside these times must be made to transfusion laboratory at RSUH. Use bleep <0900 hr or >1700 hr	4757 Bleep 4751
Haematology consultant for transfusion	Tuesday, Thursday, Friday	74284/5 sec 71927 direct
Lead transfusion nurse	Monday–Friday. Pager 07623616520	72579
Transfusion nurses	Monday–Friday. Pager 07623950511	71909
Transfusion clerical assistant	Monday, Wednesday–Friday	71534

For further information refer to

- Trust policy C03 for full transfusion guidelines and relevant SOPs
- Trust intranet>Clinicians>Clinical guidance>Blood and blood products

PLATELET TRANSFUSION ● 1/2

BACKGROUND

- Collected from UK volunteer whole blood or apheresis platelet donors
- Pooled buffy coat platelets (4 donors in 'platelet additive solution'); mean volume 308 mL, mean platelets 308 x10^9/unit (165–500)
- Apheresis platelets; mean volume 199 mL, mean platelets 280 x10^9/unit (165–510)
- Stored in controlled temperature 20–24°C with agitation for <7 days (including bacterial screening)
- There is no need to agitate platelets after removal from cold storage

INDICATIONS

- Indications for platelet transfusion can be broadly divided into
- **prophylactic** (WHO bleeding grade 0–1) – to prevent bleeding
- **pre-procedure** – to prevent bleeding expected to occur during surgery/invasive procedures
- **therapeutic** (WHO bleeding grade ≥2) – to treat active bleeding
- Assess WHO bleeding score (see **Guiding principles of transfusion** guideline – Table 2)
- Patients who may require platelet transfusion include those with
- bone marrow failure (BMF); reversible associated with treatable disease and/or chemotherapy and occasionally chronic irreversible BMF e.g. MDS
- thrombocytopenia in critical care
- peripheral platelet consumption/destruction e.g. DIC
- abnormal platelet function; inherited or acquired disorders e.g. uraemia
- **Specific indications** for platelet transfusions in adults are **detailed in table 1** as thresholds are dependent on the procedure/surgery
- In patients with inherited or acquired platelet disorders/abnormal platelet function, discuss transfusion with haematology first
- Platelet transfusion may be inferior to standard care in patients on anti-platelet agents with spontaneous intra-cerebral haemorrhage
- In some situations target platelet thresholds may not be achievable and individual case review is required

CONTRAINDICATIONS (unless life-threatening haemorrhage)

- Thrombotic thrombocytopenic purpura (TTP)

ALTERNATIVES TO PLATELET TRANSFUSION

- Apply surface pressure and correct any surgical causes
- Review/stop anticoagulants/antiplatelet drugs
- Consider tranexamic acid
- Uraemia with bleeding – dialysis, correct anaemia, consider desmopressin
- Inherited platelet function disorders – consider desmopressin
- If fibrinogen <1.5 g/L with severe bleeding – replace (see cryoprecipitate)

DOSE

- Platelets – dosed as 1 adult treatment dose (1ATD) - should be prescribed on the fluid prescription of the drug chart
- Adult treatment dose of platelets is **1 ATD**
- **Each single ATD platelets transfused is a treatment decision**
- Assess every patient for risk of transfusion associated circulatory overload (TACO) and manage appropriately e.g. rate, diuretics, frequency of observations

ADMINISTRATION

- Transfuse as soon as possible after component arrives using a standard blood administration set with a 170–200 micron filter
- **Do not** transfuse platelets through an administration set that has already been used to administer red blood cells (to avoid platelet clumping)
- Check product for signs of deterioration prior to use e.g. clumping/discolouration suggesting bacterial contamination
- Transfusion rate depends on clinical situation/patient history and must be specified (typically 20–30 min per ATD if low risk of TACO vs 30–60 min per ATD if high risk of TACO vs 'stat' over 5–10 min if MHP)

ASSESSING RESPONSE TO TRANSFUSION

- 1 ATD typically increases platelet count by 20–40 x 10^9/L
- Platelet increment reduces with repeated platelet transfusions, even in the absence of allo-immunisation
- **Assess patients clinically after each ATD** to assess bleeding symptom severity and signs/symptoms of adverse events including TACO (fluid overload) and TRALI
- **Assess laboratory parameters** after each unit (repeat FBC@≥15mins) to assess if target platelet threshold achieved

Table 1: Indications and thresholds for platelet transfusion (BCSH guidelines 2016)

Indication	Transfusion indicated (platelet threshold)
Prophylaxis (no bleeding or WHO grade 1)	
Reversible bone marrow failure (BMF) including stem cell transplantation (although consider no prophylaxis in autologous stem cell transplantation)	10 x 10^9/L
Critical illness	10 x 10^9/L
Chronic BMF receiving intensive therapy	10 x 10^9/L
Chronic BMF to prevent persistent bleeding of grade ≥2	Count variable
Chronic stable BMF Abnormal platelet function Platelet consumption/destruction e.g. DIC, TTP Immune thrombocytopenia e.g. ITP, HIT, PTP	Not indicated
Prophylaxis in presence of risk factors for bleeding (e.g. sepsis, antimicrobial treatment, abnormalities of haemostasis)	
Reversible/chronic BMF/critical	10–20 x 10^9/L
Abnormal platelet function; platelet consumption/destruction e.g. DIC, TTP; immune thrombocytopenia e.g. ITP, HIT, PTP	Not indicated
Platelet transfusions pre-procedure	
Central venous catheter insertion (excluding PICC)	20 x 10^9/L
Lumbar puncture	40 x 10^9/L
Percutaneous liver biopsy	50 x 10^9/L
Major surgery	50 x 10^9/L
Epidural anaesthesia, insertion and removal	80 x 10^9/L
Neurosurgery or ophthalmic surgery involving the posterior segment of the eye	100 x 10^9/L
Bone marrow aspirate +/- trephine PICC line insertion Traction removal CVCs Cataract surgery	Not indicated
Therapeutic use (WHO bleeding grade 2 or above)	
Multiple trauma Brain or eye injury Spontaneous intracranial haemorrhage	100 x 10^9/L
Severe bleeding	50 x 10^9/L
Bleeding (WHO grade 2 but not severe)	30 x 10^9/L

PROTHROMBIN COMPLEX CONCENTRATE (OCTAPLEX®) TRANSFUSION • 1/2

BACKGROUND

- 4-factor PCC is a manufactured plasma product containing clotting factors II, VII, IX and X, plus the natural anticoagulant proteins C and S
- Available as Octaplex® 500 IU or 1000 IU coagulation factor IX (25 IU/mL)
- Store in controlled temperature <25°C for <2 yr
- Once requested keep in controlled storage at 2–8°C until required
- **Only use PCC where clinically indicated as administration may exacerbate underlying pro-thrombotic states**
- There is small risk of disseminated intravascular coagulation (DIC), particularly with repeated dosing
- **Clinician direct access** from the transfusion laboratory is available for agreed indications to ensure prompt treatment provision in recognised indications – [(RSUH: 0900–1700 hr call 74948 or out-of-hours bleep 390) (County: 0900–1700 hr call 4758 or <midnight bleep 4751)]
- For further pathway details and SOP see:
- Trust policy C03 for full transfusion guidelines and relevant SOPs
- Trust intranet>Clinicians>Clinical guidance>Blood and blood products

INDICATIONS

- Treatment of patients receiving warfarin or alternative vitamin K antagonists (VKA) experiencing major bleeding i.e. life, limb or eye-threatening bleeding. Includes high clinical suspicion of major haemorrhage pre-imaging
- Patients receiving warfarin or VKA requiring surgery or invasive procedure within the next 6–8 hr, due to clinical urgency only
- May be indicated for patients with major bleeding/pre-operatively receiving direct oral anticoagulants (DOACs) apixaban, rivaroxaban, edoxaban – see guidelines and seek advice from consultant haematologist (ref STAC guideline 'Management of Bleeding in Patients on Antithrombotic Therapy')
- May be indicated for patients with other acquired coagulopathies e.g. liver disease, cardiac surgery, where there is high risk of transfusion associated circulatory overload (TACO) – seek advice from consultant haematologist

CONTRAINDICATIONS

- Hypersensitivity to the active substance or any of the excipients (see SPC)
- Known allergy to heparin or history of heparin induced thrombocytopenia (HIT)

DOSE

- Dosed in 'international units' (IU) as multiples of 500 IU
- Maximum single dose 3000 IU (120 mL)

For anticoagulant reversal

- Dosed at 25–50 IU/kg according to patient weight and INR (where known) as advised by transfusion laboratory and SOP
- **Do not await INR** or imaging if high clinical suspicion of major haemorrhage – especially if suspected intracranial bleeding
- For warfarin reversal always ensure vitamin K (phytomenadione) 5 mg IV has been prescribed and administered – as PCC immediately (but only temporarily) reverses the anticoagulant effects of warfarin
- Ensure anticoagulant has been omitted

As low volume FFP alternative

- Treat each 500 IU PCC as a treatment decision and evaluate clinically ± NPT post dose
- 1 IU PCC is equivalent clotting factor activity of 1 mL plasma (500 IU approximately equivalent to 2 units FFP)

ADMINISTRATION

- Commence infusion at 1 mL/min to observe for allergic reactions/anaphylaxis
- In major bleeding increase rate to 8–10 mL/min under direct clinical instruction
- Pre-surgery/procedure increase rate to 2–3 mL/min
- Return unused PCC to transfusion laboratory as soon as possible

PROTHROMBIN COMPLEX CONCENTRATE (OCTAPLEX®) TRANSFUSION ● 2/2

ASSESSING RESPONSE TO TRANSFUSION

- Assess and document bleeding symptom severity post PCC administration (see **Guiding principles of transfusion** guideline **Table 2**)
- For warfarin reversal – repeat INR 10–20 min post PCC administration
- If adequate correction, recheck clotting after 4-6 hours then daily
- If INR ≥1.5 or suboptimal correction and further PCC required - seek advice from a haematology consultant
- Monitor for adverse events of PCC usage
- Complete Datix where indication is 'major bleeding on anticoagulation'

RED BLOOD CELL TRANSFUSION ● 1/3

BACKGROUND

- Packed red blood cells (RBC) in SAG-M additive solution, 280 ± 60 mL, Hct 0.5-0.7
- Collected from UK volunteer whole blood donors i.e. allogeneic
- Stored in controlled temperature at 2–6°C for <35 days
- Only store red cells in designated blood fridges
- RBC routinely derequisitioned at 24 hr i.e. returned to stock
- Areas without a satellite fridge should collect 1 unit of blood at a time (except renal dialysis patients and MHP activation)

INDICATIONS

- Red cells are used to restore oxygen carrying capacity in patients with anaemia or blood loss, **where alternative treatments are ineffective or inappropriate**
- Decision to transfuse should be based on the whole clinical picture; including cause of anaemia, chronicity, current and historic laboratory parameters, symptom severity, underlying co-morbidities and patient choice, not just the haemoglobin value
- Blood loss of >20-30% (where average circulating blood volume is 70ml/kg) with ongoing bleeding will likely result in urgent transfusion – aim to use cell salvage where possible to minimise allogeneic transfusion requirements
- Blood transfusion is associated with significant risk and its use should be minimised wherever possible
- Use alternatives to transfusion wherever possible and appropriate

Core indications for red cell transfusion
1. **Acute blood loss** with haemodynamic instability/uncontrolled haemorrhage – to save life
2. **Recoverable anaemia** in a haemodynamically stable patient – to improve short term outcome*
3. **Bone marrow failure** e.g. thalassaemia, myelodysplasia – to improve quality of life
4. **Exchange transfusion** – to replace red cells e.g. sickle cell disease, haemolytic disease of the newborn
5. **Radiotherapy** – to improve response to treatment in cervical cancer (weak evidence)

* Where evidence suggests no harm from withholding transfusion, **uphold restrictive thresholds**

- Restrictive thresholds minimise blood usage – resulting in reduced adverse events for patients and reduced demand on finite resources
- **Regard each unit of red blood cells transfused as a treatment decision**
- Except in circumstances where the person's condition is life threatening, the patient must be given time to ask questions and to make a decision to proceed with transfusion
- Patients with cardiovascular disease require a more liberal threshold
- Document indication for transfusion in medical notes

Acute blood loss

- See specific guidelines, including **Acute upper gastrointestinal haemorrhage** guideline and **Major haemorrhage pathway** on Trust intranet>Clinicians>Clinical guidance>Blood and blood products

Anaemia

- See **Chronic anaemia** guideline, **Investigation and management of symptoms of B_{12} deficiency/Investigation and management of folate deficiency** guidelines where appropriate

ALTERNATIVES TO TRANSFUSION

- Blood transfusion is associated with significant risk and its use should be minimised wherever possible
- Use alternatives to allogeneic transfusion wherever possible and appropriate e.g. oral or intravenous iron, B_{12}/folate supplementation, erythropoietin
- Optimise oxygenation and management of underlying medical conditions to improve tolerance of anaemia and maximise erythropoiesis

RED BLOOD CELL TRANSFUSION ● 2/3

NBTC (2016) Indication codes for RBC transfusion

Clinical situation	Target Hb	Threshold for transfusion*	Code
Acute bleeding/massive haemorrhage	70–90 g/L	n/a	R1
Stable patient**	70–90 g/L	<70 g/L	R2
Stable patient with known cardiovascular disease	80–100 g/L***	<80 g/L	R3
Chronic transfusion dependence	Individual to patient	Avoid symptoms	R4

* Decisions to transfuse are based on more than Hb level (see text above)
** Refers to haemodynamically stable patients with reversible cause of anaemia e.g. post op, iron deficient
*** Higher restrictive threshold also currently supported in cardiac surgery, orthopaedic surgery, haemato-oncology patients and acute coronary syndrome – pending further RCT evidence

DOSE

- Uphold a **'single unit transfusion policy'** – each single unit RBC transfused is a treatment decision (except in active bleeding)
- Red blood cells (RBC) – dosed in units (or mL in low weight patients e.g. <50 kg, who are at high risk of TACO) – prescribe on fluid prescription of the drug chart
- In the absence of active bleeding use **minimum number of units required to achieve a target Hb** taking into account patient size
  - 1 unit RBC expected to raise Hb by 10 g/L in 70 kg patient
  - 4 mL/kg RBC expected to raise Hb by 10 g/L
- Each unit transfused is a treatment decision
- **Prior to every transfusion, assess all patients for risk of Transfusion Associated Circulatory Overload (TACO)** and manage appropriately e.g. increase rate, diuretic use, frequency of observations
- Indicate special blood requirements (SBR) e.g. irradiated, HbS neg, Rh/kell matched

ADMINISTRATION

- Transfuse as soon as possible after removal from designated temperature-controlled storage using a standard blood giving set with a 170–200 micron filter
- Complete transfusion within 4 hr of red cells leaving cold storage
- Transfusion rate depends on the clinical situation and patient history and must be specified (do **not** give a range on the prescription chart)
  - 90–120 min per unit if low risk TACO
  - 3 hr per unit ± diuretics if high risk of TACO
  - 'Stat' through blood warmer if MHP (i.e. over 5–10 min)
- **If delay is unavoidable, return to designated controlled temperature storage as soon as possible** (within 30 min)
- Monitor patients closely for fluid overload (TACO)
- **Any blood component connected to the patient's IV access is regarded as 'transfused' for traceability purposes** - even if the unit was subsequently (partially) wasted

ASSESSING RESPONSE TO TRANSFUSION

- Assess every patient **clinically after each unit** transfused
  - **have the symptoms/signs of anaemia resolved?** – document severity grade
  - **is there evidence of fluid overload (TACO)?** – document any symptoms/signs
- Check **Hb increment** after each unit transfused (except in active bleeding, chronically transfused outpatients or where target threshold cannot realistically be achieved)
  - FBC can be performed at 15 min post transfusion
- **Patients transfused to >20 g/L above target threshold are deemed 'over transfused'**
- Adhere to national guidance on transfusion indications wherever possible and document deviation rationale
- Fully document transfusion and any complications in medical and nursing notes (plus discharge letter)
- **Ensure definitive treatment also prescribed where appropriate** e.g. iron therapy

For further information refer to

- Trust policy C03 for full transfusion guidelines and relevant SOPs
- Trust intranet>Clinicians>Clinical guidance>Blood and blood products

EMERGENCY RED CELLS

- Group O RhD negative blood cells are a finite resource and should only be used where clinically indicated i.e. Group O RhD negative patients and emergency situations (if required) whilst awaiting group specific blood
- Where a valid G&S available in the lab, crossmatched blood (or group specific if inappropriate for electronic issue) can be available almost immediately
- Where no sample is available, group specific blood available within 15 min of sample receipt (<40 min for serologically crossmatched RBC)
- Take XM sample before group O red cell administration (NB 2-sample rule does **not** apply in the emergency setting)

Access

- Patient's unique ID (NHS number) must be entered in fridge kiosk when removing group O RhD negative unit(s) to aid traceability
- The A5 form included with the Group O RhD negative unit must be fully completed and sent back to transfusion laboratory as soon as possible to aid traceability
- Inform transfusion laboratory immediately emergency Group O RhD negative units have been used so they can be replaced
- Location of group O RhD negative blood is detailed below:

Location of Group O RhD negative red blood cells

Royal Stoke – A&E	2 units
Royal Stoke – Theatre -1-5	2 units
Royal Stoke – Theatre Hub	2 units
Royal Stoke – Main issue Fridge	2 units
Royal Stoke - Maternity	2 units (suitable for paediatrics)
County- Main issue Fridge	8 units

CT IMAGING IN MAJOR TRAUMA ● 1/2

- CT imaging is the gold standard for secondary survey of the head, neck and trunk
- If multiple injuries suspected, perform whole body CT (WBCT) – vertex to symphysis pubis (see **Flowchart**), as soon as possible
- use IV contrast unless contraindicated
- alert CT radiographer on notification of trauma call
- provisional report should be available within 30 min
- Consider immediate operative intervention if systolic BP <70 mmHg – on-call senior surgical teams **must** be aware and attend
- Continue to resuscitate, including use of blood products, monitor and warm patient during CT
- Maintain spinal precautions until clinically and radiologically cleared
- CT scan exposes patients to significant risk from radiation and should not be used indiscriminately
- When a more limited distribution of injury is suspected (e.g. isolated head injury), the use of sector CT scan may be more appropriate
- Body sectors include: head + neck, thorax, abdomen and pelvis

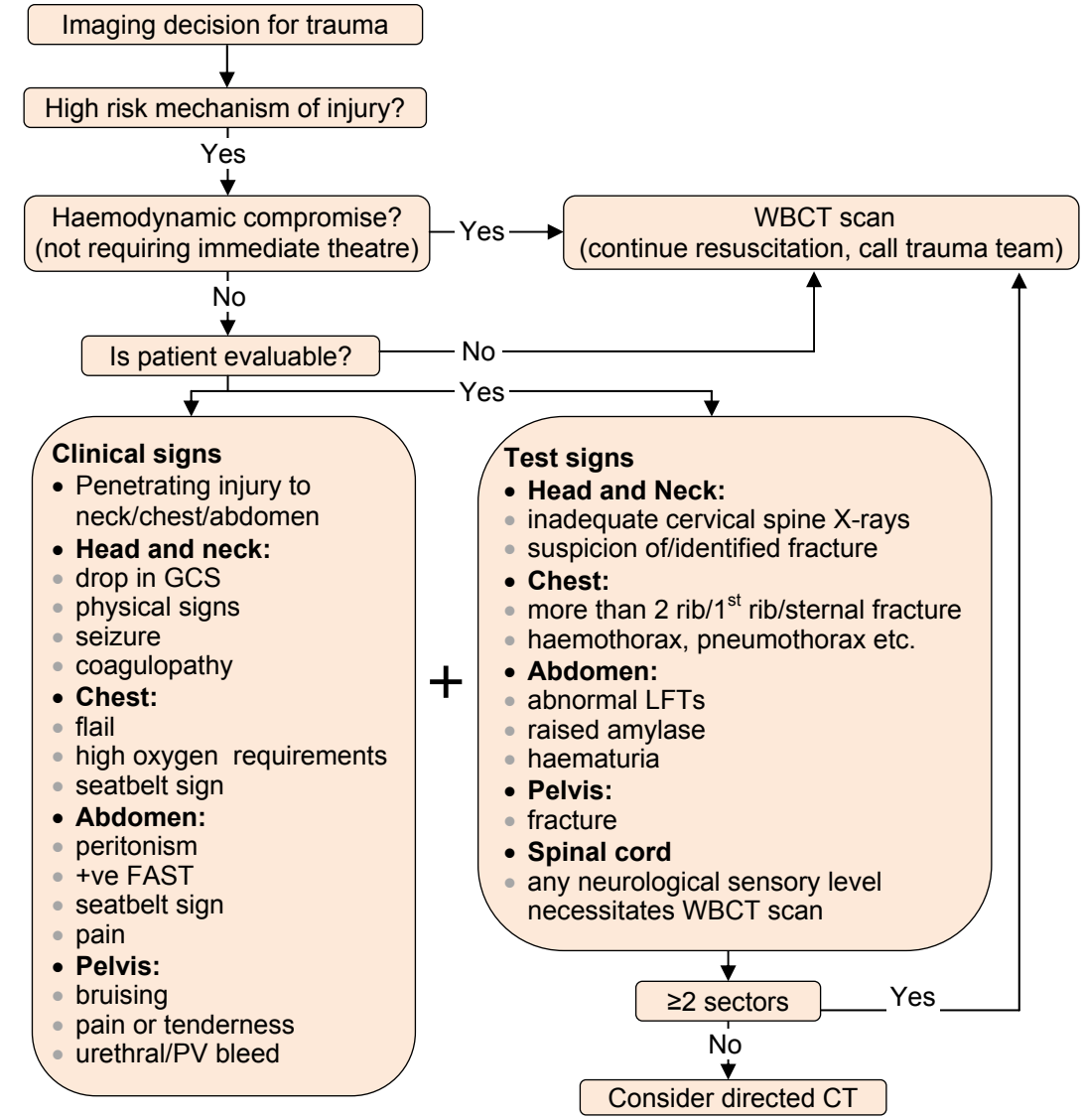
INDICATIONS

- **Consider use of CT scan if patient has experienced a high risk mechanism of injury**
- penetrating injury to neck/chest/abdomen
- fall >3 m (adult), >twice standing height (child)
- combined motor vehicle impact speed >50 mph
- ejection from motor vehicle (partial or complete)
- intrusion into passenger compartment and/or entrapment for >20 min
- death of another occupant of same motor vehicle compartment
- motorcycle crash (impact speed >20 mph)
- pedestrian or cyclist vs motor vehicle (thrown or run over)
- **Following high risk mechanism of injury use WBCT scan in following circumstances:**
- evidence of hypovolaemia: e.g. systolic BP <90 mmHg (adult), <70 mmHg (child)
- patient evaluation compromised due to: reduced GCS, effect of drugs/alcohol, requirement for immediate intubation
- suspicion of spinal cord injury (new sensory or motor deficit)
- clinical evidence of significant injury e.g. flail chest, high oxygen requirements, seatbelt bruising
- abnormal preliminary investigations e.g. injuries identified on primary X-ray series, positive FAST, abnormal laboratory results
- discretionary: deemed necessary by trauma team leader
- Paediatric patient – consider USS in resus before requesting CT

If performing CT scan of ≥2 sectors request whole body CT scan (WBCT)

CT IMAGING IN MAJOR TRAUMA ● 2/2

Flowchart: CT imaging in major trauma



HEAD INJURY ● 1/4

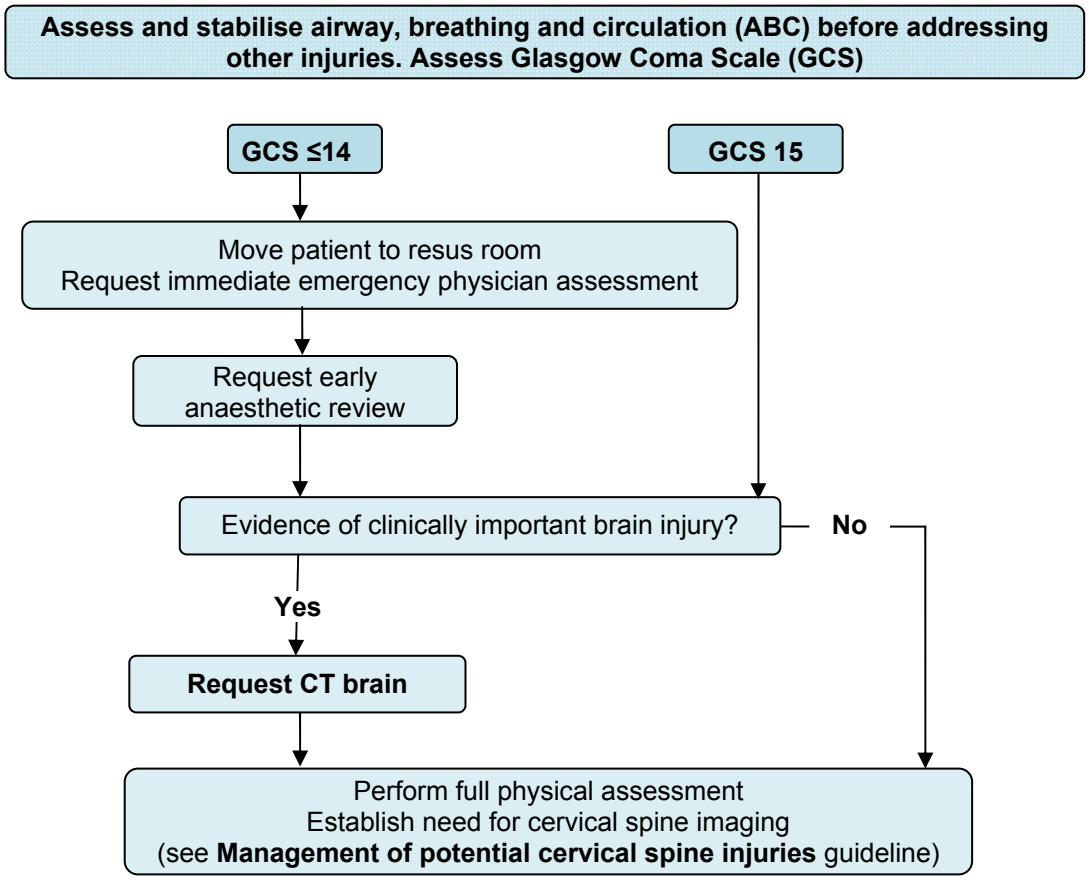
DEFINITION

Head injury is defined as trauma to the head (other than superficial injuries to face)

TRIAGE

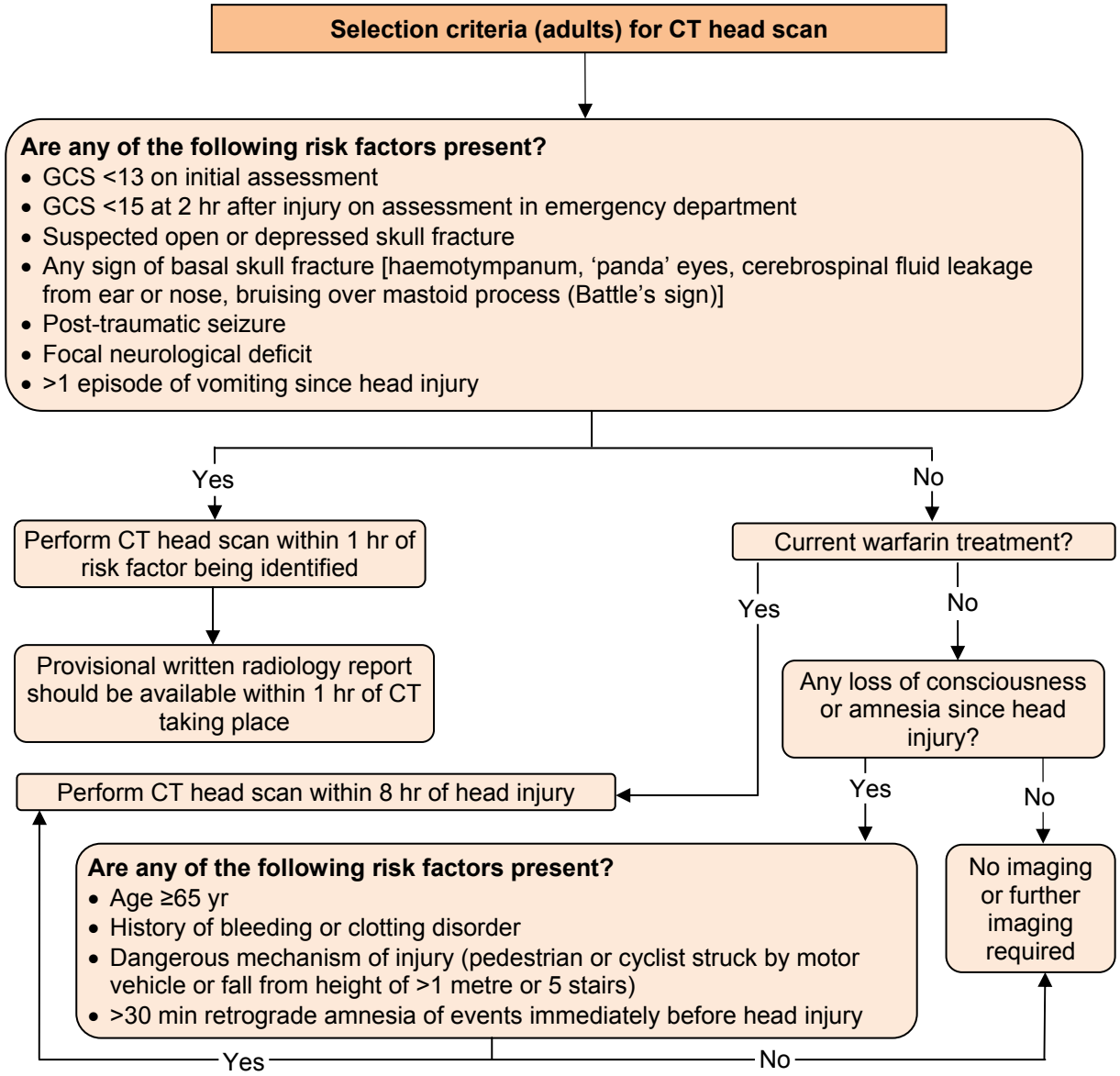
- Assess all patients with possible head injury within 15 min of arrival at emergency department
  - identify cardio-respiratory abnormalities
  - establish risk of clinically significant brain injury and/or cervical spine injury
  - establish risk of other serious injuries/co-morbidities
  - if patient taking warfarin early CT scan advised (irrespective of INR and GCS)
- Follow algorithm below

Assessment of patient with head injury

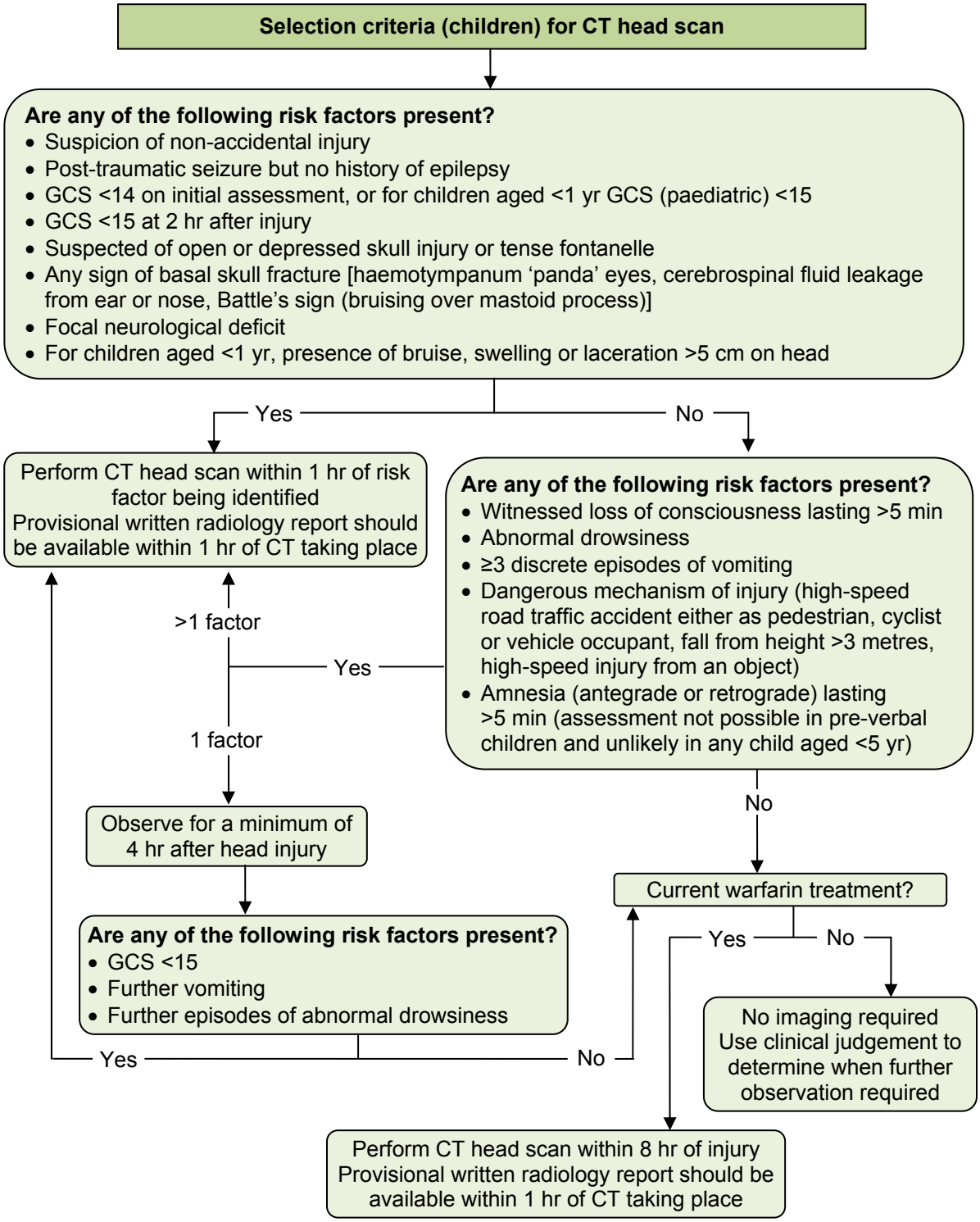


Exclude significant brain injury before ascribing depressed conscious level to intoxication

Investigation of head injury (adults)



Investigation of head injury (children)



CARE OF PATIENT DURING IMAGING

Patients with GCS <15 (or those with multiple injuries)

- Before transfer to imaging, organise urgent anaesthetic review, airway protection and adequate resuscitation
- During transfer, presence of an appropriately trained and equipped clinician (and assistant) capable of delivering any necessary ongoing care, full continuous monitoring

Patients with GCS 15

- Check stable before transfer
- During transfer, presence of an appropriately trained and equipped staff member who will continue to monitor basic observations, including GCS

MONITORING AND NEUROLOGICAL OBSERVATIONS

Monitor all patients with head injury

Minimum observations

- Basic observations (pulse, BP, respiratory rate, oxygen saturations and temperature)
- Pupil size and reaction
- Limb movement
- GCS recorded at following frequency:
- GCS <15, every 30 min
- GCS 15:
  - first 2 hr, every 30 min
  - next 4 hr, hourly
  - then, 2-hrly

Senior review

- Request a senior review of patient if any of following occur:
- agitation or abnormal behaviour
- worsening headache or persistent vomiting
- new or evolving focal neurological signs (e.g. pupil abnormality)
- fall in GCS (1 point) persisting >30 min (or immediately if a fall >2 points)

When to involve neurosurgical team

- If new surgically significant abnormality identified on imaging
- Regardless of results of imaging, if any of following:
- persistent coma (GCS ≤8) after initial resuscitation
- unexplained confusion for >4 hr
- deterioration in GCS after admission (pay greater attention to motor response deterioration)
- progressive focal neurological signs
- seizure without full recovery
- definite/suspected penetrating injury
- CSF leak

SUBSEQUENT MANAGEMENT

Ongoing care

- Refer patients with new surgically significant neurological abnormalities to neurosurgical team
- If patient requires ongoing ventilation or has multiple injuries they may need admitting to and must be discussed with intensive care team
- Admit to emergency department CDU for neurological observations any adult with isolated minor head injuries (with no evidence of neurosurgical injury) and who:
- are intoxicated or experiencing other symptoms (e.g. persistent vomiting)
- live alone
- All patients who sustain head injury whilst taking anticoagulants should be:
- referred to neurosurgery and have their anticoagulation reversed if injury is detected on CT brain scan (see **Management of bleeding and over-anticoagulation with warfarin** in **Medical** guidelines)
- admitted to CDU for 24 hr observation if CT brain scan shows no evidence of injury or if a CT scan is not indicated initially (see **Flowchart**)
- discuss all patients with inherited bleeding disorders with on-call haematologist (see **Bleeding disorders in adults** in **Medical** guidelines)
- reviewed by a senior doctor and re-scanned if any signs of clinical deterioration occur
- Refer children with isolated minor head injuries to paediatrics if a further period of observation required

Discharge

- Adults and children with isolated head injuries (with no evidence of neurosurgical injury), who are alert (GCS 15) and fully orientated, may be allowed home under supervision of a responsible adult who has been given head injury advice (written and verbal) and asked to return if new concerns arise

PATIENTS RETURNING/PRESENTING TO EMERGENCY DEPARTMENT

- If patient returns with persistent complaint of head injury symptoms involve senior clinician and discuss need for CT scan of head

POTENTIAL CERVICAL SPINE INJURY ● 1/3

SPINAL PRECAUTIONS

All patients to have full spinal precautions until assessed (see Flowchart) and cleared clinically and cervical spine cleared radiographically (where appropriate)

CLINICAL ASSESSMENT

- Triage all patients with possible cervical spine injury within 15 min of arrival at the emergency department
- Identify cardio-respiratory abnormalities and resuscitate accordingly
- Establish the risk of cervical spine injury (apply decision rule – see below)
- Establish the risk of other serious injuries/co-morbidities/vertebral disease
- Document any neurological abnormalities accurately (see Emergency Assessment of Spinal cord injuries guideline)
- Apply hard collar, use head blocks and manage on firm surface
- all patients must be removed from spinal boards within 1 hr of arrival
- pre-existing vertebral disease (see **Clinical decision rule**) may require amended technique – request senior ED clinician review
- Use log-rolling to change position
- Use manual in-line immobilisation of head and neck when collar or blocks removed (e.g. for airway procedures)
- Assess pain and provide analgesia (see **Pain management** guideline)

CLINICAL DECISION RULE

Indications for cervical imaging

Request cervical spine imaging and review with cervical spine assessment guideline, for patients subjected to blunt trauma that may have injured their neck and if:

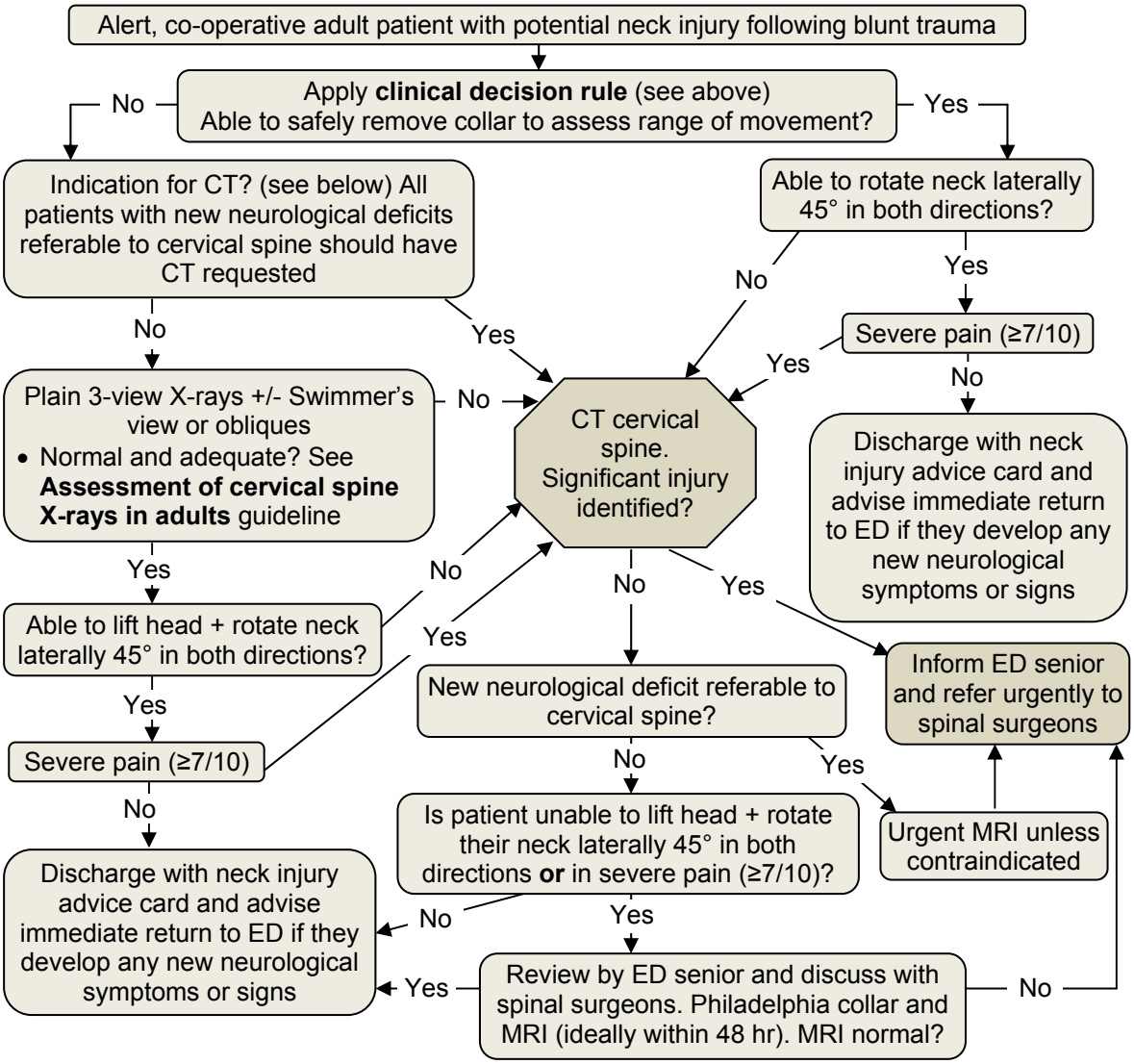
- GCS <15 on assessment in ED
- Paralysis, focal neurological deficit, or paraesthesia in the extremities
- Abnormal vital signs (systolic BP <90 mmHg or respiratory rate <10 or >24 breaths/min)
- Cervical spine fracture needs to be urgently identified (e.g. before surgery)
- Severe neck pain (≥7/10 severity)
- Neck pain and any of the following high risk factors:
- fall from >1 m or 5 stairs
- axial load to the head (e.g. diving)
- high-speed motor vehicle collision (combined speed >60 mph)
- rollover motor vehicle accident or ejection from a motor vehicle
- an accident involving motorised recreational vehicles
- bicycle collision
- aged ≥65 yr (unless local policy dictates primary imaging modality is CT)
- injured >48 hr earlier
- re-attending with the same injury
- known vertebral disease (e.g. ankylosing spondylitis, rheumatoid arthritis, spinal stenosis, or previous cervical surgery)
- dangerous mechanism of injury (see above) and either a visible injury above the clavicles or a severely painful (≥7/10 severity) thoracic injury, even if no neck pain or tenderness

Examination of cervical spine

- If cervical imaging is not indicated or only following low risk factors identified patient can have collar removed and range of movement assessed:
- simple rear-end motor vehicle collision (but not if pushed into another vehicle, or hit at high speed or by a large vehicle)
- sitting position in ED
- ambulatory at any time since injury
- delayed onset of neck pain (i.e. not immediate)
- absence of midline cervical spine tenderness
- Low risk patients able to rotate their necks 45° to the left and right: consider significant cervical spine injury excluded, without need for imaging
- If patient unable to rotate their neck 45° in both directions or report severe pain (≥7/10 severity) on doing so: perform cervical spine imaging

POTENTIAL CERVICAL SPINE INJURY ● 2/3

Flowchart: Management of adult patients with potential neck injury following blunt trauma



INDICATIONS FOR CT SPINE (ADULTS)

CT to exclude cervical spine injury indicated for the following:

- All patients with new neurological deficits referable to cervical spine
- GCS <13 on initial assessment
- Inadequate plain film series
- Suspicion or certainty of abnormality on plain film series (CT from cranio-cervical junction to the thoraco-cervical junction; selective scanning may miss injuries)
- If patient:
- intubated
- being scanned for head injury or multi-region trauma
- has dementia (or a chronic disability precluding accurate clinical assessment)
- has new neurological signs or symptoms
- has severe neck pain (≥7/10 severity)
- has a significantly reduced range of neck movement
- has known vertebral disease (e.g. ankylosing spondylitis, rheumatoid arthritis, spinal stenosis, or previous cervical surgery)

POTENTIAL CERVICAL SPINE INJURY ● 3/3

INDICATIONS FOR C-SPINE IMAGING (CHILDREN AGED <16 YR)

- Perform MRI for children (aged <16 yr) if strong suspicion of:
  - cervical spinal cord injury as indicated by clinical decision rule and by clinical assessment **or**
  - cervical spinal column injury as indicated by clinical assessment, or abnormal neurological signs or symptoms, or both
- Consider plain X-rays in children who do not fulfil the criteria for MRI but in whom clinical suspicion remains after repeated clinical assessment
- Discuss the findings of plain X-rays with a consultant radiologist and perform further imaging if needed. For imaging in children with head injury and suspected cervical spine injury, see **NICE guideline recommendations for head injury** below

NICE guideline recommendation for head injury

- For children who have sustained a head injury, perform a CT cervical spine scan **only** if any of the following apply (due to increased risk to thyroid gland from ionising radiation and generally lower risk of significant spinal injury):
  - GCS <13 on initial assessment
  - patient has been intubated
  - focal peripheral neurological signs
  - paraesthesia in upper or lower limbs
  - definitive diagnosis of cervical spine injury needed urgently (e.g. before surgery)
  - patient having other body areas scanned for head injury or multi-region trauma
  - strong clinical suspicion of injury despite normal X-rays
  - plain X-rays:
    - are technically difficult
    - inadequate
    - identify a significant bony injury
- Perform scan within 1 hr of identifying risk factor. A provisional written radiology report should be made available within 1 hr of performing scan

CLINICAL CLEARANCE

GCS <13

- Maintain cervical spine immobilisation
- Request senior radiologist/spinal surgeon review of imaging
- If cervical spine CT scan imaging are normal (reported so by a senior radiologist or spinal surgeon) in an obtunded patient (GCS <13) who is predicted to be un-assessable clinically during next 24 hr, then spine is declared clear on risk-benefit grounds

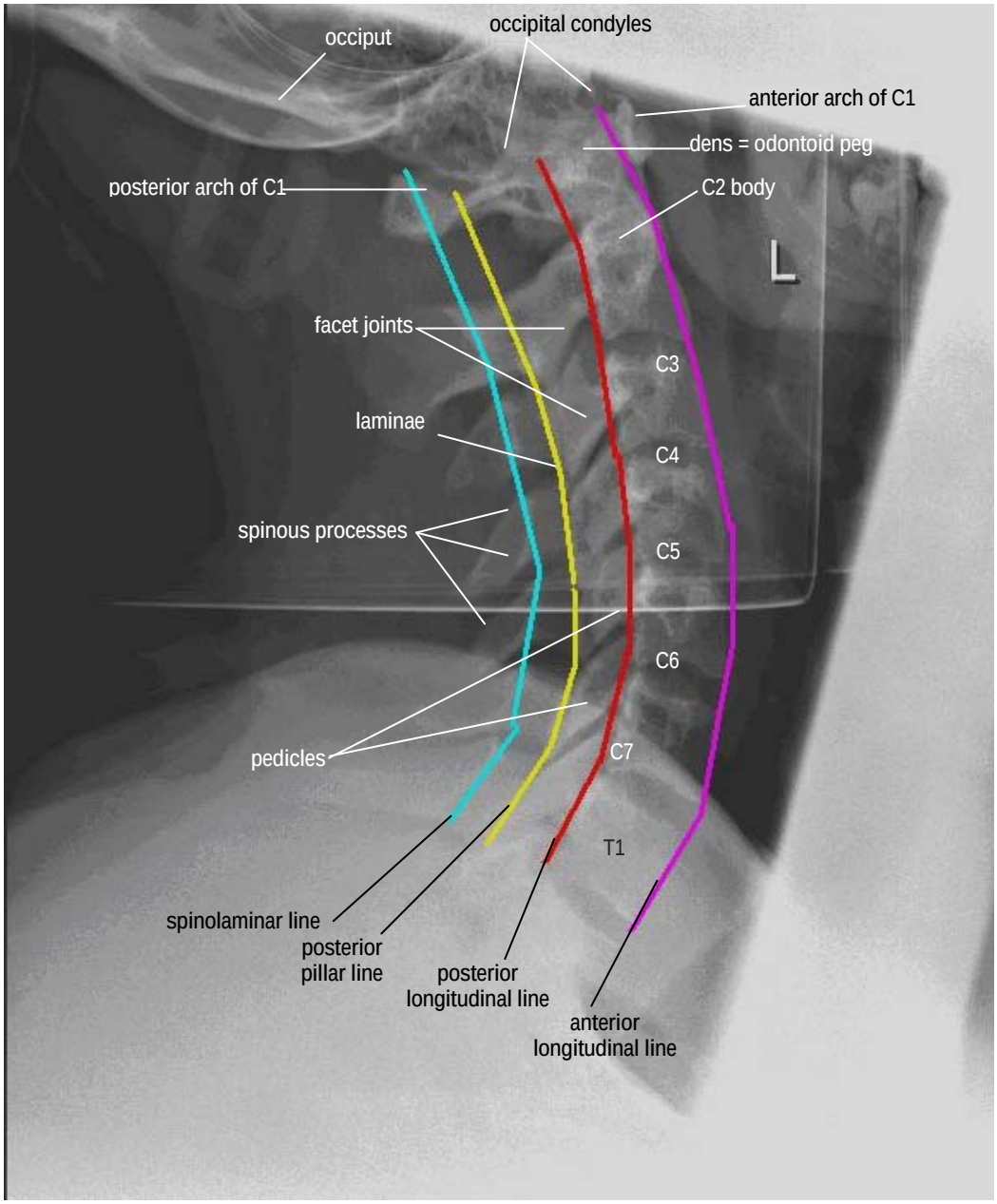
GCS>13

- Remove collar and blocks
- Clinically clearance is achieved if the following manoeuvres are achieved unaided without the occurrence of neurological features or severe pain (pain score >7/10)
  - 45º rotation to left and right
  - lift head up against gravity

DISCHARGE AND FOLLOW-UP

- Refer all patients with suspected cervical spine injury (radiological +/or neurological) to the on-call spinal team
- Request senior ED clinician review of any patient who fails to achieve clinical clearance and consider spinal team referral

ASSESSMENT OF CERVICAL SPINE X-RAYS IN ADULTS ● 1/3



WHICH PLAIN FILMS

Cervical spine radiographs are usually adequate to rule out fracture but up to 20% can be missed on plain films. If there is any question of an abnormality on plain radiograph or if patient has neck pain disproportionate to findings on plain films, obtain a CT scan of the area in question

- Patients assessed using appropriate algorithm from **Potential cervical spine injury** guideline who require plain films need a series of 3 cervical spine x-rays
- lateral (to include top of T1)
- long AP view
- open mouth AP view of C1/C2 or 'peg' view
- If C7/T1 junction (commonly injured site) not visible on lateral view:
- arrange trauma oblique views (30°) showing intervertebral foramina, pedicles and facet joints
- if trauma oblique views are inadequate or concern persists, request urgent CT

VIEWING PLAIN FILMS

- Use following stepwise approach to viewing films in order not to miss an injury

LATERAL PLAIN FILMS

- Check adequacy i.e. whole C-spine including top of T1 visible

ASSESSMENT OF CERVICAL SPINE X-RAYS IN ADULTS ● 2/3

Assess craniocervical alignment

Trace lines

- Anterior longitudinal line along anterior bodies of vertebrae and merging superiorly with anterior aspect of the peg
- Posterior longitudinal line along posterior bodies of vertebrae and merging superiorly with the posterior aspect of the peg
- Posterior pillar line along the back of the lateral mass i.e. facets
- Spinolaminar line along bases of the spinous processes
- spinolaminar line sometimes shows a slight step at C2 level (especially in children), though this should not be >2 mm posterior to the curve traced between C1 and C3

Lordosis

- Loss of normal lordosis is non-specific and may be due to muscle spasm, old injuries, age-related changes, a semi-rigid collar, or radiographic positioning

Unilateral vs bilateral facet dislocation

- Apparent forward movement of one vertebra on another suggests facet joint dislocation. If suspicion exists, request urgent CT
- Unifacet dislocation:
- soft tissue swelling with rotation of vertebrae above the dislocation resulting in both facet surfaces being visible on the lateral – bow tie sign
- Bilateral facet dislocation:
- extensive forward displacement of vertebral body (>50% width of vertebral body), widening of interspinous processes, disc space narrowing and soft tissue swelling
- If no fracture or dislocation seen, consider whether a ligamentous injury may be present with the following signs
- facet joint over-riding
- facet joint widening (usually have parallel articular surfaces with gap of less than 2 mm between)
- interspinous fanning
- >25% compression of vertebral body
- over 10% angulation between vertebral bodies
- over 3.5 mm vertebral body over-riding with fracture

Evaluate individual vertebrae

- Vertebral bodies below C2 have a fairly uniform square or rectangular shape. Anterior and posterior heights of vertebral bodies should be the same (>2 mm difference indicates a compression fracture)
- Detached fragment of bone may signify important ligamentous damage
- Spinous process should be intact

C2 and the odontoid peg (dens)

- Odontoid peg should be immediately posterior to the arch of C1, normal distance between these being 3 mm (or 5 mm in a child)
- Posterior aspect of peg forms a continuous line with posterior aspect of the body of C2
- look for the incomplete circle (Harris' ring) projected over base of peg and part of the body of C2 – it should be continuous apart from at its base; any other disruption indicates a fracture through base of peg

Intervertebral disc spaces

- Should be of uniform height (any widening is likely to be pathological)
- narrowing of the anterior intervertebral disc space, with widening posteriorly suggests hyperflexion injury
- conversely, hyperextension produces widening anteriorly and narrowing of the posterior intervertebral disc space

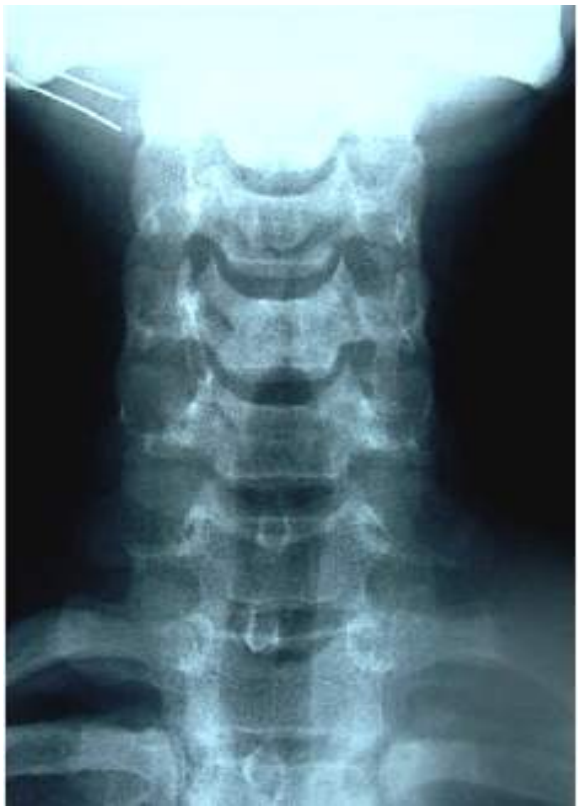
Prevertebral soft tissues

- Maximum normal width of the prevertebral soft tissues should be:

Level	Width (mm)	Approx % of vertebral body width
C1–4	5	30
C5–7	22	100

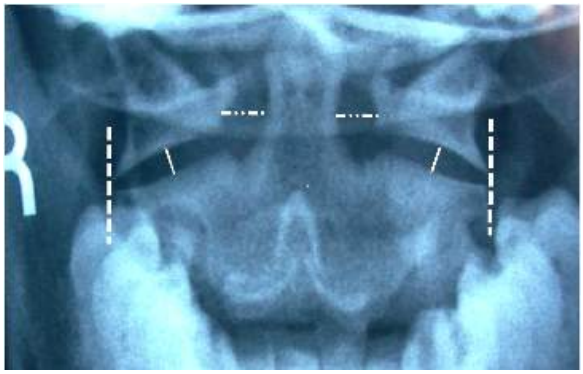
ASSESSMENT OF CERVICAL SPINE X-RAYS IN ADULTS ● 3/3

LONG AP VIEW



- Spinous processes lie in a straight line (NB they are commonly bifid, so may be difficult to see)
  - if they do not it indicates a unilateral facet joint dislocation
- Distances between them should be approximately equal. No single space should be 50% wider than the one above or below
  - abnormal widening indicates an anterior cervical dislocation

AP PEG VIEW



- Look for fractures through odontoid peg
- Lateral margins of C1 should align with those of C2 (less than 2 mm overhang)
- Distance between each side of the odontoid peg and the lateral mass of C2 should be equal. Slight rotation of the neck may cause them to appear unequal but if lateral margins are normally aligned the asymmetry can be attributed to rotation

MEASURABLE PARAMETERS OF NORMAL CERVICAL SPINES

Predental space	<3 mm
C2–C3 pseudosubluxation	<3 mm
Retropharyngeal space	<6 cm at C2 <22 mm at C6
Angulation of spinal column at any single interspace level	<11°
Cord dimension	10–13 mm

EMERGENCY ASSESSMENT OF SPINAL CORD INJURY ● 1/3

RECOGNITION AND ASSESSMENT

- Initial assessment goal: establish diagnosis, prevent further injury which can occur as a result of injudicious movement, and because of inadequate spinal cord perfusion and oxygenation
- Common causes of spinal cord injury (SCI) include:
- road traffic crash
- falls
- assault
- sports
- SCI may occur with or without X-ray or CT evidence of fracture or dislocation
- Spinal cord compression can result from non-osseous pathology e.g. malignancy (usually metastatic), epidural haematoma or abscess, or disc prolapse

Symptoms and signs

- Autonomic function may be affected by SCI. A higher level of cord injury tends to lead to more profound autonomic dysfunction
- Neurogenic shock, characterised by:
- hypotension
- relative bradycardia
- peripheral vasodilatation
- hypothermia
- does not usually occur with SCI below T6
- Consider shock associated with SCI as haemorrhagic until proven otherwise, especially in the context of multiple injuries
- Disruption to blood supply of the spinal cord may result in a cord lesion at a level several segments higher than level of vertebral injury
- Differentiating a nerve root injury from SCI can be difficult
- presence of neurologic deficits that indicate multilevel involvement suggests SCI rather than a nerve root injury
- Spinal shock: spinal cord concussion resulting in a 24–72 hr period of paralysis, hypotonia and areflexia that at its conclusion may result in hyperreflexia, hypertonicity and clonus
- In absence of spinal shock, motor weakness with intact reflexes indicates SCI, while motor weakness with absent reflexes indicates a nerve root lesion

Examination

- Begin with primary survey to detect life-threatening conditions compromising airway, breathing, and circulation, and assess disability (central and peripheral neurological function)
- Utilise log roll technique to allow examination of whole axial skeleton (occiput to sacrum)
- In all patients with suspected SCI, a complete detailed neurological evaluation of motor and sensory function including perianal sensibility and voluntary anal contraction, and deep tendon reflexes is essential
- Accuracy of baseline examination is important since cephalad progression of abnormalities is a sensitive marker of deterioration and may herald respiratory failure

Steps in classification

- Utilise ASIA spinal cord injury documentation form (**Figure 1**)
- Determine sensory levels and grade (light touch and pin prick) for right and left sides
- Determine motor levels and grade for right and left sides: In regions where there is no myotome to test assume the same level as sensory

Grade	Sensory	Motor
5		Normal muscle strength
4		Active movement against resistance
3		Active movement against gravity
2	Normal	Active movement with gravity eliminated
1	Impaired/hyperaesthesia	Flicker of movement
0	Absent	No contraction or movement
NT	Not testable	Not testable due to factors such as pain, immobilisation etc

- Determine single neurological level: the lowest (most caudal) segment where motor and sensory function is normal on both sides
- Determine whether injury is complete or incomplete (sacral sparing): any perianal sensibility or voluntary anal contraction, assessed when spinal shock can be shown to have worn off by return of bulbocavernosus and/or anal wink reflexes, indicates sacral sparing

Investigations

- FBC
- Crossmatch blood
- U&E
- LFT
- Amylase
- Arterial blood gas
- Blood lactate
- Urinalysis

Imaging

- Cervical spine: See Management of cervical spine injury guideline
- Dorsal and lumbar spine: Request plain X-ray if presence of spinal fracture suspected clinically
- CT scan if:
  - required to evaluate for other significant injuries e.g. source of haemorrhage or visceral injury
  - plain X-rays provide inadequate images or an abnormality is identified
  - further evaluation of a fracture or displacement required
- Noncontiguous spinal fractures (fractures separated by at least 1 normal vertebra) occur in 10–15% of patient with spinal cord injury
- Once spinal fracture identified, image entire axial skeleton to assess for noncontiguous fracture
- MRI is best modality for assessing extent of SCI, soft tissue injuries of axial skeleton and non-osseous pathology resulting in cord compression

IMMEDIATE TREATMENT

Patients with pre-existing deformity (especially ankylosing spondylitis) should be immobilised in the position that is normal for them. Do not force bent patients to a straight spine board. They may need to be propped up with several pillows

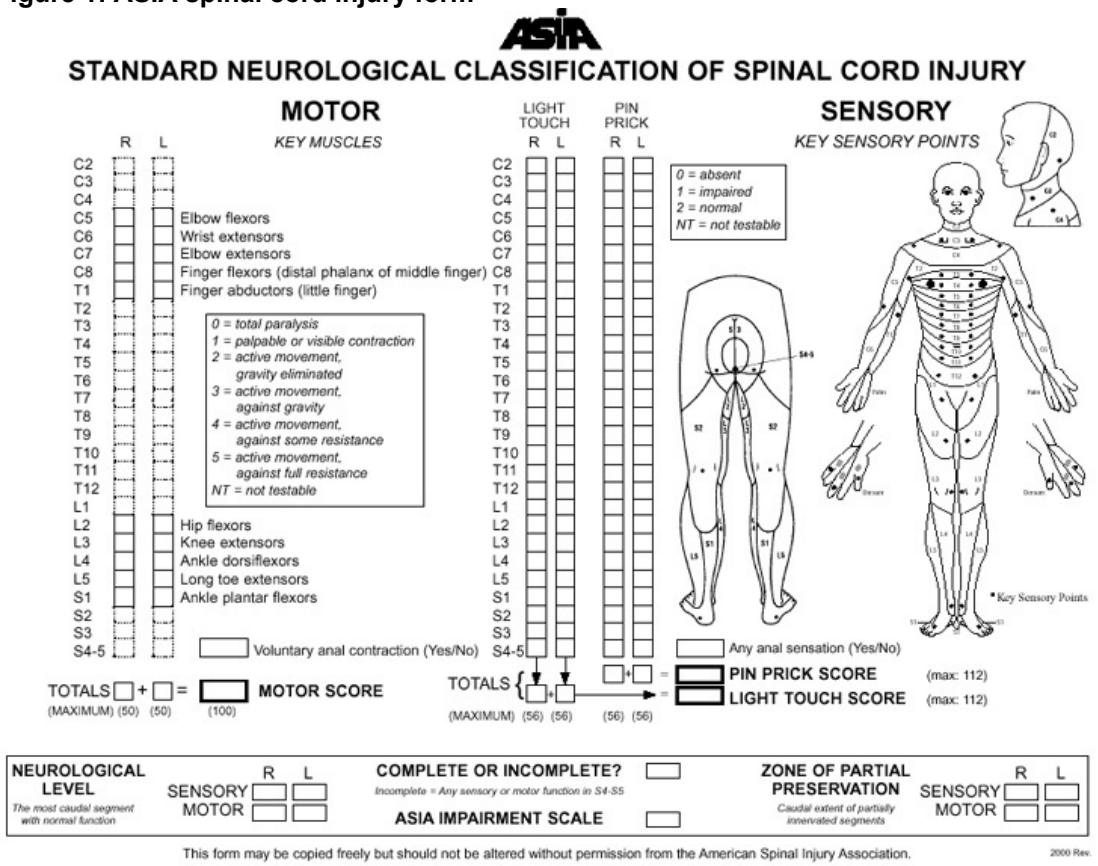
- Spine should be protected by immobilisation: Collar, head blocks, tape/straps and maintain supine position on an emergency department trauma trolley
- If patient arrives on a spinal board remove it as soon as possible to reduce the risk of developing pressure injuries. Insensate skin is particularly prone to pressure necrosis
- Avoid use of spinal board in prolonged secondary transfer. Consider alternatives e.g. vacuum mattress
- Utilise log rolling technique when movement of patient required
- Prescribe analgesia (see **Pain management** guideline)
- Prescribe anti-emetic and place NG tube if patient experiences nausea. Tilt trolley head down and utilise suction to manage vomiting
- Refer to on-call orthopaedic team once all other immediate life-threatening injuries have been identified and initial management has been completed
- Refer all spinal cord injured patients to regional spinal cord injury unit (Oswestry) within 4 hr of arrival

Treatment of neurogenic shock

- First exclude visible and concealed source of haemorrhage through clinical assessment and appropriate radiological evaluation
- SCI patients are at high risk of hypothermia, partly because of inability to shiver
- Aim to maintain the following parameters:

Physiological variable	Target range	Notes
Heart rate	60–100/min	• Treat haemodynamically significant bradycardia with atropine sulphate 300–600 microgram IV, repeated if necessary
BP (mean arterial pressure)	85–90 mmHg	• Assume potential for hypovolaemic cause for hypotension, and give crystalloid sufficient to maintain urine output • If, despite adequate urine output, patient remains hypotensive, consider inotropic support • Monitor blood lactate levels
SpO_2	94–98%	• Measure arterial blood gas to evaluate for hypercapnia • If respiratory failure detected request ITU review
Urine output	>30 mL/hr	• Insert urinary catheter and monitor hourly fluid balance
Temperature	36–37°C	• Monitor hourly and keep patient covered • If temperature <35°C, commence active re-warming

Figure 1: ASIA spinal cord injury form



MAJOR PELVIC TRAUMA ● 1/2

HISTORY

- Consider pelvic fractures based upon mechanism of injury
  - road traffic collision: combined vehicle impact speed >50 mph, motorcycle accident, pedestrian/cyclist vs motor vehicle
  - fall from height: >3 m (adult), twice standing height (children)
  - crush injury
- Any patient with hypotension and potentially relevant mechanism of injury **must** be considered to have a pelvic injury
- Less serious pelvic injuries (e.g. fractures of pubic ramus) may occur following simple fall – see **Hip fractures (suspected)** guideline

DO NOT EXAMINE PELVIS FOR MECHANICAL STABILITY: Compression or distraction of the pelvis is unreliable and may exacerbate injury

CLINICAL FEATURES

- Haemodynamic compromise is common but may not be apparent at initial presentation
- Contusions or abrasions over bony pelvis or perineum
- Tenderness on palpation of bony pelvis
- Urethral, vaginal or rectal bleeding
- Shortening of a lower limb

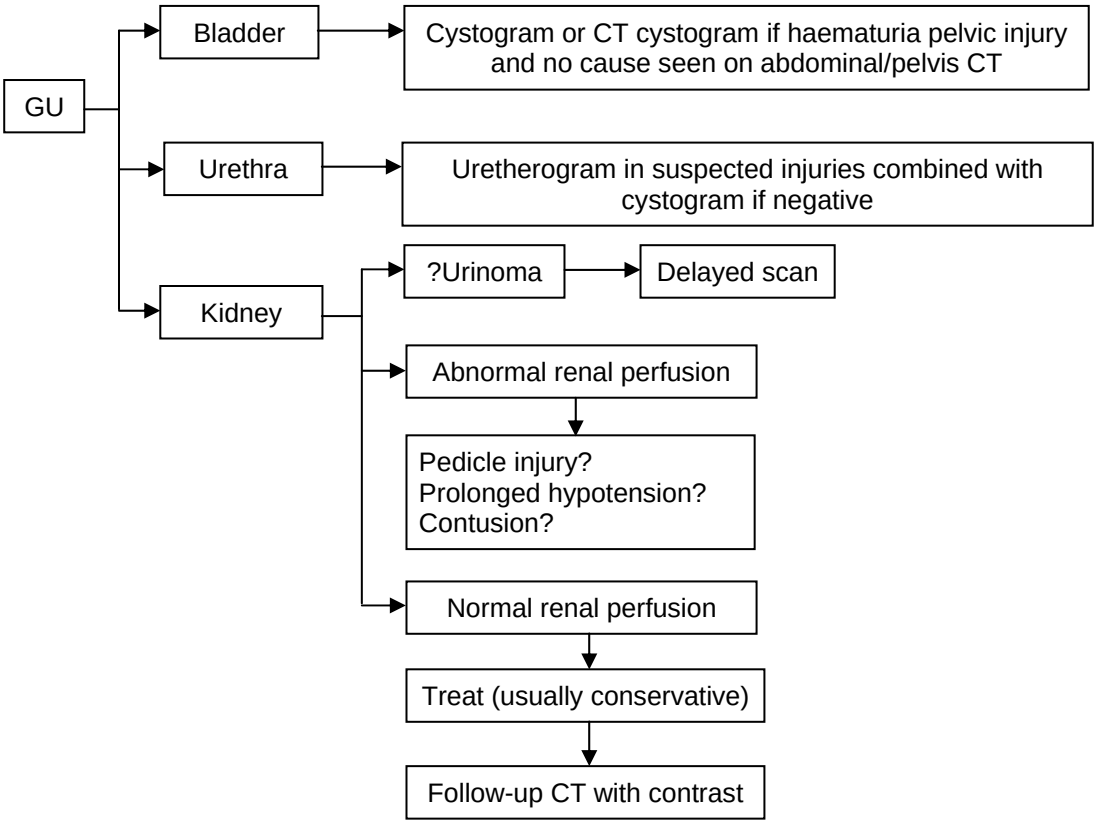
INITIAL MANAGEMENT

- Call trauma team leader
- Apply pelvic binder at the level of the greater trochanters (not iliac crests)
  - if pelvic binder applied pre-hospital, check positioning correct and leave in place pending radiological evaluation
  - pelvic binder can be applied even if lateral compression fracture is suspected
  - splinting the pelvis tamponades haemorrhage and reduces movement at fracture site
- Assess patient as per ATLS principles and identify other injuries
- Secure intravenous access and if evidence of haemodynamic compromise active major haemorrhage protocol (see **Major haemorrhage control and use of blood products in uncontrolled bleeding** guideline)
- Order urgent pelvic X-ray (or proceed to immediate CT) to clear pelvis
- **DO NOT LOGROLL** patient until pelvis is cleared. Use a scoop stretcher
- Consider appropriate pain management (see **Pain management** guideline)

SUBSEQUENT MANAGEMENT

- Pelvic ring fractures and dislocations:
  - leave pelvic binder in place
  - request contrast CT pelvis (see **CT imaging in major trauma** guideline)
  - request early senior orthopaedic review
  - assess pelvis and perineum for wounds
  - assess for presence of genito-urinary injury (blood at urethral meatus, high riding or boggy prostate, haematuria) and request contrast studies and senior urological opinion (see **Flow diagram**)
- Acetabular fractures:
  - request early senior orthopaedic review
  - document neurovascular status of the limb
  - hip dislocations must be reduced urgently
- No evidence of pelvic fracture on initial imaging:
  - remove pelvic binder and re-evaluate patient
  - if suspicion of pelvic fracture persists, repeat pelvic X-ray after removal of pelvic binder
  - an AP compression injury may be perfectly reduced by application of the binder but will become apparent on repeat X-ray

Flow diagram: Imaging of suspected genito-urinary trauma



MANAGEMENT OF BURNS ● 1/4

RECOGNITION

Identification of patients with major burns – MUST be discussed with burns centre

- Adults with >15% total body surface area burn (TBSAB)
- Children with >10% TBSAB
- Airway burn/inhalation injury (except pure carbon monoxide poisoning)

Other burns warranting discussion with burns centre (or other burns facility/plastics where available)

- A child with a partial thickness burn ≥2%
- An adult with a partial thickness burn ≥3%
- Any full thickness burn ≥1%
- Circumferential burns
- Burns to special areas: face, neck, hands, perineum, feet
- Burns to an area involving a joint which may adversely affect mobility/function
- Electrical or chemical burns
- Suspected non-accidental injury (NAI) – any burn with suspicion of NAI should receive expert assessment within 24 hr
- Any burn not healed within 2 weeks

ASSESSMENT

Airway

Urgent airway management may be necessary – do not delay
Does patient have an airway injury?

- Seek immediate senior anaesthetic review if patient has any of following:
  - stridor
  - soot in airway
  - singed nasal hair
  - facial burn
  - change in voice
  - brassy cough
  - carbonaceous sputum
- If intubation required, use an uncut ETT to allow for facial oedema

Remember to protect C-spine until clinically cleared as stable

Breathing

- Assess for evidence of breathing impairment. Has patient any of following:
  - oxygen saturation lower than expected
  - respiratory rate outside expected limited
  - reduced arterial-venous oxygen saturation difference (consider cyanide poisoning – use of antidote recommended – see Toxbase)
  - carbon monoxide >10% [available with arterial bloodgas (ABG)] – see Toxbase
- Assess for evidence of broncho-pulmonary injury, circumferential chest burns or other chest wall injury e.g. flail segment
- Administer high flow oxygen
- Call for senior anaesthetic review if concerns regarding breathing impairment
- Contact burns centre

Circulation

Absence of peripheral pulses requires immediate contact with local burns service as escharotomy may be required

- Is there any suggestion of a circulation problem? Has patient any of following:
  - tachycardia
  - tachypnoea
  - reduced level of consciousness
  - central and peripheral capillary refill time >2 sec
  - cool peripheries
  - elevated lactate
  - arrhythmias
  - circumferential limb burn

- Commence IV resuscitation as per ATLS protocol. If this does not improve parameters, repeat primary survey, looking for causes of shock
- Insert 2 large bore cannulae for patients requiring IV fluid resuscitation (through burn if necessary) and an indwelling urinary catheter attached to an hourly collection bag. See **Fluid resuscitation** guideline

Disability

- Does patient have a reduced GCS and/or pupils unequal and not reacting to light? If so:
- consider CO poisoning
- exclude other injuries (e.g. head injury)
- contact an anaesthetist

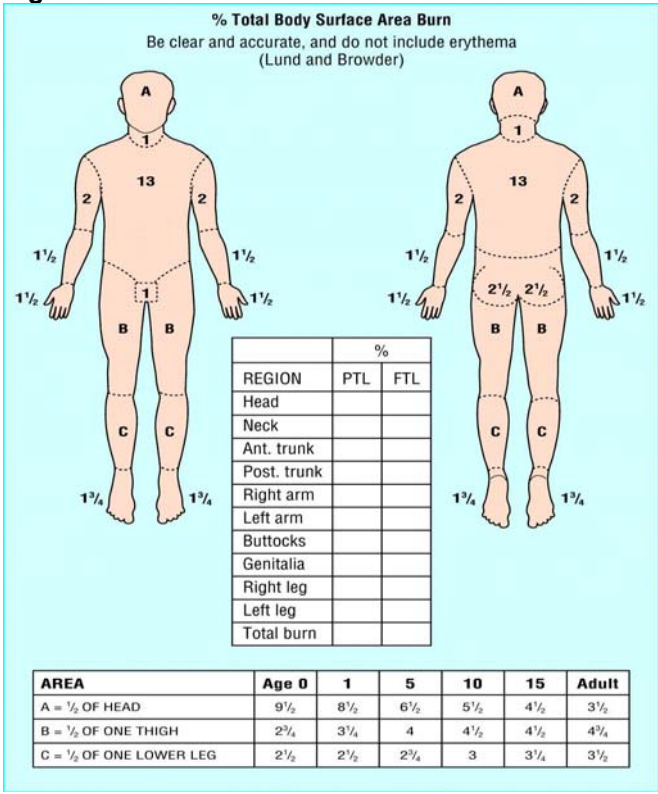
Exposure, environment and evaluation

- Measure core temperature and maintain >36°C

Total body surface area burn (TBSAB)

- Use Lund and Browder chart (**Figure 1** – available from resus or the internet) to document findings. Ignore simple erythema
- patient's hand including digits is 1% total body surface area (TBSA) – this knowledge can be used to calculate total area of small burned or unburned areas
- Assess type, depth and area involved – see **Assessment and treatment of burn**

Figure 1 Lund and Browder chart



	%	
REGION	PTL	FTL
Head		
Neck		
Ant. trunk		
Post. trunk		
Right arm		
Left arm		
Buttocks		
Genitalia		
Right leg		
Left leg		
Total burn		

AREA	Age 0	1	5	10	15	Adult
A = ½ OF HEAD	9½	8½	6½	5½	4½	3½
B = ½ OF ONE THIGH	2¾	3¼	4	4½	4½	4¾
C = ½ OF ONE LOWER LEG	2½	2½	2¾	3	3¼	3½

Investigations

- Take blood for FBC, U&E, ABG, group and save, creatine kinase, urine pregnancy test

IMMEDIATE TREATMENT

Fluid resuscitation

Adults with >15% TBSA burned requires IV fluid resuscitation
Children with >10% TBSA burned require IV fluid resuscitation

- Use compound sodium lactate (Hartmann's). Calculate amount of fluid required over first 24 hr **from time of injury** using Parkland formula:

  4 mL x %TBSA x weight (kg) = total fluid volume (TFV) over first 24 hr from time of injury. Give half of TFV over first 8 hr; with remaining half administered over following 16 hr

- Maintenance fluids over first 24 hr:
- adults – no additional maintenance fluid
- children – calculate maintenance as normal (see **IV fluid therapy** in **Paediatric** guidelines) and add to resuscitation fluid. Give as sodium chloride 0.45% + glucose 5%
- Target urine output: adults 0.5 mL/kg/hr, children 1–2 mL/kg/hr, infants 2–4 mL/kg/hr
- adjust infusion rate to deliver appropriate urine output

Remove burning agent

- Important in chemical burns – all clothing must be removed
- If burn due to Bitumen/petrochemicals do not attempt removal

Analgesia, tetanus and dressing

- Give adequate analgesia. Opiates may be required – see **Pain management** guideline
- Assess tetanus status – may require tetanus immunoglobulin +/- vaccine, see **Tetanus prevention** guideline
- Dress burn appropriately (see **Table** – **Treatment of specific burns**)

Transfer to major burns centre

- Organise transfer to major burns centre
- Ambulance transfers for patients requiring resuscitation must be performed by crews who can provide continuing fluid resuscitation, thermal regulation and monitoring throughout
- Ensure X-rays and blood results are attached to patient's notes

Potentially non-survivable burn injuries

- Decisions about end of life care for burn injured patients are only considered after patient has been assessed by 2 senior and experienced clinicians in consultation with the on-call consultant surgeon at the regional burns centre
- Clinical factors relevant to making these decisions include:
- size of the burn and %TBSA
- depth of the burn [partial thickness (PTB)/full thickness (FTB)]
- age of patient*
- any co-morbidities present
- wishes of patient and/or family/carers

*Age and %TBSA have been used as indicators of the likelihood of burn injury survival

ASSESSMENT AND TREATMENT OF BURN

Type of burning agent	Injury
Wet heat	• Scalds from hot water/drinks – usually superficial • Boiling water may cause full thickness loss • Steam (especially if superheated) or boiling fat will cause deeper burns
Dry heat	• Flame burns (e.g. from matches, cigarettes, iron, oven etc.), common but although deep are usually small • Burning clothing/petrol burns are commonly serious
Chemicals	**All chemical must be removed by copious lavage** • **Cement:** lime in cement causes severe alkaline burns when dry powder reacts with moisture on the skin • **Hydrofluoric acid:** copious lavage and application of calcium gluconate gel/injection of calcium gluconate into area • **Phenol:** if burn area large, absorption may occur to cause renal failure
Electrical burns	Degree of damage increases with higher voltages. Most domestic supply burns give a localised deep burn at point of entry but occasionally skin is relatively spared with major damage present to underlying structures

Depth of burn	Signs and symptoms
Erythema	Skin is red, painful but causes no skin loss and does not scar
Superficial partial thickness	Skin is red, painful, and tender with thin-walled blisters – heals quickly with little scarring
Deep partial thickness	Skin is whiter than superficial partial thickness with thicker walled blisters. Follicles may appear as red puncta. Painful. Heals with scarring and, if extensive, will need grafting
Full thickness	Hard, leathery and insensitive, white and waxy in appearance. Coagulated vessels may be noted. Burn may be relatively painless. Will require grafting

Treatment of specific burns

- General measures:
  - first aid – irrigate with cool tap water for 20 min to ensure intradermal cooling. Do not use ice/ice water. Avoid induction of hypothermia (maintain body temperature >36°C)
  - clean burns with soap and water to remove debris and loose skin

Type	Treatment
Major burns • Adults >15% TBSA • Children >10% TBSA	• Cover burn wounds in loose cling film before transfer • If transfer is going to be delayed, clean burn wounds then cover with a non-adherent soft silicone dressing (e.g. Atrauman®)
Deeper/more extensive burns (<10% TBSA)	• Request senior ED doctor review • Adult with burn ≥3% or child with burn ≥2%: discuss management with plastics team/local burns centre
Small superficial/ partial thickness burns (≤3% adult, ≤2% child TBSA)	• Request senior doctor review if unsure about burn depth • Where doubt regarding burn depth persists treat as deeper burn • Dress with a non-adherent soft silicone dressing (e.g. Atrauman®) and refer to CTS (next clinic)

Hand burns	• Discuss with plastics/burns centre:
	  - any full thickness burns
	  - any partial thickness burns involving the palmar skin
	• any large (>3 cm) areas of partial thickness burns or burns involving joints
	• Check with plastics team/burns centre regarding management and whether to use silver sulfadiazine 1% cream (Flamazine®) or alternative dressing
	  - if agreed, clean burn and cover with silver sulfadiazine 1% cream
	  - place hand in polythene bag/glove and tape at wrist
	  - encourage patient to mobilise hand within bag and keep limb elevated
	  - bag needs to be changed daily at CTS
	  - advise patient of degree of exudation and maceration that will occur

Hand burns Small areas (<3 cm)	• Dress with a non-adherent soft silicone dressing (e.g. Atrauman®) - review next available appointment in central treatment suite (CTS)
Facial burns	• Inspect lid margins for burns and perform fluorescein examination of eyes to identify corneal burns. Refer to ophthalmology immediately • **Superficial** burns (erythema only): exposure is best form of treatment (wound being cleaned and left open) • **Partial or full thickness** facial burns: refer to plastics/burns centre
Blister treatment	• Intact blisters act as a sterile dressing • Deroof blisters if large, tense, restricting movement or unable to adequately assess depth of the burn • Once deroofed, dress burn with a non-adherent soft silicone dressing (e.g. Atrauman®)

DIVING RELATED ILLNESS • 1/2

RECOGNITION AND ASSESSMENT

Consider in any patient who has been diving in the last 3 weeks. Remember common medical conditions when presented with an unwell diver – exacerbations of cardiorespiratory problems are common as in other forms of exertion and exposure to hostile/cold environments

A range of problems are possible in divers presenting acutely including:

- Decompressions sickness ("The Bends")
- Arterial gas embolism
- Barotrauma
- Nitrogen narcosis
- Oxygen toxicity
- Hypothermia
- Medical emergencies precipitated by exertion/diving

Decompressions sickness ("The Bends")

- Nitrogen collects in tissues as a result of breathing pressurised gas during diving. If allowed to expand before being reabsorbed (typically by ascending too quickly) it can form bubbles of nitrogen throughout the body producing symptoms ranging from musculoskeletal pain to life-threatening neurological compromise – see **Table 1**
- **Treatment:** 100% oxygen, IV fluids and consultation with DDRC Healthcare (01752 209999) to consider hyperbaric treatment

Table 1: Signs and symptoms of decompression sickness

DCS Type	Bubble location	Clinical manifestations
Musculoskeletal	Mostly large joints	• Localised deep pain: ranging from mild to excruciating, a dull ache but rarely a sharp pain • Pain aggravated by active and passive motion of the joint, may be reduced by bending joint to find a more comfortable positon • Pain occurring immediately on surfacing or many hours later
Cutaneous	Skin	• Itching, around ears, face, neck, arms and upper torso • Sensation of tiny insects crawling over the skin (formication) • Mottled or marbled skin or subcutaenous crepitation, around the shoulder, upper chest and abdomen, with itching • Skin swelling, accompanied by pitting oedema
Neurologic	Brain	• Altered sensation, paresthesia, hypersthesia • Confusion or amnesia • Visual abnormalities • Unexplained mood or behavioural changes • Siezures, unconsciousness
	Spinal cord	• Ascending weakness or paralysis in the legs • Grinding abdominal or chest pain • Urinary and fecal incontinence
Constitutional	Whole body	• Headache • Unexplained fatigue • Generalised malaise, poorly localised aches
Audiovestibular	Inner ear	• Loss of balance • Dizziness, vertigo, nausea, vomiting • Hearing loss
Pulmonary	Lungs	• Dry persistent cough • Burning chest pain under the sternum, aggravated by breathing • Shortness of breath

Arterial gas embolism

- Commonly results from barotrauma to the lungs caused by pressurised gasses (often precipitated by rapid ascent) leading to escape of gas mixtures into the arterial circulation – can be fatal
- **Treatment:** high flow oxygen and consultation with DDRC Healthcare

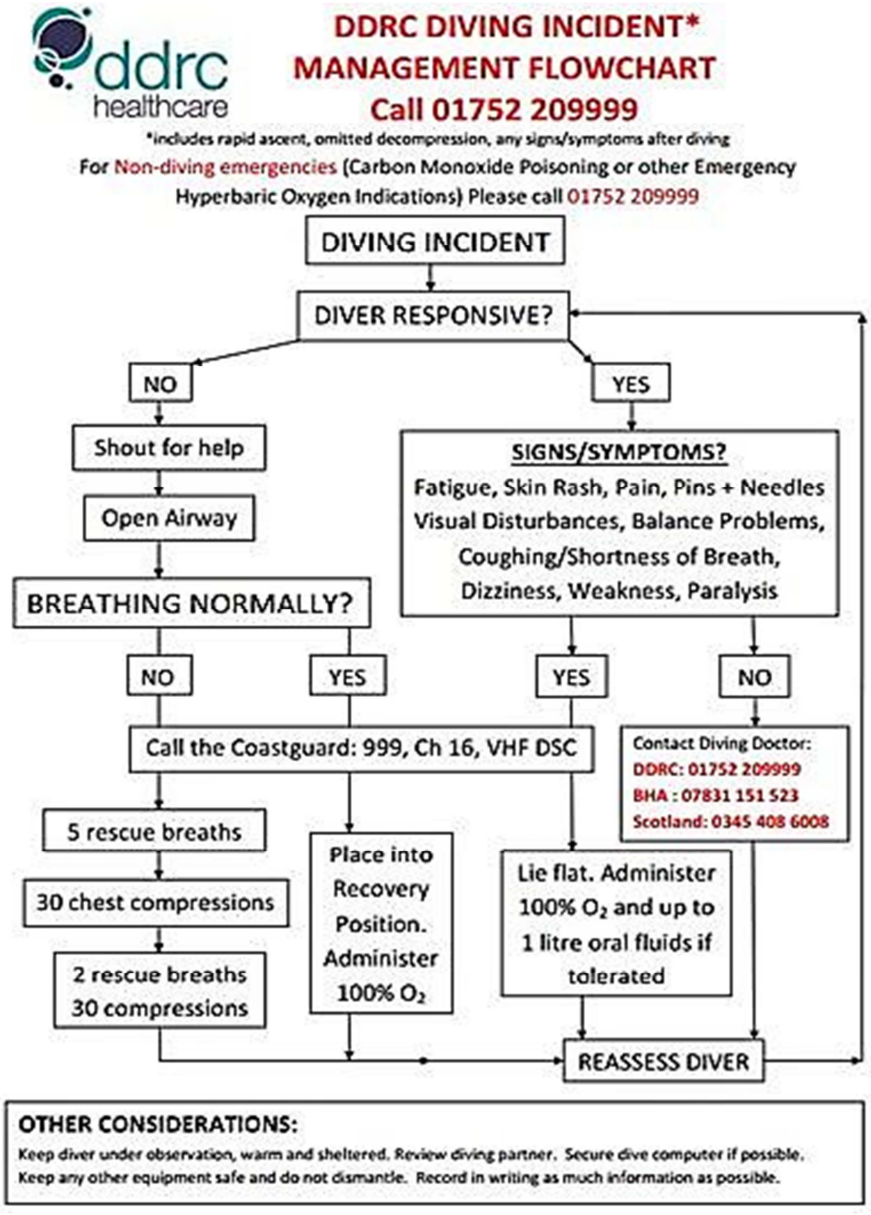
Table 2: Signs and symptoms of arterial gas embolism

• Loss of consciousness	• Stupor and confusion
• Pulmonary rales or wheezes	• Vision changes
• Haemotympanum	• Cardiac arrest
• Decreased reflexes	• Headache
• Extremity weakness or paralysis	• Unilateral motor changes
• Chest pain	• Change in gait or ataxia
• Irregular breathing or apnoea	• Conjunctivitis
• Vomiting	• Sluggishly reactive pupils
• Coma with/without convulsions	• Vertigo
• Haemoptysis	• Sensory loss

IMMEDIATE MANAGEMENT

DDRC Healthcare

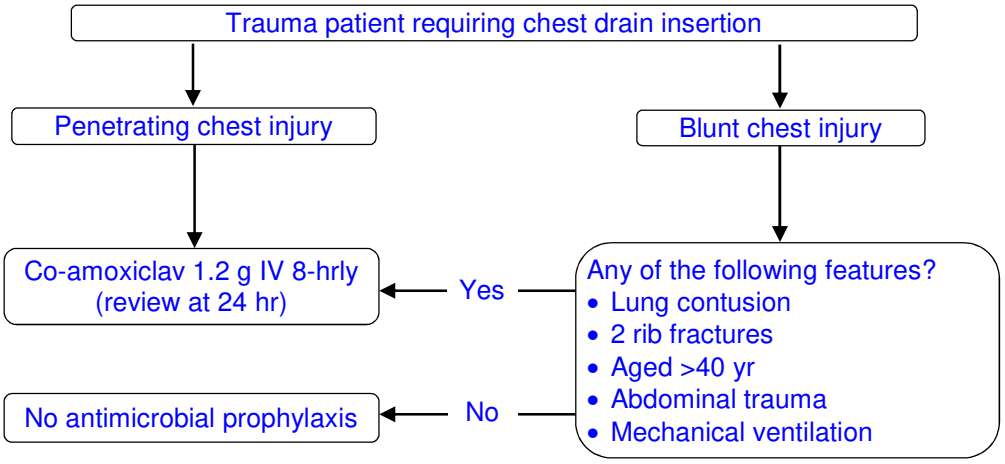
- 24 hr advice line for diving and hyperbaric emergencies – see **Flowchart**
- will require information about the dive (length, depth, gas breathed, time submerged and rate of ascent – often available from dive colleague/dive computer worn by diver) in addition to history (including number of recent dives and previous problems with dives) and examination findings



CHEST TRAUMA REQUIRING TUBE THORACOSTOMY INSERTION ● 1/1

- Consider IV antimicrobials for all patients with thoracic trauma requiring tube thoracostomy. The aim is to reduce complications e.g. empyema and pneumonia
- Pneumothorax, haemothorax or open pneumothorax requiring insertion of an intercostal drain may be associated with an increased risk of infective complications and require antimicrobial prophylaxis

Flow diagram



If confirmed history of penicillin allergy, discuss with microbiology

SUBSEQUENT MANAGEMENT

- Commence/continue antimicrobial therapy in the presence of any of the following:
  - suspected or confirmed intro-thoracic infection
  - mechanical ventilation
  - retained haemothorax
  - lung contusion
- If empyema suspected consult early with cardiothoracic surgeons

ACUTE HOT JOINT, SEPTIC ARTHRITIS AND GOUT ● 1/3

RECOGNITION AND ASSESSMENT

Symptoms and signs

- Acutely painful, swollen joint
- Warm, tender, swollen joint (+/- effusion)

Pyrexia may not be a feature of septic arthritis, especially in the elderly or immunocompromised, or in patients with diabetes, renal failure or rheumatoid arthritis

In patients with prosthetic joint and pyrexia of unknown origin (PUO) – consider prosthesis infection

Investigations

Immediate

- If knee joint swollen, aspirate for urgent synovial fluid analysis (polarised microscopy), Gram stain and culture – see **Knee aspiration** guideline
- contact on-call orthopaedic team (bleep) for urgent joint aspiration +/- arthroscopic washout and further management. For medical inpatients, also contact on-call rheumatology team (bleep)
- FBC
- U&E
- Microbiology:
- Gram stain and culture of synovial fluid
- blood cultures – see **Collection of blood culture specimens** guideline
- swab from any infected skin lesion
- if gonococci suspected, swab rectum, urethra and throat, and contact genitourinary medicine at Cobridge – 0300 7900 165

Within 24 hr

- ESR
- CRP
- Serum uric acid
- X-ray of affected joint

Differential diagnosis

- Septic arthritis
- Crystal arthritis, including gout
- Acute inflammatory arthritis (e.g. reactive arthritis or rheumatoid arthritis)
- Haemarthrosis

If patient has acute arthritis affecting more than one joint, discuss case with on-call rheumatologist (page via call centre)

IMMEDIATE TREATMENT

Supportive

- Adequate analgesia for joint pain: naproxen 500 mg single oral dose, then 250 mg oral 6-hrly (if not contraindicated) plus:
- step 1: paracetamol 1 g oral 6-hrly
- step 2: if paracetamol alone not adequate, add codeine phosphate 30–60 mg oral 6-hrly
- step 3: if codeine phosphate not adequate, substitute morphine sulphate solution 10 mg oral 4-hrly
- Refer to physiotherapists for ice pack and splint on joint
- Rehydrate – see **Maintenance fluid therapy** guideline
- If patient already taking low-dose corticosteroids, consider increasing to prednisolone 10 mg oral daily

Antimicrobial therapy

- Start as soon as joint aspirated. Review choice after Gram stain result
- Most common microbe causing septic arthritis is *Staphylococcus* spp (including MRSA), other causes include *Steptococcus* spp and Gram negative bacilli

Penicillin allergy should only be accepted as genuine hypersensitivity if convincing history of either rash within 72 hr of dose or anaphylactic reaction.
True penicillin allergy is rare and, in many infections, alternative antimicrobials are less effective with greater risks attached. If a patient reports penicillin allergy, it is imperative to establish, as far as possible, the nature of the reported allergy. In patients able to provide a history, the nature of the penicillin allergy must be recorded on admission.
If any doubt about whether patient is truly allergic to penicillin, seek advice from a microbiologist or consultant in infectious diseases

Type of patient	First line	Alternative (penicillin allergy)
Immunocompetent patient with no risk factors for atypical organisms AND **not** tagged for MRSA in iPortal	Flucloxacillin 2 g IV 6-hrly **plus** sodium fusidate tablets 500 mg oral 8-hrly	Vancomycin IV by infusion – see **Vancomycin** guideline **plus** sodium fusidate tablets 500 mg oral 8-hrly
Tagged for MRSA in iPortal	Vancomycin IV by infusion – see **Vancomycin** guideline **plus** sodium fusidate tablets 500 mg oral 8-hrly	
High risk of Gram-negative organisms (e.g. elderly, frail, recurrent UTI, recent abdominal surgery)	**Add** co-amoxiclav 1.2 g IV 8-hrly to above regimens	**Add** aztreonam 1 g IV 8-hrly to above regimens
Duration	At least 4–6 weeks total IV – continue for at least 2 weeks If good clinical response to IV therapy, CRP falling **and** good information on organism and its sensitivities after that time, switch to oral therapy. Contact consultant microbiologist if required **Do not stop treatment until symptoms (e.g. fever) and signs (e.g. joint effusion) resolve, and WBC and CRP return to normal**	

Check iPortal for IC alerts under patient alerts. If iPortal not available, check previous 12 months microbiology reports. If MRSA present treat as tagged for MRSA; if ESBL present treat as tagged for ESBL; if CARB present discuss with microbiologist for empirical treatment

If patient immunocompromised or has prosthesis, contact consultant in infectious diseases or consultant microbiologist for advice

- If gonococci isolated and strain sensitive:
- refer patient to genitourinary medicine
- ceftriaxone 1 g IV or IM daily or if anaphylaxis to penicillin, ciprofloxacin 500 mg oral 12-hrly for 7 days
- if strain resistant to ciprofloxacin, contact consultant microbiologist
- If severe sepsis present, refer to **Sepsis management** guideline and treat with appropriate IV antimicrobials

MONITORING TREATMENT

- Pulse, BP, temperature 4-hrly until patient stable
- While effusion persists, repeat culture of joint effusion daily (see below)
- WBC, ESR, CRP, U&E every 48 hr
- If using sodium fusidate or rifampicin, liver function tests weekly

SUBSEQUENT MANAGEMENT

Septic arthritis

- Supportive treatment, as above
- Refer to physiotherapists for passive exercise and rehabilitation
- Perform regular aspiration of the joint to dryness +/- arthroscopic lavage while a significant effusion persists
- If patient able to be managed at home and on IV antimicrobials, refer to outpatient antibiotic therapy service (bleep via call centre) for IV antimicrobials at home

Antimicrobial therapy

- Adjust antimicrobials once results of therapy and bacterial sensitivities available
- If no bacteria isolated, consider stopping antimicrobials – discuss with rheumatology team (page on-call rheumatology SpR or call Scotia ward 73617)
- If infection likely or proven, continue IV antimicrobials for at least 2 weeks. If good clinical response to IV therapy, CRP falling and good information on organism and its sensitivities after that time, switch to oral therapy. Contact consultant microbiologist if required
- Continue antimicrobials for 4–6 weeks total. Do not stop treatment until symptoms (e.g. fever) and signs (e.g. joint effusion) resolve, and WBC and CRP return to normal

Failure to respond to therapy

- Reconsider diagnosis
- Repeat cultures
- If no response within 48 hr, contact rheumatology team (page on-call rheumatology SpR or call Scotia ward 73617)

Confirmed gout

- Gout is confirmed by microscopic identification of urate (negatively birefringent) crystals in synovial fluid
- Rehydrate – see **Maintenance fluid therapy** guideline. Consider stopping diuretics
- Naproxen 750 mg single dose then 250 mg oral 8-hrly OR ibuprofen 400 mg 8-hrly (can be increased to maximum of 800 mg 8-hrly). If NSAID contraindicated, colchicine 500 microgram oral 6-hrly. Higher doses can be used but beware abdominal pain, vomiting or diarrhoea (maximum 6 mg per course – **do not repeat course within 3 days)**; see BNF for further guidance
- Systemic corticosteroids are effective in acute gout but use **only** under rheumatologist guidance

Do not start allopurinol in acute gout

- In difficult or resistant cases, contact rheumatology team (page on-call rheumatology SpR or call Scotia Ward 73617)

DISCHARGE AND FOLLOW-UP

- If patient already under follow-up because of arthritis, review existing follow-up arrangements
- Refer new cases to a consultant rheumatologist

ACUTE NON-TRAUMATIC SWOLLEN JOINT(S) ● 1/3

RECOGNITION AND ASSESSMENT

History

- Joint(s) affected
- Speed of onset
- Pain
- Swelling
- Ability to weight bear
- Previous similar episodes
- Systemic symptoms
- Recent illnesses e.g. sexually transmitted infection, diarrhoeal illness
- Past medical history of inflammatory bowel disease (IBD) or psoriasis
- Drug history of anticoagulant use
- Risk factors (see **Table**)

Table: Risk factors

Septic arthritis	Gout	Osteoarthritis
• Joint disease e.g. rheumatoid arthritis (RA), osteoarthritis (OA) • Joint prosthesis • Recent joint infection • IV drug user • Alcohol excess • Diabetes • Ulcerated skin • Low socio-economic status • Advanced age • Malignancy • Immuno-compromised patient • Sepsis: infection plus systemic manifestations – see **Sepsis management** guideline	• Male • Age >40 yr • Alcohol excess • Obesity • Family history • Renal insufficiency • Hypertension • Diuretic use • Previous episode	• Increasing age • Female sex (knee) • Family history • Previous joint injury • Joint alignment problems e.g. slipped upper femoral epiphysis (SUFE) • Obesity • Occupation e.g. athletes • White European ethnic origin

Examination

- Erythema
- Tenderness
- Warmth
- Effusion
- Range of movement (ROM)
- Small area of tenderness and swelling and pain in limited planes only suggests periarticular pathology, but whole joint affected suggests articular pathology
- Involvement of other joints
- General observations (e.g. temperature) and examination of other systems

Differential diagnosis

- See **Flowcharts 1** and **2**

ACUTE NON-TRAUMATIC SWOLLEN JOINT(S) ● 2/3

Flowchart 1: Differential diagnosis – single joint involved

Single joint involved

History of trauma or oral anticoagulant use?

- No → Non traumatic
- Yes → Consider haemarthrosis

Non traumatic:

- Articular (whole joint involvement) → Painful, swollen, tender, red joint, decreased ROM in all directions
- Periarticular (focal involvement)
  - Bursitis
  - Tendonitis

Consider septic arthritis if:

- Large joint involved
- Pyrexia (though not always)
- Difficulty weight bearing
- Rapid onset
- Risk factors – see **Table**

Consider gout if:

- 1st metatarsophalangeal joint
- Precipitating factor e.g. alcohol excess, intercurrent illness, surgery, starvation, trauma, drugs (aspirin, diuretics)
- Onset over 6–12 hr
- Malaise, low grade fever
- Risk factors – see **Table**

See **Acute hot joint, septic arthritis and gout** guideline

Flowchart 2: Differential diagnosis – multiple joints involved

Multiple joints

Seronegative arthropathies

- Ankylosing spondilitis:
  - chronic low back pain
  - men aged 15–30 yr
  - hip/shoulder/knee involvement
- Reiter's syndrome:
  - large joint reactive monoarthritis
  - triad with urethritis, conjunctivitis
  - following chlamydia or enteric bacterial infection
- Associated with pre-existing medical condition:
  - psoriasis
  - inflammatory bowel disease (IBD)

Pointers suggestive of OA:

- Onset over several days
- Knees, hips, hands, neck and lower back
- Reduced ROM
- Periarticular tenderness
- Absence of constitutional symptoms
- Risk factors for OA – see **Table**

Pointers suggestive of RA:

- Insidious onset
- Pain and swelling
- Stiffness, especially early morning
- Fatigue, fever and weight loss
- Symmetrical, distal small joint arthritis

Recent viral illness suggests reactive arthropathy?

Following can precipitate arthritis:

- Rubella
- Hep B
- Mumps
- EBV
- Enteroviruses

Differential diagnosis for polyarthropathy

- RA
- Ankylosing spondilitis
- Psoriatic arthritis
- Arthritis associated with IBD
- Viral
- Rheumatic fever
- Gonoccocal
- Gout

Investigations

Blood tests (supportive but not diagnostic)

- Blood cultures
- WCC, CRP and ESR. However, normality does not exclude septic arthirits and if clinical suspicion remains high, proceed to joint aspiration
- Serum urate is of no diagnostic value in suspected acute gout

Imaging

- Plain radiographs have a limited role in the absence of trauma but in suspected arthritis are useful as a baseline for assessing future joint damage
- If hip joint sepsis is suspected, USS guided aspiration of synovial fluid is recommended

Joint aspiration

- Discuss with senior ED clinician
- Indicated if suspected septic arthritis
- Send synovial fluid for Gram stain and cultures, and examination for crystals before starting antimicrobials
- If only 1st metatarsophalangeal joint(s) affected, diagnose gout without joint aspiration
- See **Acute hot joint, septic arthritis and gout** guideline

IMMEDIATE TREATMENT

- See **Acute hot joint, septic arthritis and gout** guideline

AVULSED TEETH ● 1/1

IMMEDIATE TREATMENT

First teeth 'milk'/'baby'

- Do not replace deciduous (milk) teeth if knocked out, as complications to permanent dentition may occur

Second teeth 'adult'

- Main aim is to re-implant tooth back into socket as soon as possible (within 60 min)
- if the tooth has been avulsed and kept dry for >60 min, successful re-implantation is unlikely (discuss with on-call maxillo-facial team)

How to re-implant

- Check tooth is clean
- if tooth is dirty, rinse tooth in cold water (10 sec) **DO NOT SCRUB**
- If tooth is clean, put it back into socket at triage (hold by the crown to avoid damage to delicate cells in root)
- make sure tooth is right way around
- push it gently into tooth socket
- Once relocated, ask patient to bite down on a paper-towel or similar until they are seen
- Refer to on-call maxillo-facial team

If you cannot put tooth back into socket

- Keep tooth moist to increase the chances of permanent recovery up to 24 hr after avulsion
- put tooth into cup of milk as soon as possible
- if milk unavailable place tooth in patients' mouth between cheek and gum
- Refer urgently to the on-call maxillo-facial team

DISCHARGE ADVICE

- Antimicrobial treatment in not necessary in most cases
- Consider only if any of the following occur:
- injury to multiple teeth
- contaminated tooth or soft tissues
- give:
  - aged >12 yr: Doxycycline 200 mg on day 1, then 100 mg daily for 6 days
  - aged <12 yr: Amoxicillin, refer to BNFc for doses and duration
- Soft diet for up to 2 weeks
- Brush teeth with a soft toothbrush after each meal
- Use a chlorhexidine gluconate (0.2%) mouthwash twice daily for 2 weeks

BACK PAIN (ADULTS) ● 1/2

DEFINITION

Adult patient with new onset back pain (within previous 3 weeks). Most acute back pain caused by simple musculoskeletal strain, but a minority of patients will have a serious underlying condition that may result in significant morbidity (e.g. cauda equina syndrome) or even death (e.g. aortic aneurysm)

ASSESSMENT

History

- Mechanism of injury (if any)
- Features of pain
- Presence of red flag symptoms: see **Flowchart**
- Associated symptoms: numbness, paraesthesia, bowel or bladder dysfunction

Mechanical back pain

- Usually affects low back, buttocks and thighs
- Mechanical pain (exacerbated by movement/posture)
- No neurological or sphincter involvement
- Patient systemically well

Examination

- Full examination of the musculoskeletal and peripheral nervous systems

Imaging

- Unless significant spinal trauma or pathological fracture suspected, plain X-ray not indicated
- In all those with findings suggestive of spinal cord compression or cauda equina syndrome, request MRI scan urgently and refer to orthopaedic team immediately

Blood tests

- Not routinely required unless serious underlying pathology suspected (e.g. multiple myeloma, discitis)

Differential diagnosis

- Discitis
- Intra-abdominal pathology (posterior abdominal wall structures – renal, pancreas, diverticulitis psoas abscess with Crohn's)

MANAGEMENT

See **Flowchart**

Mechanical back pain

Drugs

- Analgesia: regular paracetamol 1 g oral 6-hrly (max 4 g in 24 hr). If insufficient, add NSAID (ibuprofen 400 mg 8-hrly or naproxen 250 mg 6-hrly) and/or codeine 30–60 mg 6-hrly (choice depends on contraindications and side effects). Used in combination and taken regularly they can be highly effective
- If NSAID prescribed in a patient aged >45 yr age or at high risk of gastrointestinal bleed, prescribe omeprazole 20 mg or lansoprazole 30 mg (as per local policy) once daily for duration of NSAID use
- Muscle relaxant: diazepam 2 mg oral 8-hrly, use sparingly and for short periods only (2 days) to allow mobilisation. Ensure patient advised of potential side effects (e.g. drowsiness, not handling machinery or driving if affected)

Patient education

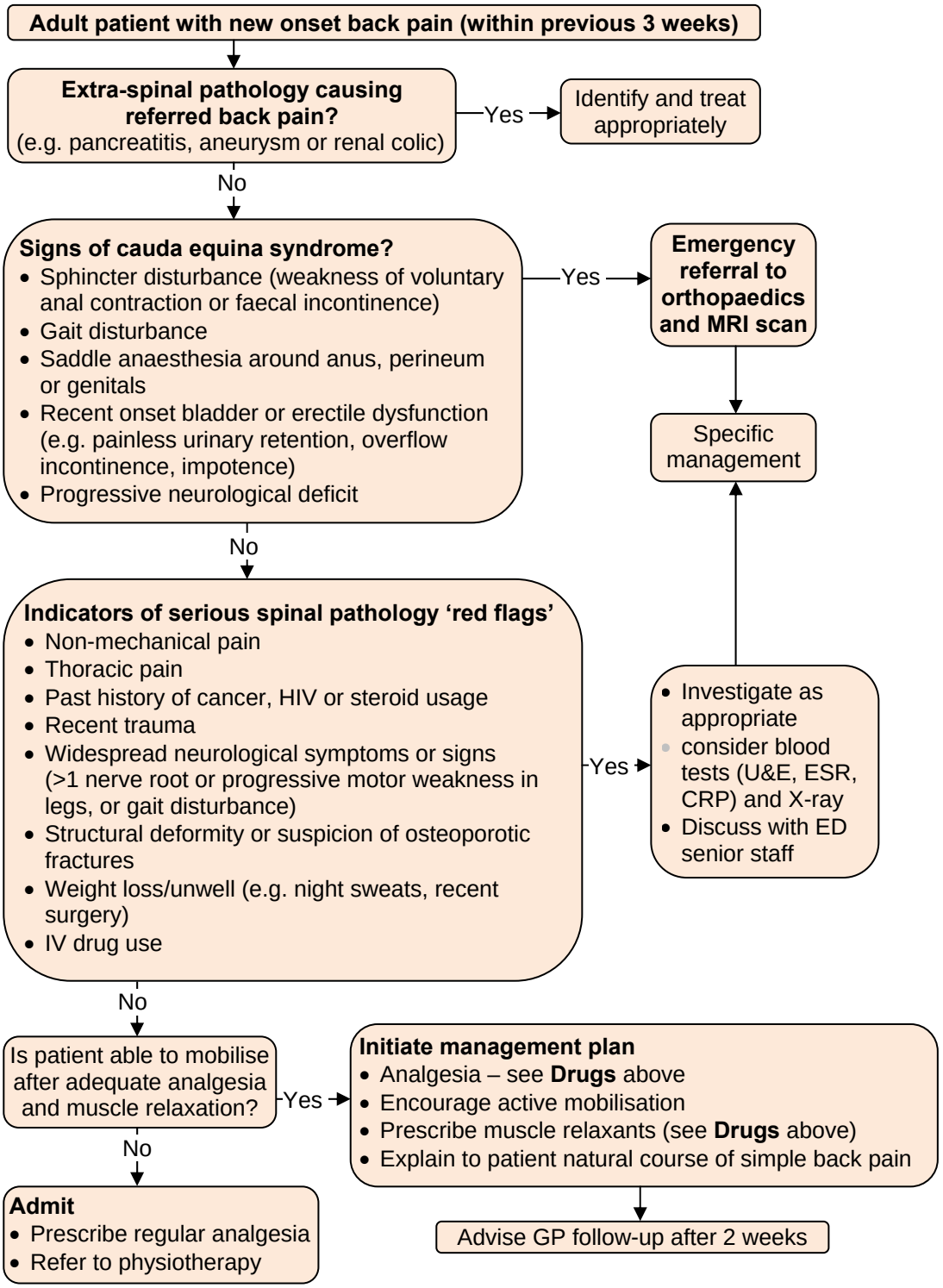
- Advise patient that most simple musculoskeletal back pain usually resolves within a 6 week period (with majority experiencing significant improvement by 2 weeks)
- encourage early active mobilisation. Bed rest is not beneficial and avoid if possible
- encourage regular use of analgesia
- Advise patients to seek help urgently if they experience new problems, leg weakness, unsteady gait, perineal sensory disturbance or problems with sphincter control

Failure to mobilise

- Admit the patient for regular analgesia and physiotherapy referral

BACK PAIN (ADULTS) ● 2/2

Flowchart



HIP FRACTURES (SUSPECTED) ● 1/2

BACKGROUND

- Common fracture
- Risk factors – osteoporosis (female, postmenopausal, steroid, old age)
- Incidental finding in patient presenting with collapse

FAST TRACK

From arrival in ED, ensure patients receive adequate analgesia and X-ray within 60 min, be admitted within 2 hr of arrival (within 1 hr of diagnosis) and if deemed fit, operated on within 24 hr

RECOGNITION AND ASSESSMENT

Symptoms and signs

- Hip/groin pain
- Knee pain
- Inability to mobilise
- Shortening and/or external rotation of affected limb

Assessment

- Clerk using **'Fractured neck of femur care pathway'.** This pathway provides guidance on investigations needed and facilitates 'fast track' admission to orthopaedic ward
- identify patients who require joint management from medical and orthopaedic teams or suffer from acute medical problems requiring admission to an non-orthopaedic ward
- Request imaging. Follow flowchart **Suspected hip fracture: imaging pathway**
- No fracture on X-ray: consider differential diagnosis and senior review

Investigations

- Request X-ray pelvis and hip
- If no X-ray evidence of fracture, but high clinical suspicion persists (e.g. due to persistent inability to mobilise), request a CT scan. If normal but concerns persist refer to orthopaedics as further imaging may be required
- For confirmed fractures or if clinically indicated:
- bloods: group and save, FBC, INR, U&E
- CXR
- ECG

Differential diagnosis

- Occult fractured neck of femur (NOF)
- Pubic ramus fracture
- Muscular strain
- Spinal fracture

Occult fractured neck of femur

- Usually undisplaced fracture
- Consider in patient with persistent inability to mobilise despite adequate analgesia. Follow suspected hip fracture pathway (**Occult hip fracture**) – available on share point drive or paper copies in the draws in ED

Pubic ramus fracture

- Usually unilateral affecting inferior or superior ramus: if bilateral or displaced discuss with ED senior
- Frequently, patient can't weight bear due to pain
- Treatment: adequate analgesia and graduated mobilisation
- Transfer to CDU for mobility assessment
- If safe for discharge or immediate care bed need, repeat Hb (venous gas acceptable), document lying and standing BP
- if Hb dropped or postural blood pressure drop – consider 'corona mortis'. Discuss with senior, may need CT pelvis to rule out pelvic haematoma
- Review in fracture clinic within 1 week
- If unable to mobilise, refer to frail elderly assessment unit

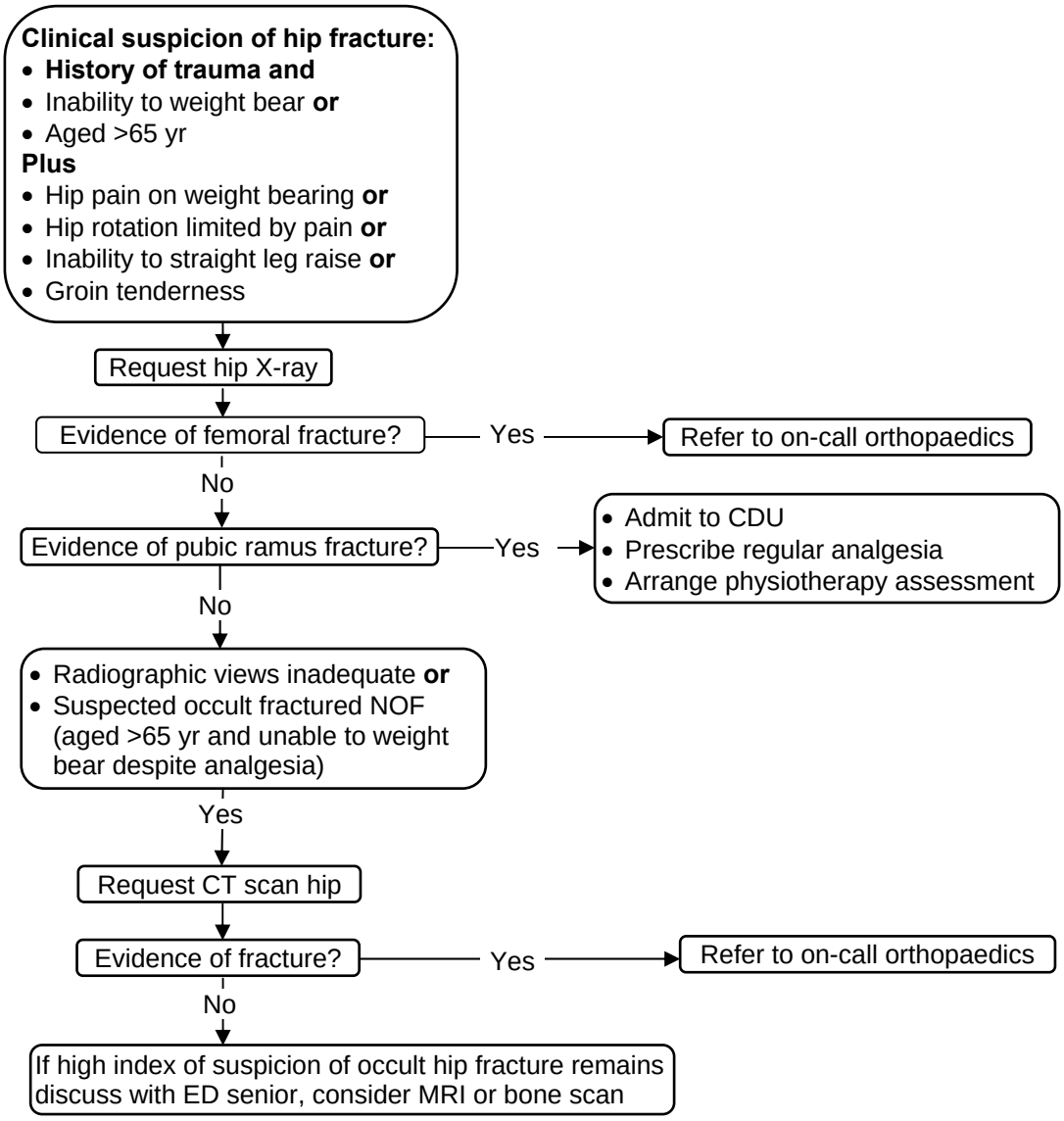
HIP FRACTURES (SUSPECTED) ● 2/2

IMMEDIATE MANAGEMENT

Some patients may also suffer from acute medical problems that may preclude admission to an orthopaedic ward. Assessing doctor to identify patients who require joint management from medical and orthopaedic teams

- Assess pain score
- Administer appropriate analgesia, see **Pain management** guideline
- Consider use of regional local anaesthesia (fascia iliaca block), see **Local anaesthetic and peripheral nerve blocks** guideline
- Admit to appropriate ward
- Patient may need mobility assessment. Consider social circumstances

Suspected hip fracture: imaging pathway



LIMB FRACTURES AND DISLOCATIONS ● 1/5

Refer all significantly displaced or open fractures urgently to on-call orthopaedic team

INDICATIONS FOR X-RAY

- Bony tenderness
- Swelling or bruising over a bone/joint (children often have little swelling or bruising)
- Loss of function
- Following manipulation or application of plaster of Paris

IMMEDIATE TREATMENT

- Ensure all patients receive adequate analgesia (see **Pain management** guideline) and splinting before performing X-rays
- If no fracture found, see **Limb soft tissue injuries** guideline

Antimicrobial cover

- Adult patients with open bone fractures (start as soon as possible and continue for 5 days total – IV plus oral, post-operatively):
  - first line: gentamicin IV (see **Gentamicin** guideline) **plus** co-amoxiclav 1.2 g IV 8-hrly for 2 days **then** co-amoxiclav 625 mg oral 8-hrly
  - if penicillin allergy: aztreonam 1 g IV 8-hrly **plus** vancomycin IV by infusion (see **Vancomycin** guideline) **plus** metronidazole 500 mg IV by infusion 8-hrly for 2 days **then** metronidazole 400 mg oral 8-hrly
- Children with open bone fractures: check BNFc for doses
- Open bone fractures are prone to tetanus infection, determine whether the patient requires a tetanus-containing vaccine +/- tetanus immunoglobulin – see **Tetanus prevention** guideline

SPECIFIC INJURIES

- Neck of femur fractures – see **Suspected hip fractures** guideline

Type of injury	Treatment and follow-up	Fracture clinic/referral options
SHOULDER		
Sternoclavicular dislocation (if suspected, request CT scan)	• Anterior: broad arm sling • Posterior: refer to orthopaedic team (beware of injury to airway + great vessels, emergency reduction may be required)	Wed/Fri clinic within 1 week
Acromio-clavicular joint subluxation/ dislocation (request weight-bearing X-ray)	• If displacement >clavicle diameter, dislocated: broad arm sling • Subluxed: broad arm sling	Fri am clinic within 1 week Refer to physiotherapy
Clavicle fracture	• Severe displacement or poor skin viability: broad arm sling • NV intact: broad arm sling	Refer to on-call orthopaedic team Wed/Thur/Fri clinic within 1 week

Shoulder dislocations
2 X-ray views necessary i.e. AP and apical oblique/axial
	Main types: Anterior, Posterior and Luxatio erecta
	• Anterior dislocation (+/- fracture greater tuberosity)
	  • if dislocation associated with fracture other than greater tuberosity refer to orthopaedic team; otherwise proceed to manipulative reduction
	  • check axillary and radial nerve function before and after reduction
	  • if greater tuberosity does not reduce satisfactorily, refer to orthopaedic team
	• Post procedure: collar and cuff
	• Posterior dislocation and Luxatio erecta: discuss with ED senior, manipulative reduction, collar and cuff
		Wed/Fri clinic within 1 week

Scapula (non-articular)	• Broad arm sling • high energy fracture, ensure no other injuries	Wed/Fri clinic within 1 week

LIMB FRACTURES AND DISLOCATIONS ● 2/5

Type of injury	Treatment and follow-up	Fracture clinic/referral options
HUMERUS		
Greater tuberosity	• Undisplaced: broad arm sling • Displaced: discuss with orthopaedic team	Wed/Fri clinic within 1 week
Neck	• Collar and cuff (under clothes)	Wed/Fri clinic within 1 week
Shaft	• Undisplaced/minimally displaced: apply sling/collar and cuff ◦ if severe pain or displacement, discuss with ED senior or orthopaedic team • Check for radial nerve palsy (drop wrist + sensory impairment dorsum of hand)	Within 1 week – any clinic
ELBOW		
Supracondylar fracture	• Check neurovascular function • Undisplaced: collar and cuff in >90° flexion (under clothes) • Displaced: refer to orthopaedic team	Within 1 week – any clinic
Medial epicondyle	• Not involving joint: broad arm sling • Involving joint: refer to orthopaedic team	Within 1 week – any clinic
Capitellum	• Undisplaced: broad arm sling	Within 1 week – any clinic
Dislocation	• Manipulative reduction into flexion ◦ if reduced: above elbow back slab ◦ if unable to reduce alert ED senior • Check X-ray (medial epicondyle may be in joint)	Next available fracture clinic
Olecranon	• Undisplaced: above elbow back slab • Displaced: refer to orthopaedic team	Within 1 week – any clinic
FOREARM		
Radial head/neck	• Undisplaced: broad arm sling • Displaced: refer to orthopaedic team	Within 1 week – any clinic
Radial	• Broad arm sling; next fracture clinic	
Isolated shaft of radius	• Undisplaced/greenstick: above elbow back slab • Displaced: refer to orthopaedic team • Beware fracture shaft radius with distal ulna dislocation (Galeazzi), ensure X-rays of full forearm are obtained	Within 1 week – any clinic
Isolated shaft of ulna	• Undisplaced/greenstick: above elbow back slab • Displaced: refer to orthopaedic team • Beware radial head dislocation with proximal ulna shaft fracture (Monteggia) ensure X-rays of full forearm are obtained	Within 1 week – any clinic
Radial and ulna shaft	• Discuss with ED senior • If displaced refer to orthopaedic team	
Distal radial fracture	• Smith's fracture: discuss with ED senior; reduce and apply above arm plaster of Paris in supinated position; sling • Barton's fracture: refer to orthopaedic team • Radial styloid fracture: Colles' plaster • Colles' fracture (adults only) ◦ displaced and requiring manipulation: discuss with ED senior; reduce and apply colles' plaster of Paris; sling ◦ undisplaced: back slab; sling • Children – undisplaced greenstick or distal radius fracture: below elbow back slab • Displaced and requiring manipulation; refer to orthopaedic team • Torus/buckle fracture: Torus splint, advice leaflet; discharge	Next available fracture clinic Next available fracture clinic Next available fracture clinic Next available fracture clinic

LIMB FRACTURES AND DISLOCATIONS ● 3/5

Type of injury	Treatment and follow-up	Fracture clinic/referral options
HAND INJURIES		
Scaphoid Resulting from fall on outstretched hand/ hyperextension	• May present with limited range of movement, tenderness in anatomical snuff box (ASB)/ scaphoid tubercle or on telescoping thumb • No signs on X-ray, suspected fracture: Gauntlet splint, advise elevation, rest and analgesia • Fracture: plaster of Paris scaphoid slab	Hand clinic in 10–14 days Next available hand clinic
Metacarpal Crush/contact injury, tenderness at base, shaft, or head	• No fracture: elevation/sling, analgesia, exercise ◦ if poor function consider referral to occupational therapy • Fracture of shaft/base/neck of index, middle, ring or little finger: check for angulation (>10°) or rotational deformity ◦ reduce if necessary, Bedford splint, plaster of Paris resting volar, elevation/sling ◦ if open/dislocated with associated carpometacarpal joint injury refer to on-call orthopaedic team • Fracture neck of little finger (Boxer's fracture) ◦ any rotation or significant angulation (>45^{o}): Bedford splint, elevation ◦ minimal angulation (<45°): Bedford splint, elevation, advice leaflet, discharge	Next hand clinic Next hand clinic
THUMB INJURIES		
Fracture/ dislocation Crush/contact injury/fall on outstretched hand/ hyperextension	• Fracture base metacarpal or dislocation carpometacarpal joint (Bennett's): discuss with on-call orthopaedic team • Fracture shaft or neck metacarpal, through metacarpophalangeal joint, or proximal phalanx: ◦ undisplaced: plaster of Paris thumb spica ◦ displaced: refer to on-call orthopaedic team • Metacarpophalangeal joint: if no fracture apparent, assess for collateral ligament integrity. If ulna collateral ligament intact with no evidence of sprain, advice, analgesia and discharge • Ulna collateral ligament injury – see **Limb soft tissue injuries** guideline • Fracture distal phalanx: mallet splint ◦ if subungual haematoma: trephine	Next available hand clinic Next available hand clinic
FINGER INJURIES		
Crush/contact/ hyperextension (tender over phalanges/ interphalangeal joints)	• Ungual (nail) dislocation: needs to be reduced • If nail bed/open injury refer to ED senior • No fracture: assess integrity of collateral ligaments, tendons and presence of subungual haematoma or nail dislocation ◦ neighbour strapping/Bedford splint (if required), advise elevation, analgesia and exercises. Discharge ◦ if subungual haematoma: trephine, advice and discharge • Metacarpophalangeal joint dislocation: relocate and refer to on-call orthopaedic team • Interphalangeal joint dislocation: relocate with analgesia, neighbour strapping • Fracture proximal or middle phalanges (including volar plate): Bedford splint • Fracture distal phalanges: mallet splint/firm dressing	Next available hand clinic Next available hand clinic Next available hand clinic

Type of injury	Treatment and follow-up	Fracture clinic/referral options
PELVIS AND LEG		
Pelvis	• Isolated fractures of pubic rami: if pain and circumstances allow, discharge home; examine for possible posterior pelvic injuries • if hypotensive or postural hypotension detected, request CT pelvis to exclude corona mortis • dipstick urine to exclude urethral injury • All other fractures: discuss with ED senior and refer to orthopaedic team	Next available fracture clinic
Sacrum	• Assess for nerve root involvement • Undisplaced: symptomatic treatment (analgesia, advise to mobilise) • Displaced or nerve root involvement: refer to orthopaedic team	Next available fracture clinic
Haemarthrosis of knee	• If suspected, perform X-ray of knee • Known coagulopathy – see **Bleeding disorders in adults** in **Medical** guidelines • Young people: discuss with on-call orthopaedic team • No fracture, stable, not locked: quadriceps exercises, crutches and analgesia • Tibial plateau: refer to on-call orthopaedic team • Tibial spine (undisplaced): plaster of Paris cylinder • Very tense and tender haemarthrosis may need aspirating	Refer to physiotherapy Next available fracture clinic
Lateral dislocation of patella	• Manipulative reduction if not already reduced • Immobilisation: cricket splint, (if unavailable, plaster of Paris cylinder or wool and crepe)	Within 1 week
Patella fracture	• Undisplaced with intact extensor mechanism: plaster of Paris cylinder • Unable to straight leg raise or displaced, refer to on-call orthopaedic team	Within 1 week
Tibial shaft	• Refer to orthopaedic team • for analgesia, use above knee back slab	
Fibular shaft	• Beware ankle diastasis, if absent treat symptomatically	Within 1 week
ANKLE AND FOOT		
Lateral malleolus	• Undisplaced: Below knee back slab; advise strict elevation • Displaced (talar shift): reduction, back slab and refer to on-call orthopaedic team • Small avulsion fractures; see **Limb soft tissue injuries** guideline	Within 1 week
Bimalleolar fracture	• Undisplaced (no talar shift): below knee back slab • Displaced (talar shift): reduction, back slab and refer to on-call orthopaedic team	Next available fracture clinic
Talus	• Undisplaced: below knee back slab • Displaced: refer to orthopaedic team	Next available fracture clinic
Calcaneus	• Exclude spinal/hip/knee fractures • Refer to orthopaedic team • Admit all for elevation	
Navicular and cuboid	• Undisplaced: below knee back slab; advise strict elevation • Displaced: refer to orthopaedic team	Next available fracture clinic

Type of injury	Treatment and follow-up	Fracture clinic/referral options
Metatarsals	• Undisplaced single MT – metatarsal boot or below knee back slab with toe platform if NWB, advise strict elevation • Undisplaced multiple MTs or single displaced MT – below knee backslab with toe platform, advised strict elevation • Grossly swollen foot or multiple displaced MTs – request lateral X-ray of foot to exclude Lisfranc injury (tarso-metatarsal dislocation). Refer Lisfranc injuries immediately to orthopaedic team **Base 5th metatarsal** • Symptomatic: if very swollen/painful, below knee back slab or metatarsal boot, otherwise analgesia	Within 1 week Within 2–3 days Within 2–3 days
Phalanges	• Unless hallux fracture, dislocation or foreign body suspected, avoid X-ray of single toe injury • Great toe: if intra-articular • Symptomatic only: discharge	Within 1 week

LIMB SOFT TISSUE INJURIES ● 1/5

Clear and accurate documentation of history, examination and diagnosis essential

HISTORY

- What was the **exact** mechanism of injury? If no definite history of trauma, look for other causes of limb pain
- Was there:
- immediate loss of function (e.g. unable to weight-bear in knee or ankle injury)
- immediate swelling
- anything atypical in history (e.g. "felt like I was kicked in back of ankle" – ruptured T. Achilles)
- previous injury or chronic instability of joint

EXAMINATION

Always compare sides before deciding there is no problem, especially in children

Look for

- Joint effusion
- Soft tissue swelling
- Bruising, inflammation
- Ability to weight-bear

Feel for

- Crepitus
- Bony tenderness
- Ligamentous tenderness
- Joint line tenderness
- Joint stability

Movement

- Active
- Passive

INVESTIGATIONS

- X-ray specific area (e.g. if patient has a finger injury, request finger view – centred on finger and including a true lateral with other fingers held out of way as far as possible)
- a hand view will be centred on metacarpals and is inadequate for assessing finger injury
- Examine X-ray – important incidental findings can become apparent on X-rays requested for trauma
- If fracture found, see **Limb fractures and dislocations** guideline

TREATMENT

General principles

- Rest, ice, elevation
- Early movement beneficial in most cases
- Advice on self-physiotherapy (**important – use specific advice sheets where appropriate**)
- Advice on prognosis (2–4 weeks in most injuries, as opposed to a few days)
- Clear follow-up arrangements either with GP or physiotherapy referral
- Analgesic support. If not contraindicated, NSAIDs +/- paracetamol
- NSAIDs are contraindicated in patients with large muscle haematoma
- Compression supports – wool and crepe bandages, and rigid supports such as a Futuro splint (for wrist) or plaster of Paris
- Tubigrip can be useful in calf muscle strains, but not for use as a physical support in joint injuries

Referral to physiotherapy

- **Do not** refer patients with chronic conditions/injuries without discussion with ED senior
- Give physiotherapy information on mechanism of injury, primary or differential diagnosis, and any significant history/concurrent conditions

SPECIFIC INJURIES

Clinical features	Imaging
ANKLE AND FOOT INJURIES	
• Most ankle injuries affect **lateral** ligamentous complex. Anterior talo-fibular ligament (ATFL) tears first (most ankle sprains), followed by calcaneo-fibular ligament and finally posterior talo-fibular ligament • Complete examination must include: ◦ proximal fibula ◦ tendo-Achilles ◦ ankle ◦ heel and foot (especially base of 5th metatarsal in inversion injuries) • If painful 5th metatarsal, X-ray foot (fractures run at right angles to shaft of 5th metatarsal and epiphyses run parallel) • If pain on postero-lateral aspect of ankle only with no history of inversion, consider **tendo-Achilles rupture** • If history of fall from height, landing on feet, consider **calcaneal fracture**. If calcaneal fracture identified, examine patient's back • Avulsion fracture of medial or lateral malleolus implies significant ligamentous injury and will require physiotherapy • Advise rest, ice and elevation and encourage patient to mobilise if possible. May require immobilisation if pain very severe ◦ give patient prognostic timescale of 4–8 weeks • In patients presenting with spontaneous onset of heel pain, especially if obese, with valgoid feet or pes cavus, consider plantar fasciitis	**Ottawa ankle rules** • X-ray required following inversion injury only if pain in malleolar or midfoot area, and **any one** of following: ◦ bony tenderness – along distal 6 cm of posterior edge of tibia or tip of medial malleolus – along distal 6 cm of posterior edge of fibula or tip of lateral malleolus – at base of fifth metatarsal (foot injuries) – at navicular bone (foot injuries) ◦ inability to weight bear both immediately and in emergency department for 4 steps • These imaging rules apply to patients aged 18–55 only and have not been validated in some groups i.e. pregnant patients, those with existing bone problems and those with diminished ability to follow test (e.g. head injury or intoxication)
KNEE INJURIES	
• 90% of diagnoses can be gained from history • Twisting mechanism suggests meniscal injury. Mixed forces may cause a combination of injuries • Valgus/varus strains cause collateral ligament injury • Anterior cruciate ligament (ACL) rupture occur with AP deceleration mechanisms (75% of patients with an acute haemarthrosis have ACL rupture) • Assess extensor mechanism of knee to exclude patella tendon/quads ruptures • Self-physiotherapy, especially quadriceps exercises (give advice on exercises, use knee injury advice sheets), is an essential component in rehabilitation of knee injuries • Refer all patients with truly locked knees, complete ligament injury (Grade 3) or tense haemarthroses to orthopaedic team • Refer all patients with likelihood of significant knee injury for physiotherapy	**Ottawa knee rules** • X-ray only required for adult knee injuries with **any one** of following: ◦ aged ≥55 yr ◦ isolated tenderness of the patella (no other bone tenderness) ◦ tenderness at head of the fibula ◦ inability to flex to 90° ◦ inability to weight bear both immediately and in emergency department (4 steps – unable to transfer weight twice onto each lower limb regardless of limping)
HIP INJURIES	
• Beware children with vague hip and/or knee pain, possibly related to trauma – see **Limping child** guideline ◦ take a full history ◦ examine joints thoroughly (test hip extension) ◦ perform systemic examination looking for anaemia, lymphadenopathy, rashes, bruising, hepatosplenomegaly, abnormal neurology • If no evidence of fracture and still unable to mobilise, request physiotherapy mobility assessment and ED senior review	• Elderly patients with hip pain following a fall **must** have an X-ray to exclude fractured neck of femur or fracture of pubic rami

Clinical features	Imaging
SHOULDER INJURIES X-ray shoulder – if X-ray reveals no apparent bony injury or dislocation, consider:	
Posterior dislocation • History and examination should alert to possibility of this diagnosis • beware the epileptic who complains of a painful shoulder and reduced range of movement after a seizure	• X-ray may appear normal at first glance but head of the humerus will show typical 'light-bulb' appearance • axillary or axial view to confirm dislocation (can be difficult to obtain in true dislocations)
Acromio-clavicular joint (ACJ) • Point tenderness over AC joint suggests damage • **Grade 1 injuries**: no radiological abnormality (on weight-bearing views) and suggest sprain to AC ligament • treat with broad arm sling, analgesia and advise early mobilisation, GP follow-up in one week • **Grade 2 injuries**: subluxation at AC joint on weight-bearing views consistent with a rupture of AC ligament • treat with broad arm sling, analgesia and refer to physiotherapy • **Grade 3 injuries**: marked displacements of end of clavicle, suggests major disruption of coracoclavicular ligaments as well • treat with broad arm sling, analgesia, and refer to fracture clinic	• Request weight-bearing X-ray
Rotator cuff injury (supraspinatus, infraspinatus, subscapularis, and teres minor) • Common cause of shoulder pain and frequently misdiagnosed. • Represent a spectrum of disease, ranging from acute reversible tendonitis to tears involving supraspinatus, infraspinatus, and subscapularis • Consider in patients whom you have excluded bony injury, dislocation and ACJ injury who have difficulty abducting or rotating their shoulder • Tenderness often localised to greater tuberosity and subacromial bursa • Assess function: • anterior cuff (subscapularis) – lifting hand away from back against resistance • posterior cuff (infraspinatus, teres minor) – position arm in 90° of forward flexion with elbow flexed to 90°, test external rotation • supraspinatus – test resistance with arm elevated and extend elbow fully [position arm in abduction (in scapula plane) with shoulder in full internal rotation (thumbs down position)] • Refer complete ruptures (unable to maintain any shoulder abduction) to fracture clinic within 1 week even complete disruptions in elderly patients may benefit from reconstruction • Refer partial ruptures to physiotherapy	• A high-riding humeral head on AP X-ray will confirm diagnosis in minority of cases
Tendonitis • Acute pain and history of minimal/no trauma may be supraspinatus or biceps tendonitis • Tenderness often localised to subacromial bursa or bicepital groove • Pain on shoulder abduction (supraspinatus or biceps) or resisted elbow flexion (biceps) occurs • Treat with non-steroidals and physiotherapy • most episodes resolve within 2 weeks	• If X-ray reveals calcification present, refer to fracture clinic

Clinical features	Imaging
Frozen shoulder syndrome (adhesive capsilitis) • Progressive pain and loss of shoulder motion (active and passive) • external rotation typically most severely affected • Where stiff shoulder established, refer to physiotherapy • Refer diabetics to fracture clinic	
BICEPS RUPTURE	
Proximal (long head) • Typically occur in the elderly following relatively minor trauma. Bulging of biceps muscle 'Popeye appearance' is noted on resisted elbow flexion • Treat with NSAIDs and/or simple analgesia **Distal** • Acute avulsions – result of forceful extension of the elbow from a flexed and supinated position • Refer to on-call orthopaedic team	
ELBOW INJURIES	
• In patients with no bony injury, who have a significant haemarthrosis (positive fat pad or sail sign), and limited movement: treat with collar and cuff, appropriate analgesia and refer to physiotherapy	
WRIST INFLAMMATION	
• If history suggestive of significant trauma (e.g. fall onto outstretched hand), exclude bony injury • If joint hot and swollen, consider sepsis or crystal arthritis (see **Acute non-traumatic swollen joint(s)** guideline) • In cases of minimal or no trauma, especially with a repetitive component, consider tenosynovitis: • swollen, hot, tender area on dorso-lateral aspect of wrist/forearm • presence of crepitus implies a hyper-acute presentation • signs may be minimal when chronic • Treatment • hyper-acute: NSAIDs, Futuro splint support. If not settling in 10–14 days, advise to see GP • chronic: NSAIDs and GP follow-up	
WRIST/HAND/FINGER LACERATIONS	
• Apparently minor wounds to the wrist, hand or digits may result in significant injuries to underlying tendons and neurovascular structures. Early detection is vital to avoid long-term disability • Explore all wounds using good light and analgesia **Refer to orthopaedics** • If sensation altered distal to wound, for exclusion of nerve injury • If tendon injury suspected (functional deficit or tendon/digital nerve visible on wound exploration) • **Punch/bite** injuries: Refer all lacerations over MCP joints • **Hand/finger tendon sheath infections** • **Ungual dislocation**: if nail bed/open injury, needs to be reduced, refer to ED senior or on-call orthopaedic team **No functional/clinical deficit** • Appropriate closure/dressing, give advice sheet, refer to GP/practice nurse for follow-up	• If suspected foreign body/fracture perform X-ray

LIMB SOFT TISSUE INJURIES ● 5/5

Clinical features	Imaging
THUMB INJURIES – Crush/contact injury/fall on outstretched hand/hyperextension	
Interphalangeal joint injury • Tendon injury: mallet splint, next hand clinic within 1 week • Subungual haematoma: trephine, dressing, advice and discharge	
Metacarpophalangeal joint injury • Ulnar collateral ligament injury suspected: thumb plaster of Paris slab, advice, next hand clinic within 1 week • Carpometacarpal ligament injury: advice and discharge • **Ulna collateral ligament** (UCL) injuries of metacarpal phalangeal joint may be the result of a fall onto an abducted thumb. Failure to detect UCL rupture results in joint instability • on examination, swelling and tenderness over the UCL, pain +/or laxity on abducting the MCP joint • treatment – thumb plaster of Paris slab, advice, next hand clinic within 1 week	
FINGER INJURIES	
Mallet finger • Avulsion of extensor tendon from distal phalanx resulting in a flexion deformity • Treat with Mallet splint, next hand clinic	• X-ray joint to exclude bone involvement
Subungual haematoma • Trephine, dressing, advice	

WOUND MANAGEMENT ● 1/3

Careful, competent and confident management of wounds could have a life-long effect on the patient; remember they will carry the scar (and story behind it) for life

RECOGNITION AND ASSESSMENT

A clear accurate history and cause of injury is essential to aid examination and management

Type	Appearance	Possible cause
Abrasion	Friction of skin rubbed against harder/rougher surface, tangential shear	Cyclist on gravel, children's knees
Amputation	Complete/partial severing of tissue	Finger tips in door hinges, circular saw injury
Avulsion	Skin removed from underlying tissue attachments by friction	Fingernails caught in machinery
Burns	Blisters, erythema or necrotic damage caused by chemical, electrical, thermal or radiation sources	Scalds with kettles, battery acid splashes, electrocution, ultraviolet light – arc eye
Contusion	Crush injury with bruising (bleeding into skin from damaged vessels), often with laceration	Blunt object, punch blows
Degloving	Skin rolled off bone	Trapped limb between printing rollers
Incision	Clean cut	Surgical wound, Stanley knife, glass
Laceration	Irregular breach of skin	Tear with barbed wire/nail, body being hit/hitting – punch (i.e. blunt injury)
Penetration	Deeper aspect of wound bigger than surface suggests	Stab wound, gunshot
Puncture	Wound surface area suggests depth, often ragged edges	Animal bites, trodden on nail

- Severed nerves and tendons must be excluded even in apparently minor/superficial wounds
- Examine all wounds carefully – remember anatomy
- Examine hand and also examine it in the position it lay in when injury occurred
- Wounds in the knuckles are human bites until proven otherwise. Do not ignore in punch injuries

IMMEDIATE TREATMENT

All wounds that have been sustained on smashed glass or ceramic must have X-ray to check for retained foreign body (FB), ensure surface FBs removed before imaging

Before X-raying for foreign bodies/fractures, ensure pain relief has been provided and that wound is covered/elevated where necessary

- **Check patient's tetanus immune status** – see **Tetanus prevention** guideline
- Ensure patient comfortable and has had procedure explained and been reassured
- All wounds, except those which are less than 1.5 cm and where patient prefers, will be anaesthetised using lidocaine 1% (or 50:50 mix with levobupivacaine to lengthen period of effectiveness)
- Irrigate all wounds thoroughly – under a running tap or using sodium chloride 0.9% with a syringe and green needle (patient may need local anaesthetic)
- Remove fibrin, haematoma and all debris
- Debride all devitalized tissue, consider need to trim wound edges where appropriate
- Explore the wound to exclude involvement of deeper structures. If any doubt regarding deeper structures refer to ED senior

Type of injury	Treatment
Amputations	• Wrap amputated part in moist saline swabs. Place in a sealed plastic bag surrounded by ice • Refer to orthopaedics if digit/limb or ENT/plastics if ear, nose etc.
Animal and human bites	• Most bite wounds are crush injuries, rule out bony injury and tooth foreign body where appropriate • irrigate wound thoroughly • do not suture bite wounds – if there will be a resulting cosmetic problem (e.g. facial bites), refer to ED senior • For human and deep animal bites give • **adult**: co-amoxiclav 625 mg oral 8-hrly **or** if penicillin allergy, ciprofloxacin 500 mg oral 12-hrly **plus** metronidazole 400 mg oral 8-hrly; for 5 days • **children:** refer to children's BNFC
Penetrating/puncture wound	• Puncture wounds may appear superficial but can be far deeper and heavily contaminated and may need exploration under anaesthetic • Check for foreign bodies • Consider steri-strip®/stitch depending on depth and seepage • Consider need for antimicrobials
Pretibial flaps	• Injury dimension >2 cm and complete loss of skin flap or doubtful viability of flap – discuss with ED senior • Check blood supply to flap and ensure no haematomas under flap; oppose wound edges – steri-strip® if this can be done without tension on the flap • if injury unsuitable for steri-strip® closure, lay flap down as far as possible and dress with Atrauman®. Do not attempt to pull flap to achieve opposition of wound edges • if deep, consider catgut sutures to subcutaneous layer for support • Encourage high elevation of limb for 10–14 days
Superficial degloving injuries	• **Small:** check blood supply to flap and ensure no haematomas under flap • oppose wound edges, check for skin loss • steri-strip®, consider catgut support if deep, consider Atrauman® if any skin loss • dress with gauze and cotton bandage/Mefix® • **Large:** analgesia, refer to plastics or orthopaedics as appropriate
Lips and mucous membrane	• **Large:** refer to maxillofacial or plastics • **Smaller:** if orbicularis oris intact, carefully align vermilion and suture • **Small:** clean and leave to heal with no intervention • **Teeth:** remove fragments from lips to prevent sepsis
Ophthalmic injuries	• Large lacerations to lids or lacerations involving lachrymal apparatus – refer to ophthalmic team
Ear injures	• If involving pinnal cartilage – refer ENT

Primary wound closure

- Superficial, dry wounds, away from joints, areas of moisture or hair growth: use steri-strip®
- care must be taken not to put underlying tissues under tension, especially in flap lacerations. Advise patient to keep dry and leave *in situ* 7–10 days and remove carefully or soak off
- Superficial, small, dry wounds with no tension (especially in children and cosmetically important areas) use tissue adhesive
- unsuitable for flap lacerations or any situation where tissue adhesive may enter wound
- tissue adhesive will act as a scab and does not need formal removal
- advise to keep wound dry for 7 days
- Wounds not suitable for steri-strip®/tissue adhesive – use sutures:
- 6'0 for face
- 5'0 for hands/digits
- 4'0 for upper limbs
- 3'0 for lower limbs

SUBSEQUENT MANAGEMENT

Antimicrobials do not prevent infection. Adequate wound toilet and debridement does

Removal of sutures	
Scalp	7 days for small wounds 10 days for large, deep wounds
Face	5 days (advise scar support with steri-strip® post-removal)
Upper limb	10 days
Lower limb	10 days (14 days when over joints)
Trunk	10 days (14 days when on extensor surfaces)

DISCHARGE AND FOLLOW-UP

- Significant pretibial flap wounds – follow-up in central treatment suite (CTS), next available appointment
- Other pretibial flap wounds – GP/district nurse follow-up within 3–7 days to check blood supply to flap
- Injuries to lips and oral mucous membrane – give discharge advice regarding oral and dental hygiene (warm salt water mouthwash after meals and gentle daily cleaning of dentition)
- Superficial degloving injuries – follow-up in CTS within 3 days to check flap; or if hand injury, refer to hand clinic

All doses are for adults unless stated. For children please refer to children's BNFC

Condition	Clinical features	Management
Acute sensory neural hearing loss (SNHL) Otological emergency	• Acute hearing loss, tinnitus with or without vertigo • Tuning fork tests suggest SNHL and ear drums normal **Cause** • Viral, vascular and traumatic in origin • Majority are idiopathic	• Refer immediately to on-call ENT for investigation and treatment (consideration of intratympanic steroids) **Investigations** • FBC,U&E, ESR
Acute conductive hearing loss	• Acute hearing loss • Tinnitus with/without vertigo • Outer/middle ear pathology usually visible **Cause** • Wax impaction, otitis externa • Glue ear, otitis media • Tympanic membrane (TM) perforation • Ossicular discontinuity following trauma	• Request ENT outpatient clinic for investigation and treatment
Acute facial palsy	• Determine if upper motor neurone (UMN) (forehead spared) or lower motor neurone (LMN) (complete half of face does not move) • Examine ears, neck, oropharynx and CNS • Check for vesicles in pinna, tympanic membrane or palate (herpes zoster) **Causes** **UMN** • CVA, cerebral tumour, polio **LMN** • Bell's palsy (idiopathic), Ramsay Hunt syndrome, acute or chronic otitis media, skull base fracture, post-operative, neck, middle ear or cerebello-pontine angle tumour	**UMN facial palsy** • Request CT brain scan • Refer to stroke team/neurology **LMN facial palsy** • Advise patient re eye care. Use hypromellose 0.3% eye drops, 1 drop into affected eye as required, at night use a lubricating ointment (e.g. Lacri-Lube®) and tape affected eye closed • If Bells palsy (idiopathic) suspected and presentation within 72 hr of onset, start prednisolone 60 mg oral daily for 5 days followed by a daily reduction in dose of 10 mg (for a total treatment time of 10 days) if a reducing dose is preferred; GP follow-up • If infective, tumour or traumatic origin suspected, refer to on-call ENT
Acute otitis externa	• Painful discharging ear – red oedematous external canal with mucopus and squamous debris • Ear drum normal, no mastoid tenderness	• Swab for C&S, microscopy • Topical compound anti-inflammatory with antimicrobial ear drops (e.g. Gentisone® HC or Sofradex®) 2 drops into affected ear(s) 8-hrly for 7 days • Analgesia – see **Pain management** guideline • Advise to avoid water (immersion of ears) • GP follow-up unless: ◦ ear canal filled with debris or pus – request ENT outpatient clinic for microsuction ◦ if severe (pyrexia, facial cellulitis), refer to on-call ENT for admission
Localised otitis externa (furunculosis)	• Associated with infection of hair follicle	• Flucloxacillin 500 mg oral 6-hrly or clarithromycin 500 mg oral 12-hrly for 5 days

Condition	Clinical features	Management
Acute otitis media (AOM)	• Acute earache and hearing loss • Ear discharge if tymphanic membrane (TM) perforated • Red and bulging TM • Pyrexia	• Analgesia plus antipyretic: paracetamol 1 g oral 6-hrly • Antimicrobials have little proven benefit • Consider oral antimicrobials in the following: ◦ bilateral infection (especially if aged <2 yr) ◦ AOM with ottorrhea ◦ systemic symptoms, including fever (>38.5°C) or vomiting ◦ local signs of severe infection e.g. bulging or inflamed tympanic membrane • Amoxicillin 500 mg oral 8-hrly; **or** if penicillin allergy, clarithromycin 500 mg oral 12-hrly; for 5 days • Advise GP follow-up • If VII nerve palsy, refer to on-call ENT
Acute tympanic perforation	• Acute hearing loss and bloody otorrhoea (trauma) • Acute earache followed by bloody otorrhoea, hearing loss and sudden relief of pain (acute otitis media) • Perforation visible with or without infection	• Advise avoid water (immersion of ears) • Swab for C&S, microscopy • If not infected, do not give antimicrobials • If infected – prescribe topical compound anti-inflammatory with antimicrobial ear drops (e.g. Gentisone® HC or Sofradex® 2 drops into affected ear(s) 8-hrly for 10 days **plus** (if severe) co-amoxiclav 625 mg oral 8-hrly; **or** if penicillin allergy, clarithromycin 500 mg oral 12-hrly; for 5 days) • Review antimicrobials with C&S results: GP to follow up
Acute mastoiditis	• Painful discharging ear, hearing loss • Systemically unwell, not eating or sleeping • Pyrexial, looks 'toxic' • Red tender swelling behind ear, protruding ear, canal filled with pus, ear drum sometimes abnormal or perforated • Check for intracranial complications	• Refer immediately to on-call ENT • FBC, blood cultures and swab for C&S, microscopy • IV access • Co-amoxiclav 1.2 g IV 8-hrly; **or** if penicillin allergy, clarithromycin 500 mg IV by infusion 12-hrly **plus** metronidazole 500 mg IV by infusion 8-hrly • Review antimicrobials once sensitivities available • IV should be converted to oral as soon as clinical improvement occurs and temperature has been normal for 24 hr, providing no contraindication to oral therapy • Duration of treatment 10–14 days total (including IV treatment) • Analgesia, see **Pain management** guideline • Nil-by-mouth

Condition	Clinical features	Management
Discharging mastoid cavity	• Painful discharging ear • Mastoid cavity filled with mucopus and debris • Look for neurological signs: meningism, headaches, localising signs, VII, VIII, IX nerves affected	• Swab for C&S, microscopy **Mild** • Topical compound anti-inflammatory with antimicrobial ear drops (Gentisone® HC **or** if TM is perforated prescribe Sofradex® 2 drops into affected ear(s) 8-hrly for 7 days) • Discuss with on-call ENT regarding outpatient clinic **Severe or neurological signs** • **Refer to on-call ENT** • **IV access** • FBC, U&E, glucose, blood cultures • Co-amoxiclav 1.2 g IV 8-hrly; **or** if penicillin allergy, clarithromycin 500 mg IV by infusion 12-hrly **plus** metronidazole 500 mg IV by infusion 8-hrly • Review antimicrobials once sensitivities available • IV should be converted to oral as soon as clinical improvement occurs and temperature has been normal for 24 hr, providing no contraindication to oral therapy • Duration of treatment 10–14 days total (including IV treatment)
Foreign body (FB) in ear	• Examine ear thoroughly to assess if any underlying TM damage • Ensure no FB in other ear or nose • If present for some time, look for infection	• Corrosive material (e.g. battery), refer to on-call ENT to remove **immediately** • If no TM perforation and FB not vegetable matter – attempt syringing ear with water at body temperature • If insect, insert olive oil to drown it • If patient uncooperative, discuss with on-call ENT and request outpatient review • If infected, start topical anti-inflammatory with antimicrobial ear drops (Sofradex® 2 drops into affected ear(s) 8-hrly for 7 days)
Auricular haematoma	• Acute painful swelling of pinna following trauma	• Refer to on-call ENT for evacuation of haematoma **Complication** • Perichondritis (viral and bacterial)

Condition	Clinical features	Management
Acute vertigo	• Consider non-ENT origin if horizontal nystagmus absent or history of loss of consciousness • TM's normal except some traumatic cases • **Ménière's syndrome:** episodic vertigo, nausea and vomiting, tinnitus and hearing loss <24 hr duration • **Vestibular neuronitis/viral labyrinthitis:** vertigo, nausea and vomiting, no tinnitus or hearing loss >24 hr, recent history of URTI • **Benign paroxysmal positional vertigo (BPPV):** acute vertigo on sudden head movement only • **Trauma:** rule out skull base fracture (CSF otorrhoea, haemotympanum, facial palsy, hearing loss)	• Consider systemic causes and perform neurological examination • Perform Dix-Hallpike test to confirm if BPPV suspected • If neurological deficit (e.g. cerebellar signs): request CT brain and stroke team/neurology review • If no neurological deficit: ◦ mild symptoms – advise bed rest, oral fluids and prochlorperazine 5 mg oral 8-hrly ◦ severe symptoms (vomiting) – commence IV fluids and prochlorperazine12.5 mg IM followed after 6 hrs prochlorperazine 5 mg oral 8-hrly and admit to CDU or refer to on-call ENT • BPPV – attempt Epley manoeuvre (if trained) +/or discuss outpatient follow-up with on-call ENT • Consider suggesting Brandt-Daroff exercises • Advise patients not to drive when dizzy • The Driver and Vehicle Licensing Agency (DVLA) state that people liable to 'sudden attacks of unprovoked or unprecipitated disabling giddiness' should stop driving • Workplace – the person should inform their employer if their vertigo poses a risk in the workplace (e.g. using ladders, operating heavy machinery)
Skull base fracture	• History of trauma usual • Acute hearing loss (sensorineural or conductive), tinnitus, vertigo with or without clear-coloured otorrhoea (CSF otorrhoea) • TM perforation or haemotympanum, VII nerve palsy, Battle's sign (bruising over mastoid bone) • Occasionally signs of raised intracranial pressure	• Exclude cervical spine injury • See **Head injury** guideline

Note: All ENT outpatient clinic appointments must be discussed with on-call ENT team and a referral form faxed

LARYNX AND PHARYNX ● 1/4

All doses are for adults unless stated. For children please refer to children's BNFC

Condition	Clinical features	Management
Acute tonsillitis	• Severe sore throat • Referred otalgia and neck pain [due to enlarged jugulo-digastric (JD) nodes] • Dysphagia especially for solids but in severe cases may be absolute • Difficulty breathing if very enlarged tonsils • Symmetrically enlarged hyperaemic tonsils often with pus in crypts • Enlarged tender JD nodes	**Mild cases:** sore throat (able to swallow medication) • Ampicillin and its derivatives contraindicated **unless** infectious mononucleosis ruled out by EBV serology if aged <12 yr • Phenoxymethylpenicillin 500 mg oral 6-hrly **or**, if penicillin allergy, clarithromycin 500 mg oral 12-hrly, for 10 days • Paracetamol 1 g oral 6-hrly and/or ibuprofen 400 mg oral 8-hrly as required • Discharge with GP follow-up **Severe cases:** severe sore throat, dysphasia (unable to swallow medication) and pyrexial • Refer to on-call ENT for admission and IV antimicrobials/fluids • IV access • FBC, EBV serology, U&E, LFT • Benzylpenicillin 1.2 g IV 6-hrly, **or** if penicillin allergy, clarithromycin 500 mg by IV infusion 12-hrly
Infectious mononucleosis (glandular fever) Similar to acute tonsillitis	• Prodromal malaise, fatigue and headache • Tender, enlarged cervical lymph nodes • Sore throat, enlarged tonsils coated with thick white exudates • Rarely respiratory distress • Pyrexia • Hepatosplenomegaly (uncommon)	• FBC (mononucleosis), EBV serology if aged <12 yr, LFT, U&E • Paracetamol 1 g oral 6-hrly and/or ibuprofen 400 mg oral 8-hrly as required • May return to normal activities but avoid contact sports for 1 month • Reassure patient that symptoms usually only last 2–3 weeks and fatigue is common • If patient unable to swallow or in respiratory distress refer to on-call ENT for admission • if tonsils very large, causing respiratory distress, give dexamethasone 6.6 mg IV (Hameln brand)
Peritonsillar abscess (quinsy)	• Uvula pushed to opposite side, tonsils often not visible • Upper cervical lymph nodes in neck, trismus, decreased mouth opening (caused by spasm of masseter muscle) • Rigors (often present) **Cause:** • Usually complication of untreated/partially treated acute tonsillitis. Infection spreads to peritonsillar area	• Refer to on-call ENT • Benzylpenicillin 1.2g IV 6-hrly **plus** metronidazole 500 mg IV by infusion 8-hrly **or** if penicillin allergy, discuss with microbiologist/infectious diseases consultant; Vancomycin IV by infusion (see **Vancomycin** guideline) **plus** metronidazole 500 mg IV by infusion 8-hrly
Post tonsillectomy haemorrhage	• Primary: <24 hr in theatre/recovery • Reactionary: 6–8 hr after operation • Secondary: normally due to infection 7–10 days post-operatively	• If active bleeding or new clot identified apply Xylocaine® spray. Remove clot and apply gauze soaked in 1:10,000 adrenaline onto tonsillar fossa • IV access • FBC, clotting, group and save • Co-amoxiclav 1.2 g IV 8-hrly, **or** if penicillin allergy, clarithromycin 500 mg by IV infusion 12-hrly • Nil-by-mouth • Refer to on-call ENT

Condition	Clinical features	Management
Foreign body (FB) ingested determine type – food bolus, bone/sharp object, corrosive matter (e.g. battery)	• **Soft food bolus** ◦ ask if wears dentures or previous history of food obstruction	• Lateral neck soft tissue X-ray (air in upper oesophagus) • Conservative treatment with hyoscine butylbromide 10–20 mg IV and fizzy drinks • If FB does not pass through oesophagus within 30 min refer to on-call ENT • If recurrent: need imaging of oesophagus as outpatient (request GP referral)
	• **Bone/sharp object** ◦ establish type of bone (e.g. fish, meat)	• Explore tonsil/tongue base (usual site for fish bones) try to remove with forceps • Consider lateral soft tissue neck X-ray • If unable to remove, refer to on-call ENT
Foreign body (FB) inhaled	**Initial** • Acute onset of stridor and choking spasms which may settle • Spasmodic coughing • Apyrexial **Secondary** • Bronchial obstruction • Consolidation • Collapse of distal segment • Hyperinflation/ pneumothorax	• Auscultate for signs of lung collapse or consolidation • Lateral soft tissue neck and chest X-ray • Inspiratory/expiratory chest X-ray, increase inflation on affected side of expiratory CXR • CT scan may be required to localise the object • Humidified oxygen and IV access • Refer immediately to on-call ENT • Nil-by-mouth • If bronchoscopic removal likely to be required discuss with on-call cardiothoracic team
Acute submandibular (SM) sialadenitis	• Secondary to salivary calculi (commonest in SM gland) • Sudden colic-like pain and swelling of gland when eating • If salivary outflow completely obstructed, gland swelling may not subside • Secondary infection may cause abscess • Stone may be palpated intra-orally in the duct	**Examination:** • Inspect oral cavity and perform bimanual palpation of submandibular gland • Palpate submandibular duct along floor of mouth for calculi • Examine other salivary glands and neck for lymphadenopathy **Investigations:** • FBC, U&E, if pyrexial – blood culture ◦ ultrasound helps differentiate between lymphadenopathy and submandibular gland swelling and rule out collection • If mild pain, apyrexial: give co-amoxiclav 625 mg oral 8-hrly **or** if penicillin allergy, clarithromycin 500 mg oral 12-hrly **plus** metronidazole 400 mg oral 8-hrly • Chlorhexidine gluconate 0.2% mouthwash 10 mL 12-hrly • If severe or septic, commence co-amoxiclav 1.2 g IV 8-hrly **or** if penicillin allergy, clarithromycin 500 mg IV by infusion 12-hrly **plus** metronidazole 500 mg IV by infusion 8-hrly • Refer to on-call ENT team **Management:** • Advise patient to suck lemon sweets (increases gland secretion) • Discuss with on-call ENT regarding outpatient review • If SM abscess formation, refer to on-call ENT

Condition	Clinical features	Management
Acute parotitis Inflammation of parotid salivary gland Common in elderly, dehydrated, malnourished patients, often in post-operative period, after radiotherapy or in patients with compromised immune system	• Firm, erythematous swelling of pre- and post-auricular areas • Intense local pain and tenderness, trismus • Fever, chills, marked systemic toxicity • Aetiology: ◦ bacterial – *Staphylococcus aureus, Enterobacteriaceae,* other Gram-negative bacilli and anaerobes ◦ viral – mumps	**Examination:** • Inspect enlarged gland and other salivary glands • Check facial nerve function, weakness raises suspicion of malignant lesion • Pressing over parotid gland may express pus from parotid duct (opens opposite upper second molar) • Check pharynx, look for parapharyngeal lesion that may push tonsil medially **Investigations:** • FBC, CRP, if pyrexial – blood culture, and test for any relevant medical condition • US helpful to diagnose collection ◦ plain X-ray of no use as parotid calculi are radiolucent **Treatment:** • Co-amoxiclav 1.2 g IV 8-hrly, **or** if penicillin allergy, clarithromycin 500 mg IV by infusion 12-hrly **plus** metronidazole 500 mg IV by infusion 8-hrly • Refer to on-call ENT • Good hydration and analgesia important • Treat underlying medical conditions (e.g. diabetes mellitus, dehydration etc.)
Ludwig's angina Anaerobic infection in floor of mouth and submandibular triangle	• Swelling in floor of mouth and below mandible, may cause respiratory distress (stertor/stridor)	• If airway compromise request urgent assessment by anaesthetics and ENT • If dental cause (dental pain and poor dental hygiene), refer to maxillo-facial team • If not dental cause refer to on-call ENT • Co-amoxiclav 1.2 g IV 8-hrly **or** if penicillin allergy, clarithromycin 500 mg by IV infusion 12-hrly **plus** metronidazole 500 mg by IV infusion 8-hrly • If respiratory distress present: hydrocortisone 200 mg IV and adrenaline nebuliser (2 mL of 1:1000), monitor closely
Parapharyngeal abscess	• Tender diffuse swelling of upper part of neck • Swinging temperature and rigors • Signs of tonsillitis, dental infection or quinsy • Progressively worsening pain	• CT scan to confirm diagnosis • Co-amoxiclav 1.2 g IV 8-hrly **or** if penicillin allergy, clarithromycin 500 mg by IV infusion 12-hrly **plus** metronidazole 500 mg by IV infusion 8-hrly • Refer to on-call ENT
Retropharyngeal abscess • Usually children aged <4 yr • Adults when prevertebral TB abscess ruptures through fascia	• Child becomes toxic, drools, has neck swelling with stertor or dysphagia • Suppuration of retropharyngeal lymph node after URTI or FB	• If suspected request urgent assessment by anaesthetics and ENT team • In absence of airway issues, antimicrobials may avoid need to drain abscess: Co-amoxiclav IV **or** if penicillin allergy, clarithromycin IV infusion **plus** metronidazole IV infusion ◦ **adults:** co-amoxiclav 1.2 g IV 8-hrly **or** if penicillin allergy, clarithromycin 500 mg IV by infusion 12-hrly **plus** metronidazole 500 mg by IV infusion 8-hrly ◦ **children:** for doses refer to children's BNFC

Condition	Clinical features	Management
Epiglottitis • Usually children aged 2–6 yr • Also seen in adults	• Toxicity, sore throat, drooling, dysphagia and stridor • Speech muffled • Cough often absent	• If suspected request urgent assessment by paediatric anaesthetist and ENT team • Nebulised adrenaline unlikely to be effective • Avoid IV cannulation and blood tests until anaesthetised and airway secured • Children: ceftriaxone IV by infusion – for doses refer to children's BNFC. Admit to PICU • Adults: ceftriaxone 2 g IV by infusion daily • If ceftriaxone cannot be given, contact consultant microbiologist or consultant in infectious diseases
Bacterial tracheitis	• Symptoms usually occur 2–3 days after upper respiratory tract infection • Toxicity, hoarse voice and stridor, cough with copious secretions	• If suspected request urgent assessment by paediatric anaesthetist and ENT team • Avoid IV cannulation and blood tests until anaesthetised and airway secured • After intubation, suction debris from trachea • Ceftriaxone IV by infusion – see children's BNFC for doses • If ceftriaxone cannot be given, contact consultant microbiologist or consultant in infectious diseases • Admit to PICU
Laryngeal trauma	• Uncommon – patients often have multiple injuries • Breathing difficulty or haemoptysis (stridor may be absent) • Hoarse voice, change in voice or dysphonia • Dysphagia • Neck pain or ecchymosis • Surgical emphysema of neck and abnormal crepitus of laryngeal framework	• Follow ATLS protocol • Request urgent assessment by anaesthetist and ENT team • If stridor or respiratory difficulty, intubate, oxygen • Analgesia – see **Pain management** guideline • IV access • CT scan
Croup	• Preceding coryzal illness • Fever • Harsh bark/seal-like cough • Hoarse voice • Inspiratory stridor • Symptoms worse at night • Child does not look toxic	• See **Croup** in **Paediatric** guidelines

All doses are for adults unless stated. For children please refer to children's BNFC

EPISTAXIS

Causes

- Idiopathic: majority of cases
- Local: Keisselbach plexus (Little's area), infection, foreign body, tumours (including juvenile angiofibroma)
- Generalised: coagulation defects, drugs and toxins (e.g. aspirin/warfarin), hypertension

Immediate management

Preparation

- Use disposable gloves and apron
- Ensure patient given tissue and apron

First aid measures

- Apply pressure manually to cartilaginous part of nose firmly for 10–15 min without releasing the pressure
- Ice packs to bridge of nose – patient to suck ice cube
- Cold packs to back of neck

Secondary measures

- Measure BP and pulse regularly
- If hypotensive or hypovolaemic, resuscitate. Insert IV cannula and commence IV fluid
- Examine nasal cavity to exclude treatable cause
- Suction clots and apply topical local anaesthetic spray with vasoconstricting agent, cocaine 10% in chlorocresol 0.1% solution (2 mL bottle) or if unavailable, lidocaine with adrenaline soaked gauze
- After topical anaesthesia cauterise obvious bleeding points with silver nitrate 75% sticks (roll the tip of the stick over mucosa until a gray eschar forms). To prevent septal necrosis/perforation, cauterise only 1 side of septum at a time. To be effective, perform cauterisation after bleeding controlled
- If unable to see bleeding point, insert 8 cm Merocel® nasal tampon smeared with Naseptin® nasal cream

Continuing bleeding

- If still bleeding pack other nasal cavity
- If bleeding continues despite these measures:
  - pack posterior nasal cavity using a Foley catheter (seek senior advice)
  - refer to on-call ENT
  - urgent FBC, INR, group and save
- If bilateral packs inserted **patient must be admitted** – contact on-call ENT
- If unilateral pack inserted into the nasal cavity, patient may go home (assuming no contra-indication) and return to ENT ward the next day for removal of pack – contact on-call ENT

Discharge and follow-up

- If bleeding stops, discharge with Naseptin® nasal cream apply 6-hrly into affected nostril(s) for 10 days (or if patient allergic to peanuts or soya: mupirocin nasal ointment 2–3 times a day for 5–7 days)
- Advise GP visit in 1 week
- If recurrent epistaxis, refer to ENT outpatient clinic (contact on-call ENT and fax notes)

ACUTE BACTERIAL SINUSITIS

Clinical features

- Foul-tasting nasal mucopurulent discharge
- Severe throbbing pain related to sinus(es)
  - maxillary – cheek
  - frontal – forehead and orbit
  - ethmoid – root of nose
  - sphenoid – variable; occipital area, over vertex of skull, retro-orbital
- Pyrexia
- Opacification, fluid level or mucosal thickening seen on sinus X-ray

Management

Mild (mild pain, apyrexial)

- Analgesia, see **Pain management** guideline
- Nasal decongestant (e.g. ephedrine nasal drops 0.5% 1–2 drops into each nostril 6-hrly as required for 7 days)
- Explain that acute sinusitis is caused by a virus in more than 98% of people, takes on average 2.5 weeks to resolve
- antimicrobial treatment rarely required in this group
- Consider prescribing an intranasal corticosteroid for people with prolonged or severe symptoms

Severe (severe pain, pyrexial)

- Refer to on-call ENT for IV antimicrobials: amoxicillin 1 g IV 8-hrly. If no improvement: Co-amoxiclav 1.2 g IV 8-hrly; **or** if penicillin allergy: clarithromycin 500 mg IV by infusion 12-hrly **plus** metronidazole 500 mg IV by infusion 8-hrly
- Nasal decongestant (e.g. ephedrine nasal drops 0.5% 1–2 drops into each nostril 6-hrly as required for 7 days)
- Analgesia, see **Pain management** guideline
- May require surgical drainage

ORBITAL CELLULITIS

Causes

- Commonest cause is sinusitis
- If untreated, risks include blindness and frontal lobe abscess

Immediate management

- Refer to on-call ophthalmology
- See **Red eye** guideline
- If severe request CT scan
- Request on-call ENT review

ERYSIPELAS

Clinical features

- Acute inflammation of epidermis and dermis caused by pyogenic *streptococci*
- Usually begins in nose and spreads rapidly over entire face as a sharply demarcated, painful, red infiltrating area
- Pyrexia

Immediate management

Mild (mild pain, apyrexial, limited involvement)

- Swab any possible skin entry portal
- Amoxicillin 1 g oral 8-hrly for 5–7 days **or** if penicillin allergy, clarithromycin 500 mg oral 12-hrly for 5–7 days

Severe (very painful facial lesion, pyrexial, unresponsive to oral antimicrobials)

- Refer to on-call ENT for admission
- Benzylpenicillin 1.2 g IV 6-hrly. If penicillin allergy, vancomycin IV – see **Vancomycin** guideline
- Analgesia, see **Pain management** guideline
- Swab

FOREIGN BODY (FB) IN NOSE

Causes

- Usually found in children
- May be long-standing
- Objects may include coins, beads, buttons, peas etc

Clinical features

- Usually unilateral
- Foul-smelling nasal discharge, nasal blockage, worsening rhinitis or sinusitis

Diagnosis

- Examine nose thoroughly
- If reliable history of radio-opaque FB insertion but not readily visible, arrange anterior and posterior X-ray

Immediate management

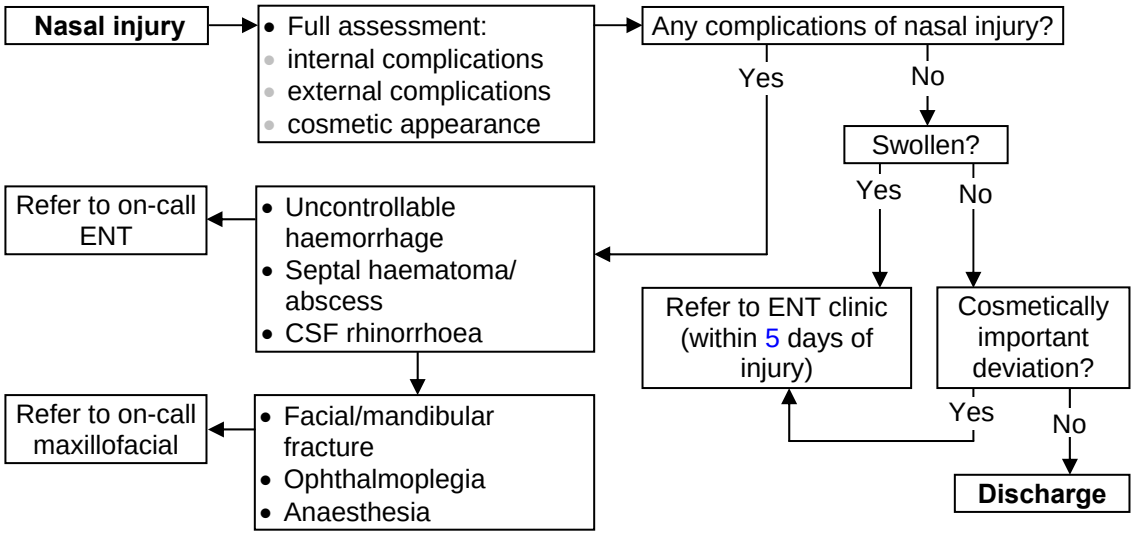
- Attempt removal only if child cooperative and object lying anteriorly, use a blunt wax hook instrument
- If child distressed/unco-operative or object too difficult to remove, refer immediately to on-call ENT
- Solid, rounded objects – roll along floor of nasal cavity with a curved probe (e.g. Jobson Horne)
- Other objects – grasp with Tilley forceps
- If any evidence to suggest inhalation, refer to on-call ENT and arrange CXR and lateral soft tissue neck X-ray

NASAL FRACTURE

Clinical features

- ATLS (advanced trauma life support) initially, nasal fracture last injury to be managed
- No X-ray required for management of this injury

Immediate management



- If epistaxis – see **Epistaxis** above for treatment
- Follow-up of displaced nasal fractures – ENT clinic 5 days from injury

VISUAL ASSESSMENT ● 1/1

HISTORY

- Ask about:
- visual disturbance: loss, flashing lights, blurring etc
- pain
- lacrimation/discharge
- trauma (including foreign bodies or chemical splashes)

ASSESSMENT

Visual acuity (VA)

Record visual acuity (VA) before any intervention – except irrigation of chemical injury

- **VA is the key to ophthalmological examination – test injured eye first** (to prevent patient remembering order of letters)
- Use a Snellen chart, read at 6 m for each eye separately. Allow patient to use spectacles if they have them, if not use a pinhole
- VA expressed as: distance from chart (m)/number of line on chart (normal vision 6/6)

Pupils

- Assess reactivity to light
- Look for both direct (same eye) and consensual (other eye) reactions
- Record pupil size in mm and any asymmetry or irregularity
- If pupillary reactions to light are diminished or absent, check reaction to accommodation
- Following direct trauma, it is important to assess for a relative afferent pupillary defect (RAPD); may indicate optic nerve compression

Inspection

- Observe patient for ptosis, exophthalmos, lesions, deformities, or asymmetry
- Ask patient to look up. Pull down both lower eyelids to inspect conjunctiva and sclera
- Next spread each eye open with your thumb and index finger. Ask patient to look to each side and downward to expose entire bulbar surface
- If foreign body suspected, evert upper lid
- Note any discoloration, redness, discharge, or lesions. Note any deformity of the iris or lesion of cornea
- If patient has suspected conjunctivitis, **wash your hands immediately**. Viral conjunctivitis is highly contagious

Extraocular movement

- Check corneal reflections, asymmetry suggests ocular muscle pathology
- Check gaze in the six cardinal directions using a cross or ‘H’ pattern
- Check convergence by moving your finger toward bridge of patient's nose

Others

- Check visual fields to confrontation
- Check fundi using fundoscopy
- Check integrity of cornea and anterior chamber using the slit lamp. Additional use of fluorescein eye drops will aid detection of corneal abrasion. Also useful for detecting presence of foreign bodies

INDICATORS OF POTENTIALLY SERIOUS EYE PROBLEMS

- Chemical injuries to the eye – see **Chemical injury** guideline
- Injury to eye as a result of trauma – see **Eye trauma** guideline
- Sudden loss of vision – see **Visual loss** guideline
- Painful red eye – see **Red eye** guideline
- Other eye problems – see **Eye problems non-traumatic** guideline

Other indicators

- Significant reduction in visual acuity
- Asymmetric, absent or poorly reactive pupils (including RAPD)

CHEMICAL INJURY ● 1/1

Chemical injuries constitute a serious threat to vision and require urgent attention. Discuss with emergency eye clinic or on-call ophthalmology

Chemical type	Recognition	Immediate treatment
Alkali	Rapidly penetrates to anterior chamber – can affect iris, ciliary body, lens and trabecular meshwork **Can remain active for up to 24 hr after initial injury**	• Irrigate immediately with sodium chloride 0.9% 1 L over 20 min • Check pH with indicator paper, if >7 continue irrigation. Stop once pH neutral • Test vision 5 min after final irrigation • Do not instil any ointment – hinders slit lamp examination • Do not pad eye, allow to lacrimate freely
Lime burns	Includes wet/dry cement and wet plaster	• Treat as for alkali burns • Remove any visible cement or plaster using a cotton bud (remember to evert eyelids)
Acid burns	Generally cause limited damage as acids form insoluble protein complexes Exception is hydrofluoric acid which damages in a similar manner to alkali	• Irrigate on arrival with sodium chloride 0.9% 1 L over 20 min • Check pH, continue irrigation if pH <7. Stop once pH neutral • Instil fluorescein eye drops into affected eye(s). Use blue filter or ophthalmoscope to detect corneal staining • If no staining and eye now comfortable send home with chloramphenicol[1] 1% eye ointment to affected eye(s) 6-hrly for 5 days • If a small amount of corneal staining, instil stat dose of chloramphenicol[2] 1% eye ointment

[1] If taking other myelotoxic drugs or in third trimester of pregnancy, prescribe fusidic acid 1% eye drops, 1 drop to affected eye(s) 6-hrly for 48 hr, then 12-hrly for 5 days

[2] If taking other myelotoxic drugs or in third trimester of pregnancy, instil stat dose of fusidic acid 1% eye drops to affected eye(s)

EYE TRAUMA ● 1/2

Injury with clinical features	Immediate management
Penetrating eye injury • Cornea or sclera may be penetrated in different ways: ◦ directly by sharp, pointed instrument (e.g. knife, scissors) ◦ directly by small particles (e.g. glass/metal from high powered machinery/hammering and chiselling) – check for entry wound on cornea, sclera/conjunctiva ◦ indirectly by severe contusion leading to rupture of the globe	• If an obvious major penetrating injury rigorous examination may be omitted to avoid extrusion ocular contents. Document acuity, pupillary function and location of injury • Refer urgently to emergency eye clinic or on-call ophthalmology ◦ do not instil any drops or ointment ◦ if intraocular foreign body (FB) suspected, orbital X-ray (metallic) or US scan/CT scan (non-metallic) ◦ keep patient nil-by-mouth
Hyphaema • Bleeding in anterior chamber ◦ usually results from blunt trauma to the globe and causes pain and reduced visual acuity ◦ can sometimes be seen with naked eye, but, if history suggestive, examine using slit lamp	• Discuss with emergency eye clinic or on-call ophthalmology • Orbital X-rays: to detect fracture • If large bleed (>50% of anterior chamber) or ocular damage suspected – admit • If no ocular damage and small bleed, advise rest – refer to next emergency eye clinic
Corneal abrasions • Abrasion causes: ◦ immediate and often severe pain ◦ redness of conjunctiva ◦ intense lacrimation	• Instil fluorescein eye drops into affected eye(s) to view abrasion, use blue light to detect any corneal staining (abrasion will glow yellow/green under light) • If evidence of perforating injury (e.g. small area of staining seen and fluorescein can often be seen draining into it), follow **Penetrating eye injury** above • If no evidence of perforating injury treat with stat dose (and send home with), chloramphenicol[1] 1% eye ointment to affected eye(s) 6-hrly for 5 days ◦ advise patient not to drive/operate machinery for 24 hr and to return if no improvement after 24 hr or if eye feels worse ◦ discharge with written advice and contact details of eye casualty clinic ◦ if large area of corneal staining, discuss with senior and refer to next available eye clinic
Fixed pupil (after trauma)	• Refer urgently to on-call ophthalmology
Sub-conjunctival haemorrhage • May occur spontaneously, often following coughing and straining	**History of trauma** • Check posterior extent of haemorrhage visible (ask patient to move eye around) • If posterior border not visible, consider possibility of significant trauma (e.g. orbital floor fracture) **No history of trauma** • Check BP to exclude hypertension • If patient taking warfarin check INR (see **Management of bleeding and over-anticoagulation with warfarin** in **Medical** guidelines) ◦ if patient has had several sub-conjunctival haemorrhages, check clotting and platelet count • No treatment required • Reassure patient eye not at risk and haemorrhage will reabsorb within 1–2 weeks • Discharge with written advice
Lid lacerations	• Discuss with emergency eye clinic or on-call ophthalmology if concerned about **any** of following: ◦ septum breached (presence of preaponeurotic/orbital fat in wound – suspected history of penetrating injury) ◦ risk of intraorbital FB or suspicion of globe injury ◦ eyelid margin crossed ◦ lateral canthal or medial canthal tendon injury ◦ canalicular trauma suspected (medial canthal injury/eyelid margin breached medial to punctum) ◦ loss of eyelid tissue

EYE TRAUMA ● 2/2

Injury with clinical features	Immediate management
Blow out fracture • Fracture of orbital wall (medial and floor most common) • Diplopia/limitation of eye movement • Numbness of lower lid (floor fractures) and gum • Enophthalmos	• Evaluate patient for evidence of significant head injury (see **Head injury** guideline) • Request facial X-rays • Refer to on-call maxillo-facial for review in outpatient clinic • Advise patient against blowing nose • Refer to ophthalmology if any evidence of injury to globe (e.g. visual disturbance, hyphaema, unreactive pupil)
Any complaints of visual problems e.g. blurred/double vision, flashing lights, floaters	• Refer urgently to on-call ophthalmology
FOREIGN BODY (FB)	
Corneal foreign body (FB) • Always check mechanism of injury; was FB after chiselling or use of high power machine?	• FB may penetrate the eye – see **Penetrating eye injury** above • **Other FBs can be treated in the ED**: ***Ensure competence assessed by senior clinician before undertaking procedure alone*** ◦ instil anaesthetic drops (e.g. tetracine 0.5% minims or oxybuprocaine 0.4% minims) 1–2 drops to affected eye(s) ◦ remove FB if easy to do so with bevel of needle under visual guidance from slit lamp (to magnify procedure) ◦ always check under upper lid – FBs under upper lid produce a characteristic pattern of staining with multiple fine vertical scratches ◦ instil fluorescein eye drops into affected eye(s), check extent of abrasion (including impact of removal) ◦ if abrasion seen, instil (and send home with) chloramphenicol[1] 1% eye ointment to affected eye(s) 6-hrly for 5 days ◦ use blue filter to examine cornea for staining **Unable to remove FB or rust remains** • Arrange follow-up 48 hr later with eye clinic ◦ prescribe chloramphenicol[1] 1% eye ointment to affected eye(s) 6-hrly. This will soften surface of eye and ease removal
Intra-ocular foreign body (FB) • Consider if history of hammering/chiselling/high velocity power tools (e.g. shot blasting). • Pain caused by penetration of FB may be only slight • May be no immediate loss of vision	• FB may penetrate the eye – see **Penetrating eye injury**
Super-glue in the eye • Causes little problems as it detaches itself in time (approximately 48 hr)	• If eyelashes are stuck together cut with sharp scissors • Ensure eye can close (if unable to close seek ED senior review) • Reassure patient that glue will detach itself • Give chloramphenicol[1] 1% eye ointment to affected eye(s) 6-hrly for 5 days

[1] If taking other myelotoxic drugs or in third trimester of pregnancy, prescribe fusidic acid 1% eye drops 1 drop to affected eye(s) 6-hrly for 48 hr, then 12-hrly. Treat for 5 days

Urgent condition with clinical features	Immediate management
Discuss all cases with emergency eye clinic or on-call ophthalmology unless indicated*	
Central retinal artery occlusion • Causes complete painless loss of vision • Absent pupil reflex • Posterior pole is pale and oedematous • Macula looks like a red spot	Refer urgently to emergency eye clinic or on-call ophthalmology
Central retinal vein occlusion (CRVO) • CRVO more common in hypertension/diabetes • Fundus looks totally haemorrhagic 'stormy sunset'	
Vitreous haemorrhage • May cause a shower of 'floaters', visual haze before painless loss of vision • Risk factors: diabetic retinopathy, peripheral vascular disease, trauma	
Retinal detachment (RD) • RD is common after trauma or in myopes • Warning signs: flashes of light followed by floaters • When partially detached a curtain partially obscures vision • Field defect • No pain • Diagnosis is by direct observation with an ophthalmoscope or partial/total loss of red reflex	
Giant cell arteritis • May present as central retinal artery occlusion or ischaemic optic neuropathy • suspect in elderly patients with complaint of visual disturbance (evolving visual loss or amaurosis fugax), headache (abrupt onset, temporal pain), scalp tenderness, thickening and reduced pulsation of temporal arteries and high ESR	• Request ESR, CRP, FBC, U&E, LFT • **Refer urgently to on-call rheumatology*** • Systemic steroids may prevent blindness in second eye • Visual loss/disturbance: give methylprednisolone 1 g IV daily for 3 days (ensure no contraindications to steroids and patient not immunosuppressed) • Diagnosis suspected but **no** visual disturbance: give prednisolone 40–60 mg daily (not <0.75 mg/kg daily) until resolution

RED EYE ● 1/2

All doses are for adults unless stated. For children please refer to children's BNFC

Never give local steroids as herpetic conjunctivitis or keratitis may be exacerbated, and destruction of eye surface may follow

Condition with clinical features	Management
Acute glaucoma • Causes a red, intensely painful hard eye with a hazy cornea and semi-/dilated fixed oval pupil • Vision will be reduced – visual acuity (VA)↓ • Raised intra-ocular pressure • Look for a shallow anterior chamber (in both eyes) and history of periodic attacks of blurred vision and haloes to confirm diagnosis. May also be positive family history	• Refer urgently to emergency eye clinic or on-call ophthalmology for confirmation of diagnosis and treatment with acetazolamide 500 mg IV and intensive pilocarpine eye drops to affected eye(s) followed by peripheral iridectomy
Iritis/uveitis • May be confused with conjunctivitis **Signs and symptoms** • Red-eye ciliary injection • Photophobia and blurring vision • Keratic precipitates or hypopyon if severe • Posterior synechiae • Small pupil • Pain • Reduced visual acuity	• Refer to emergency eye clinic to be seen within 24 hr
Keratitis • An opacity on cornea with ciliary injection, needs accurate diagnosis before treatment • Exclude recent eye trauma/previous corneal abrasions/herpetic disease/contact lens wear	• Refer to emergency eye clinic to be seen within 24 hr
Orbital cellulitis • Systemically unwell, fever • Pain, redness and swelling of lids • Painful limited eye movements; diplopia • Reduced visual acuity/colour vision	• Refer urgently to emergency eye clinic or on-call ophthalmology • Refer children to paediatric assessment unit • Arrange CT scan of orbit and sinuses • If pyrexial, blood culture • If pus present, eye swab • Nasal swab for Gram stain and culture • Ceftriaxone 2 g IV 12-hrly plus metronidazole 500 mg IV by infusion 8-hrly.**Oral step down:** co-amoxiclav 625 mg oral 8-hrly • **If penicillin allergy is rash**: Ceftriaxone 2 g IV 12-hrly plus metronidazole 500 mg IV by infusion 8-hrly. **If anaphylaxis to penicillin**: discuss with microbiologist/infectious diseases • **Switch IV to oral as soon as clinical improvement occurs and temperature has been normal for 72 hr, providing there is no contraindication to oral therapy**. Duration 7–10 days total (including IV treatment)
Corneal ulcer • Photophobia • Lacrimation • Eye pain • Conjunctival injection	• Refer within 24 hr to emergency eye clinic • Advise not to use contact lenses

Condition with clinical features	Management
Conjunctivitis • Usually presents as a red, irritating, sticky eye, often bilateral • check vision normal, cornea bright and iris reacts to light • Allergic conjunctivitis is often unilateral with papillae and follicles appearing as bumpy elevations on tarsal surface of the conjunctiva. Usually self-limiting	• Bacterial conjunctivitis: prescribe chloramphenicol[1] 1% eye ointment to affected eye(s) 6-hrly. Treat for 5–7 days • Allergic conjunctivitis, remove allergen where possible. Advise use of antihistamines (e.g. chlorphenamine 4 mg oral 6-hrly as required) • If infection suspected, advise patient regarding prevention of spread of infection to contacts • Discharge if diagnosis secure and visual acuity unchanged • Ask patient to return/see GP if worsens
Scleritis • Sclera intense brawny red colour • Eye painful, often wakes patient at night • VA usually normal, unless posterior scleritis present	• Refer to emergency eye clinic to be seen within 48 hr • If reduced VA↓, nausea/vomiting + severe pain – refer urgently to emergency eye clinic or on-call ophthalmology

[1] If taking other myelotoxic drugs or in third trimester of pregnancy, prescribe fusidic acid 1% eye drops 1 drop to affected eye(s) 6-hrly for 48 hr, then 12-hrly. Treat for 5 days

EYE PROBLEMS NON-TRAUMATIC ● 1/1

All doses are for adults unless stated. For children please refer to children's BNFC

Condition with clinical features	Management
'Arc' eye • Unprotected exposure to UV radiation e.g. welding, sunbed • Bilateral eye pain occurs 6–8 hr post exposure, with photophobia and lacrimation • Vision may be blurred and acuity mildly reduced • Conjunctival chemosis + injection • Punctate corneal epithelial loss	• Analgesia (paracetamol 1 g oral 6-hrly) +/- topical diclofenac 0.1% eye drops 1 drop 6-hrly for up to 2 days, (do not provide topical anaesthetics) • Advise to wear dark glasses • If not resolved within 72 hr, advise to return
Herpes zoster ophthalmacus (shingles)	• If reduced corneal sensation, corneal staining or reduced visual acuity, refer to emergency eye clinic or on-call ophthalmology • If no evidence of eye involvement (normal acuity, no corneal staining and lesions not affecting nose) discharge back to GP • if onset of lesions <72 hr – commence aciclovir 800 mg oral 5 times daily for 7 days (if immunocompromised continue for 2 days after crusting of lesions) • swab for viral PCR
Lids – lumps/cysts • Become red and painful if infected	• Generally no immediate action required • If infected consider oral antimicrobials: flucloxacillin 500 mg oral 6-hrly **or** if penicillin allergy clarithromycin 500 mg oral 12-hrly • Hot spoon bathing • Advise GP review +/- referral for removal

ECTOPIC PREGNANCY IN THE EMERGENCY DEPARTMENT ● 1/2

INTRODUCTION

Ectopic pregnancy is one of the commonest causes of pregnancy-related deaths. Most of those who die are misdiagnosed in the primary care or emergency department setting

Risk factors for ectopic pregnancy

- History of infertility (four-fold increased risk of ectopic pregnancy)
- Intra-uterine contraceptive device *in situ*
- Pelvic inflammatory disease (PID)
- Sexually transmitted disease e.g. chlamydia, gonorrhoea
- Tubal surgery
- Lower abdominal surgery
- Exposure to diethylstilboestrol
- Previous ectopic pregnancy
- Use of progesterone only pill (POP)
- Failed tubal ligation sterilisation
- IVF ovulation/induction
- Age ≥35 yr
- Smoking

Complications

- Tubal rupture leading to catastrophic haemorrhage
- Compromise of future fertility

Symptoms and signs

Be suspicious in a woman presenting with abnormal vaginal bleeding, lower abdominal pain or collapse. Perform pregnancy test in all post-pubertal and pre-menopausal women

- Abnormal vaginal bleeding that rarely exceeds normal menstrual flow
- usually intermittent (may be dark red)
- Ask about last period – timing, duration and amount
- woman may appear not to have missed a menstrual period, as vaginal bleeding may occur at time of expected period
- Lower abdominal or pelvic pain
- may vary from mild to severe and is often unilateral
- Abdominal tenderness, rebound or guarding
- Cervical excitation
- Adnexal tenderness
- Evidence of:
- tachycardia (>100 bpm)
- hypotension (present or postural) <100/60 mmHg
- reduced peripheral perfusion
- Nausea/vomiting
- Pallor
- Diarrhoea
- Painful defecation
- Dysuria
- Shivering
- Backache
- Occasionally detected in an asymptomatic woman, where pregnancy mimics normal intra-uterine development until sudden rupture occurs
- Rupture of ectopic gestation with resultant intra-uterine bleeding is the classic but infrequent presentation

Symptoms of tubal rupture

- Severe, sharp and sudden pain in lower abdomen
- Severe bleeding
- Dizziness
- Fainting
- Weak pulse
- Referred pain to shoulder area

ECTOPIC PREGNANCY IN THE EMERGENCY DEPARTMENT ● 2/2

Differential diagnosis

- Miscarriage
- Urinary tract infection (UTI)
- Constipation
- Irritable bowel
- Ruptured corpus luteum cyst or follicle
- Ovarian torsion
- Tubo-ovarian abscess
- Pedunculated fibroid
- Appendicitis
- Renal colic
- Pelvic inflammatory disease (PID) or endometriosis

Investigations

- Urinary pregnancy test (catheter sample if necessary)
  - negative result – ectopic gestation virtually excluded
  - positive result – call on-call gynaecology team
- FBC
- Serum βhCG
- Group and save

RISK ASSESSMENT AND IMMEDIATE TREATMENT

Essential to categorise patient according to level of risk – high (life-threatening), moderate or low. In pregnant woman with abdominal pain, consult on-call gynaecology team

Category	Signs	Treatment
High risk	• Signs of hypovolaemic shock • Acute abdominal signs (tenderness with rebound or guarding) • Low or falling Hb	• Transfer patient to Resus and request immediate attendance of on-call gynaecology middle grade or consultant • Start high-flow oxygen via rebreathable mask • Insert 2 large bore (14–16 G) venous cannulae • Crossmatch and activate Major Haemorrhage protocol • Infuse IV fluids (crystalloid)to maintain systolic BP >90 mmHg or transfuse blood if necessary – see **Fluid resuscitation** guideline • Insert a urinary catheter with hourly volume bag • Inform on-call anaesthetic team and theatre staff of probable need for emergency laparotomy
Moderate risk	• Haemodynamically stable • Tender abdomen • Low Hb	• Discuss admission with on-call gynaecology middle grade or consultant • 1–4 hrly observations as appropriate (EWOS chart) • Keep nil-by-mouth • Insert 1 large bore venous cannula • Crossmatch 4 units of blood • Infuse IV crystalloids – see **Maintenance fluid therapy** guideline • Give analgesia as required (not NSAIDs) – see **Pain management** guideline
Low risk	• Haemodynamically stable • Non-tender abdomen and adnexae • Normal Hb	• Arrange next available outpatient pelvic scan (through early pregnancy assessment unit) • Explain need to return to hospital if unwell, faints, has increasing abdominal pain or increasing vaginal blood loss • if patient unsuitable for discharge, if unable to return to hospital quickly if condition worsens – admit to gynaecology ward

PELVIC INFLAMMATORY DISEASE (PID)● 1/2

RECOGNITION AND ASSESSMENT

Symptoms and signs

- Bilateral lower abdominal tenderness
- Abnormal vaginal bleeding (intermenstrual, postcoital, or 'breakthrough')
- Deep dyspareunia of recent onset
- Adnexal tenderness (with/without a palpable mass), cervical motion tenderness or uterine tenderness (on bimanual vaginal examination)
- Abnormal cervical or vaginal mucopurulent discharge
- Fever (temp >38°C)
- Right upper quadrant pain due to peri-hepatitis (Fitz-Hugh-Curtis syndrome)

Delay in treatment increases risk of sequelae (infertility, ectopic pregnancy, chronic pelvic pain)

Differential diagnosis

- Ectopic pregnancy
- Appendicitis
- Endometriosis
- Irritable bowel syndrome
- Ovarian cyst complications
- UTI
- Pain of unknown physical origin

Investigations

- Urinary pregnancy test
- FBC, CRP
- High vaginal swab for culture and sensitivity
- Endocervical swabs for chlamydia and gonorrhoea (negative result does not exclude PID)

Assessment

- Assessment depends on clinical features, examination and supported by USS/laparoscopy (not always possible in A&E setting)
- If patient is clinically
  - stable with no systemic infection: send swabs and manage as outpatient
  - unwell: manage as inpatient and refer to gynaecology

IMMEDIATE TREATMENT

Type of patient	Treatment
Outpatient treatment Refer to genitourinary medicine	Ceftriaxone 500 mg IM **single dose** (reconstitute with lidocaine hydrochloride 1% as per manufacturer's instructions) **then** doxycycline 100 mg oral 12-hrly **plus** metronidazole 400 mg oral 12-hrly
Severe disease requiring inpatient treatment (non-pregnant) Refer to genitourinary medicine	Ceftriaxone 2 g IV by infusion daily **plus** doxycycline 100 mg oral 12-hrly **Oral step-down:** doxycycline 100 mg oral 12-hrly **plus** metronidazole 400 mg oral 12-hrly
Pregnancy or breastfeeding	Ceftriaxone 500 mg IM **single dose** (reconstitute with lidocaine hydrochloride 1% as per manufacturer's instructions) **plus** erythromycin 500 mg oral 6-hrly **In clinically severe disease add** metronidazole 400 mg oral 12-hrly
Duration	14 days total

Inpatient

- Consult on-call gynaecology team if following suspected:
  - clinically severe disease
  - tubo-ovarian abscess

PELVIC INFLAMMATORY DISEASE (PID)● 2/2

- PID in pregnancy
- lack of response to oral therapy/intolerance to oral therapy (criteria for inpatient management after failure of outpatient management)
- if temp/CRP/clinical features are worsening in spite of antimicrobial treatment, consider USS guided drainage/surgical management with laparoscopy/laparotomy
- surgical emergency cannot be excluded

Outpatient

- Assess interactions between antimicrobial and hormonal contraception or other medications and take appropriate actions
- If symptoms do not resolve, consider removal of IUCD
- advise use of emergency contraception

Information for patient

- Explain condition and need for commencing antibiotics, especially the future risk of infertility, ectopic pregnancy, and chronic pelvic pain
- Offer patient and her sexual contacts referral to a genitourinary medicine clinic for screening as high risk of transmission
- Repeat episodes of PID are associated with risk of infertility and barrier contraception reduces risk of future PID. Sexual contacts need to be screened to prevent reinfection
- Women should be advised to avoid intercourse until they and their partner have completed the treatment course
- Information leaflet available from RCOG website: www.rcog.org.uk

ACUTE ANAPHYLAXIS ● 1/4

RECOGNITION AND ASSESSMENT

Anaphylaxis is a **severe** systemic allergic reaction. Consider whenever there has been a rapid onset of respiratory difficulty and/or hypotension, especially if rash and/or angioedema present

Symptoms and signs

Airway

- Upper airways obstruction due to angioedema:
- swelling of tongue/throat
- stridor
- feeling of throat closing
- hoarse voice

Breathing

- Lower airways obstruction:
- wheeze
- increased respiratory rate
- cyanosis

Circulation

- Signs of shock:
- impaired capillary refill (capillary refill time >2 sec)
- tachycardia
- hypotension

Disability

- Confusion
- Agitation
- Loss of consciousness

Exposure

- Skin and mucosal changes (may not be present in all patients):
- redness or blotchy rash
- urticaria
- itching
- angioedema
- rhinitis and conjunctivitis

Other systems affected

- Gastrointestinal:
- abdominal pain
- vomiting
- diarrhoea

INVESTIGATIONS

- Mast cell tryptase – sample serum (7 mL red top bottle) at following times and send to immunology:
- as soon as possible after emergency treatment has started
- at 1–2 hr from onset of symptoms. No later than 4 hr
- Patient may present late. Take as many serum samples as time since presentation allows
- indicate time and date clearly to allow interpretation of results
- Inform patient that a final sample will be necessary to measure baseline levels in follow-up

DIFFERENTIAL DIAGNOSIS

- Syncope (rapid recovery) with bradycardia in vagal reaction
- Septic shock with a petechial or purpuric rash
- Acute cardiac event
- Panic attack with hyperventilation (unlikely to be hypotensive)
- Acute severe asthma
- Other causes of central airways obstruction
- idiopathic non-allergic urticaria and angioedema

IMMEDIATE TREATMENT

- See **Anaphylaxis algorithm** overleaf
- Lay patient flat and elevate feet to restore/maintain BP. Do not stand patient up
- if this causes respiratory distress, sit patient up
- For hypotension or respiratory distress with stridor or wheezing, give adrenaline:
- 500 microgram (0.5 mL of 1:1000 solution) **IM** into midpoint of anterolateral aspect of thigh. If an adult EpiPen® more readily available give this (delivers 300 microgram dose of adrenaline)
- If hypotension and respiratory distress do not respond within 5 min:
- give further dose of adrenaline 500 microgram **IM** (0.5 mL of 1:1000 solution). Can be repeated at 5 min intervals according to BP, heart rate and respiratory function
- monitor vital signs continuously
- If concerned about patient's respiratory effort/airway obstruction, contact anaesthetist
- Oxygen at high flow rate (10–15 L/min) – see **Oxygen therapy in acutely hypoxaemic patients** guideline
- Establish IV access. If systolic BP <100 mmHg give fluid challenge of 500 mL of compound sodium lactate (Hartmann's) as quickly as possible, see **Fluid resuscitation** guideline
- Chlorphenamine 10 mg by IM or **slow** IV injection
- if there is bronchospasm, give salbutamol 5 mg via oxygen driven nebuliser
- for further treatment of bronchospasm, see **Acute severe asthma in adults** guideline
- If patient has been taking a non-cardioselective beta-blocker [e.g. propranolol, oxprenolol, sotalol, timolol (including eye drops)], severity of anaphylaxis may be increased and response to adrenaline antagonised. Consider giving salbutamol by slow IV injection – see **Salbutamol IV** guideline

Severely ill patient

- When patient severely ill and there is real doubt about adequacy of circulation and absorption after IM injection, call critical care staff to attend urgently
- transfer to critical care **as soon as possible**

Further treatment under critical care supervision

- Consider giving adrenaline 50 microgram (0.5 mL of the dilute 1:10,000 adrenaline injection) by **slow** IV injection, no faster than 1 mL/min while monitoring cardiac rhythm. Repeat according to response
- if multiple doses required, give adrenaline as **slow** IV infusion, stopping when response obtained

IV adrenaline is hazardous, use only with extreme care, and under critical care supervision, for those in profound shock that is immediately life-threatening

MONITORING

Monitor (including ECG) continuously all patients experiencing severe anaphylaxis until condition stabilised and then every 15 min for 1 hr until completely stable. Continue to record hourly:

- Heart rate
- Blood pressure
- Respiratory rate
- If possible, peak expiratory flow (PEF)
- SpO_2

SUBSEQUENT MANAGEMENT

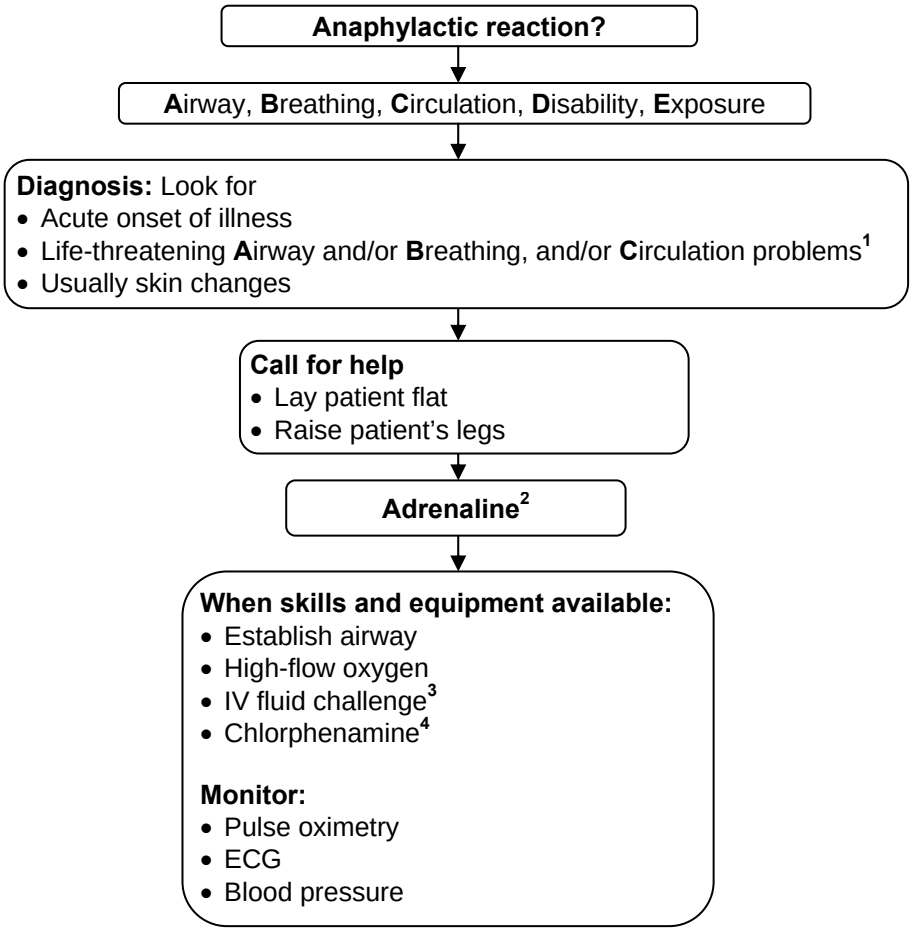
- Record time of onset of symptoms and identify possible allergens e.g. drugs, foods (within previous hour), insect stings, latex
- Consider prednisolone 30 mg oral daily until all allergic symptoms have subsided completely
- Chlorphenamine 4 mg oral 6-hrly (for at least 24–72 hr to prevent relapse) or until all allergic symptoms have subsided completely
- Warn patient of possible early recurrence and keep under observation for at least 6 hr. Likelihood of early recurrence increased in patients:
- with slow-onset severe reaction resulting from idiopathic anaphylaxis
- with severe asthma
- at risk of continued absorption of allergen
- with previous history of biphasic reactions
- Consider prolonged observation for patients who:
- developed symptoms during night, who may not be able to respond to any deterioration in clinical condition
- live in areas where access to emergency care difficult

DISCHARGE AND FOLLOW-UP

- All patients must be reviewed by a senior clinician before discharge and given clear instructions to return to hospital if symptoms return
- Advise avoidance of allergen if appropriate and management plan to include use of anti-histamines for any allergic symptoms and EpiPen® and 999 call for life-threatening symptoms of dyspnoea or faintness
- Prescribe 2 auto-injector devices containing adrenaline 300 microgram. Instruct patient on when and how to use
- Give patient phone number for SOS Talisman (0208 554 5579) or MedicAlert® (0800 581420/01908 951045) to organise a bracelet with information for those in attendance. Further information can be found at www.sostalisman.co.uk or www.medicalert.org.uk
- Give patient contact details of Anaphylaxis Campaign, 1 Alexandra Road, Farnborough, Hampshire GU14 6BU (01252 546100) www.anaphylaxis.org.uk
- Fax outpatient referral (available on intranet in clinicians/clinical services/Accident & Emergency) to Dr Goddard, clinical immunologist

Instructions for use of EpiPen®

ANAPHYLAXIS ALGORITHM



[1]Life-threatening problems	
Airway	Swelling, hoarseness, stridor
Breathing	Rapid breathing, wheeze, fatigue, cyanosis, SpO_2 <92%, confusion
Circulation	Blotchy and red, clammy, low blood pressure, faintness, drowsy/coma

[2] Adrenaline (IM unless experienced with IV adrenaline)	
IM dose of 1:1000 (repeat after 5 min if no better)	
Dose*	500 microgram IM (0.5 mL)
Adrenaline IV to be given only by experienced specialist Titrate: 50 microgram (using dilute 1:10,000)	

[3] IV fluid challenge	
Dose*	500 mL
Stop IV colloid if this might be cause of anaphylaxis	

	[4] Chlorphenamine (IM or slow IV)
Dose*	10 mg

***Note:** These are adult doses – for children's doses, see **Paediatric guidelines**

ACUTE MYOCARDIAL INFARCTION ● 1/5

RECOGNITION AND ASSESSMENT

Symptoms and signs

- Severe, persistent chest pain
- Dyspnoea
- Fear
- Pallor
- Sweating
- Anxiety
- Peripheral vasoconstriction
- Shock

Investigations

- ECG (see below)
- Locally available cardiac biomarkers of myocardial injury
- Acute coronary artery syndromes comprise myocardial infarction and unstable angina, and are currently distinguished by history, ECG and presence or absence of cardiac biomarkers of myocardial injury
- Raised cardiac biomarkers signify myocardial infarction, not unstable angina
- A raised troponin I concentration can suggest myocardial necrosis but can also occur in a number of other conditions:
  - auto-immune disease
  - congestive cardiac failure
  - critical illness
  - dilated cardiomyopathy
  - extreme physical effort
  - hypertension
  - hypothyroidism
  - multiple injury
  - myocarditis
  - pericarditis
  - pneumonia
  - pulmonary embolism
  - renal failure
  - sepsis/septic shock
  - subarachnoid haemorrhage
  - tachyarrythmias
  - vasculitis
- Plasma cholesterol (within 12 hr of onset of symptoms; otherwise leave for at least 6 weeks)
- Venous blood glucose and HbA_{1c}
- FBC, INR, APTT

IMMEDIATE TREATMENT

- Aspirin 300 mg (chew and swallow)
- Diamorphine 1 mg/min IV until pain relieved, up to maximum 10 mg (5 mg in elderly or frail patients)
- Metoclopramide 10 mg IV over 1–2 min (5 mg in young adults 15–19 yr <60 kg) with ≥8 hr before repeating
- Oxygen – see **Oxygen therapy in acutely hypoxaemic patients** guideline
- Atenolol 5 mg IV (over 5 min) or 50 mg oral daily, **unless contraindicated** – see BNF
- Atorvastatin 80 mg once daily for all acute coronary syndromes, unless history of CKD present. Start with atorvastatin 20 mg once daily if history of CKD
- **Admit** all patients with **acute myocardial infarction (MI)**, or **unstable angina with acute ST depression and/or raised troponin I** to CCU under the care of duty consultant cardiologist
- If ECG shows **ST elevation MI (STEMI**), follow **MANAGEMENT OF STEMI**
- If patient has a **Non-ST elevation MI (NSTEMI)**, follow **MANAGEMENT OF NSTEMI**

MANAGEMENT OF STEMI

- Default strategy for STEMI management for patients presenting within UHNM is primary angioplasty (pPCI)
- Contact on-call cardiology SpR **immediately** for immediate transfer and treatment
- Administer loading dose of aspirin (300 mg oral) if not already given, and either clopidogrel [600 mg oral (unlicensed dose)] or prasugrel (60 mg oral) immediately
  - prasugrel if age <75 yr, weight >60 kg, and no previous TIA/stroke or severe liver impairment
  - clopidogrel if age >75 yr, weight <60 kg or previous stroke or TIA
  - if decision is **not** for primary angioplasty, only give thrombolytic therapy if directed by on-call cardiology service – then follow **Thrombolytic therapy (STEMI)**. Usually a contraindication for primary angioplasty is a contraindication for thrombolysis
- If thrombolysis is to be administered, contact on-call cardiology SpR **immediately** for transfer to ward/CCU

Primary PCI

- Ensure patient loaded with appropriate antiplatelet agents; aspirin 300 mg oral plus prasugrel 60 mg oral **or** clopidogrel 600 mg. Contact on-call cardiology team
- Transfer patient directly to catheterisation laboratory or CCU, after discussion with cardiology SpR

Thrombolytic therapy (STEMI)

Indications

- Presentation within 12 hr of onset of symptoms
- Typical cardiac chest pain persisting for >30 min
- >1 mm ST segment elevation in 2 or more precordial leads or 2 or more bipolar leads OR >1 mm ST segment depression in leads V1–V3 (suggesting acute posterior infarction) OR LBBB with any of the following in leads V1–V3:
  - >1 mm ST segment depression
  - >1 mm ST segment elevation where QRS complex positive
  - >5 mm ST segment elevation where QRS complex negative

Contraindications

- **Absolute:**
  - active bleeding
- **Relative:**
  - major trauma/major surgery within previous 4 weeks
  - stroke/TIA within previous 3 months
  - confirmed subarachnoid haemorrhage at any time
  - traumatic cardiac massage or intracardiac injection
  - known bleeding disorder
  - active dyspepsia or history of GI haemorrhage
  - sustained systolic BP ≥180 mmHg
  - proliferative retinopathy
  - recent head injury
  - pericarditis
  - INR >2.0

Cardiogenic shock and ventricular arrhythmias are not contraindications to thrombolysis. There is no upper age limit for this treatment

Choice of agent

- Standard agent is tenecteplase (Metalyse). Tenecteplase should be administered on the basis of body weight, with a maximum dose of 10,000 units (50 mg tenecteplase) according to the table below

Body weight (kg)	Tenecteplase (Units)	Tenecteplase (mg)	Corresponding volume of reconstituted solution (mL)
<60	6,000	30	6
≥60 to <70	7,000	35	7
≥70 to <80	8,000	40	8
≥80 to <90	9,000	45	9
≥90	10,000	50	10

- Administer by giving unfractionated heparin 5000 units by IV bolus, followed by tenecteplase administered as a single IV bolus over approximately 10 seconds, then give unfractionated heparin 1000 units/hr via infusion pump for 48 hr, adjust dose to maintain APTT ratio 1.5–2.0
- In the elderly (>75 yr) not already given thrombolysis, give streptokinase 1.5 million units in 100 mL of sodium chloride 0.9% by IV infusion over 1 hr
  Streptokinase can be re-administered within 3 days of first administration but, after 5 days, the likely presence of streptokinase antibodies precludes its further use for at least 12 months

Complications

- Hypotension – if occurs *de novo*, review for cardiogenic shock, mitral regurgitation or tamponade. If streptokinase being administered, stop IV infusion and recommence at a slower rate after BP has recovered
- Bradycardia – usually responds to atropine 300 microgram IV
- Ventricular tachycardia or idioventricular rhythm – usually self-limiting and requires no therapy. If sustained – see **Cardiac arrhythmias** guideline
- Avoid arterial puncture, central venous cannulation and IM injections in patients undergoing thrombolytic therapy, unless essential to patient care

MANAGEMENT OF NSTEMI

Treatment of choice for most patients for NSTEMI is inpatient cardiac catheterisation with early revascularisation, either by percutaneous intervention (PCI) or CABG. For patients unlikely to be suitable for an early invasive strategy because of frailty or multiple co-morbidities should have that decision made early and by an experienced clinician Refer to on-call cardiology SpR (07936 182946)

- Prescribe fondaparinux 2.5 mg once daily by SC injection
- Give clopidogrel loading dose 300 mg oral [(600 mg (unlicensed dose) in those who are unstable and likely to require catheter lab management within 24 hr)]

Risk of bleeding is increased in patients with low body weight (<50 kg), physiological frailty, severe liver or renal failure (eGFR <20 mL/min), thrombocytopenia or defective platelet function and following surgery, trauma or haemorrhagic stroke. Seek advice from appropriate team e.g. cardiology, renal, liver or haematology

NON-DIABETIC PATIENTS WITH BLOOD GLUCOSE >11 mmol/L AND ALL PATIENTS WITH DIABETES MELLITUS

- On admission, check blood glucose/HbA1c and, if blood glucose is >11 mmol/L, refer to locally approved guidance for management of hyperglycaemia in ACS patients
- In patients with diabetes/raised blood glucose, seek advice from endocrinologist/diabetes nurses early

SUBSEQUENT MANAGEMENT

- Aspirin 75 mg oral daily (to be continued indefinitely) plus:
  - if STEMI and treated by pPCI with no history of CVA or TIA or cerebral bleed and age <75 yr and weight >60 kg, prasugrel 10 mg daily for 12 months
  - otherwise clopidogrel 75 mg oral daily for 1 year
- Bisoprolol 2.5 mg oral daily, or atenolol 25 mg 12-hrly (to be titrated to maximum tolerated dosage and continued indefinitely)
- If no clinical suspicion of significant mitral/aortic stenosis or hypertrophic cardiomyopathy, plasma creatinine <300 µmol/L and there is no other contraindication to using ACE inhibitor, start ramipril – see **Introduction of an angiotensin-converting enzyme (ACE) inhibitor** guideline. Check electrolytes on day 3–5. Increase titration rapidly to achieve a dose on discharge as near to 10 mg as achievable
- Check statin (atorvastatin) has been prescribed, subject to renal function (see above)
  - give patient information sheet
- If pain persistent, consider glyceryl trinitrate (GTN) infusion – see **Glyceryl trinitrate** guideline, or further dose atenolol 5 mg IV if heart rate >70 beats/min and systolic BP >100 mmHg
- If pain persists, contact duty cardiology team to facilitate transfer to ward/CCU
- Unless complications ensue, recommend early return to physical activity:
  - mobilisation depends on revascularisation strategy, with early mobilisation and discharge by day 3 the norm post STEMI managed with an early invasive strategy

- **Refer all patients to rehabilitation co-ordinator,** who will arrange for **all** suitable patients for assessment by cardiac rehabilitation team as soon as practically possible before discharge
- patients not wishing to join rehabilitation programme – provide appropriate dietary advice
- Refer all patients treated with glucose and insulin infusions to diabetes nurse specialist to confirm presence of diabetes vs stress-induced hyperglycaemia

MONITORING TREATMENT

- Continuous ECG monitoring for 24–48 hr (longer if continuing instability or arrhythmia)
- Measure BP 4-hrly for 24 hr, then twice daily
- Daily 12-lead ECG. Plasma CK and AST on 2 consecutive days, unless troponin I already positive. If troponin is positive, no further cardiac enzyme assessments are warranted
- Observe for specific complications (more likely to occur if patient not re-perfused)

Arrhythmias

- See **Cardiac arrhythmias** guideline (seek further cardiological input)

Cardiac failure

See **algorithm** (seek further cardiological input)

- In patients with left ventricular failure (LVF) or impaired LV function, introduce an ACE inhibitor as soon as this is practical – see **Acute heart failure** guideline
- In patients with significant LVF and/or anterior Q wave infarct, arrange echocardiogram as outpatient, to document LV function and exclude LV aneurysm and/or thrombus

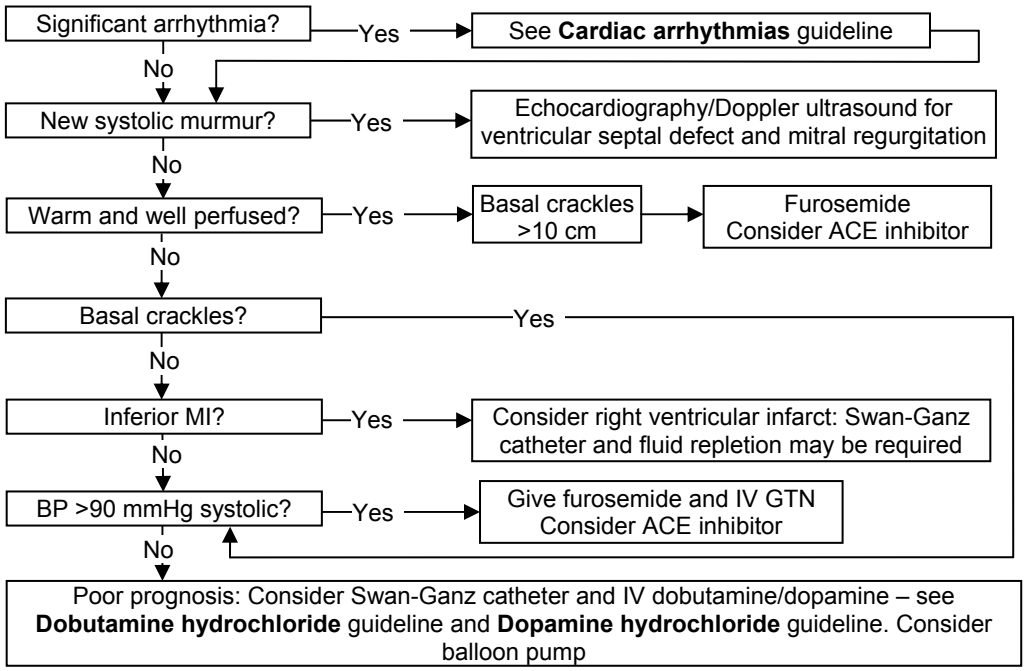
Pericarditis

- More likely after large infarcts (seek further cardiological input)
- Pain with persistent/intermittent pericardial rub 2–5 days after infarction
- Adequate analgesia (may need diamorphine). Give indometacin 25 mg oral 8-hrly if no contraindication (beware fluid retention and antagonism of loop diuretic)

Recurrent ischaemic pain (seek further cardiological input)

- Isosorbide mononitrate SR oral (GTN infusion if necessary **–** see **Glyceryl trinitrate** guideline)
- If persistent chest pain occurs, refer to duty cardiology team for consideration of inpatient stress testing, coronary angiography and possible inpatient revascularisation
- If re-infarction occurs during admission, contact duty cardiology team immediately

Management of cardiac failure after acute MI



Dopamine must only be used in critical care and in the coronary care unit and administered preferably via a central line

DISCHARGE AND FOLLOW-UP

- If no complications, discharge home on day 3–7
- Check risk factors for recurrent MI (e.g. smoking, hyperlipidaemia, hypertension, obesity) and advise or treat accordingly (mortality in first 2 years is doubled in those who continue to smoke and is 3.5-times greater if total cholesterol >6.5 mmol/L)
- Explain graded return to full activity (see advice booklet)
- Where appropriate, ensure patient has climbed stairs to assess for chest pain/shortness of breath
- Ensure advice booklet and chest pain alert card have been issued
- If taking atorvastatin, ensure GP letter regarding intensive statin therapy accompanies patient on discharge
- Warn about post-infarct angina
- Ensure GTN 400 microgram spray for sublingual use has been prescribed TTO and patient has been counselled on use
- Advise not to drive as per DVLA rules and check with insurer (Group 2 drivers must notify DVLA, taxi drivers must notify local council)
- Ensure referral has been made to cardiac rehabilitation team
- Check that rehabilitation plan has been made
- Middle grade in cardiology will be able to review patients who attend as an outpatient at cardiac rehabilitation. Rehabilitation co-ordinator will arrange
- If patient declines cardiac rehabilitation or is unsuitable for programme, refer to cardiology follow-up clinic
- Check that follow-up has been arranged in diabetic clinic for all patients treated with glucose and insulin infusions

Follow-up clinic visit

- Ask about smoking, exercise and weight reduction
- Ask about angina – if occurring, consider referral for angiography
- Look for signs of heart failure and measure BP
- Check cholesterol
- If patient has not been to catheter laboratory, consider treadmill exercise
- Encourage return to work 1–3 months after infarction
- Resume driving 1 month after infarction (except Group 2 drivers)
- Unless there are contraindications, all patients should be taking the following treatment

STEMI

- ACE inhibitor (target dose ramipril 10 mg or equivalent)
- Statin therapy (target dose atorvastatin 80 mg or equivalent, unless history of CKD)
- Beta-blocker (target dose to achieve heart rate of 60 bpm at rest)
- Aspirin (75 mg) indefinitely
- If STEMI and treated by pPCI with no history of CVA or TIA or cerebral bleed and age <75 yr and weight >60 kg, prasugrel 10 mg daily for 12 months
- otherwise clopidogrel 75 mg oral daily **for 1 yr**

NSTEMI

- ACE inhibitor (target dose ramipril 10 mg or equivalent)
- Statin therapy (target dose atorvastatin 80 mg or equivalent, unless history of CKD)
- Beta-blocker (target dose to achieve heart rate of 60 bpm at rest)
- Aspirin (75 mg) indefinitely
- Clopidogrel 75 mg oral daily **for 1 yr**

ACUTE POISONING/DRUG OVERDOSE ● 1/2

GENERAL APPROACH

- Consider drug overdose in any comatose patient aged 15–55 yr
- Identify likely poison(s)/drug(s) – ask patient, paramedics, primary carers and review prescriptions
- Serious overdoses may produce few physical signs e.g. paracetamol
- **Consult Toxbase for advice on ALL poison(s)/drug(s) ingested: www.toxbase.org**
- Subsequent steps remembered by the mnemonic 'Resus-RSI-DEAD'

- **Resus**citation
  - A, B, C, D, E approach
  - seizure control
  - correct hypoglycaemia
  - correct hyperthermia
  - resuscitation antidotes
- **R**isk assessment
- **S**upportive care and monitoring
- **I**nvestigations
  - screening (ECG, paracetamol)
  - specific
- **D**econtamination
- **E**nhanced elimination
- **A**ntidotes
- **D**isposition

The nature and timing of management at each step is guided by the risk assessment

RESUSCITATION

- Assess and manage any immediate threats to airway, breathing, circulation and disability in the resuscitation area
- **Call for early anaesthetic support and consider ITU admission if patient has:**
  - airway compromise (partial or complete obstruction)
  - inadequate oxygenation (persistent hypoxia)
  - inadequate ventilation (hypercapnia) or
  - requires inotropic support
- Seizures, hypoglycaemia and hyperthermia must be detected and treated early to ensure good neurological outcome
- Occasionally, antidotes are useful in resuscitation – check Toxbase: www.toxbase.org
- Cardiac arrest from toxicological causes may require prolonged resuscitation and extracorporeal life support should be considered

RISK ASSESSMENT

- Aims to predict the clinical course and potential complications
- Ascertain the following information and consult Toxbase for management advice:
  - agent(s) – including modified release preparations (check body for patches)
  - dose(s)
  - time since ingestion
  - current clinical status
  - patient factors (weight, co-morbidities)
- Agent, dose and time since ingestion should correlate with patient's current clinical status. If not, revise the risk assessment
- If details are unclear assume the worst-case scenario and monitor patient closely
- Early recognition of trivial poisoning allows patient and family to be reassured and unnecessary investigations, interventions and observation abandoned
- Closely observe patients with active suicidal intent
- Record a physical description of patient in notes in case patient absconds

ACUTE POISONING/DRUG OVERDOSE ● 2/2

SUPPORTIVE CARE AND MONITORING

- Monitor conscious level, temperature, respiration, pulse and BP regularly until they return to normal. Request cardiac monitoring for those at risk of cardiac arrhythmia
- Supportive care alone is required for most acutely poisoned patients
- Consider requirements for:
- fluids/feeding
- analgesia
- sedation
- thromboprophylaxis
- head of bed elevation – to minimise risk of aspiration and enhance effective respiration in those with reduced conscious level
- ulcer prophylaxis
- glycaemic control
- Withhold any regular medication that might enhance toxic effects

INVESTIGATIONS

- ECG and paracetamol level are the only routine screening tests needed
- Blood gases and acid-base – if conscious level is impaired
- Further tests are required as indicated by the specific presentation/poison/drug ingested – refer to Toxbase
- Urine toxicology screens are of little use in the acute setting

DECONTAMINATION, ENHANCED ELIMINATION AND ANTIDOTES

- Gastrointestinal decontamination procedures aim to reduce absorption of the ingested agent
- Gastric lavage and induction of emesis are of no proven benefit
- Give activated charcoal by mouth or nasogastric (NG) tube to patients who have ingested a life-threatening amount of a toxic agent and who present **within 1 hr** of ingestion. Activated charcoal does **not** affect absorption of all substances – always refer to Toxbase
- dose aged >12 yr: 50 g
- dose aged <12 yr: 1 g/kg (max 50 g)
- The risks of complications (e.g. aspiration of charcoal) must be considered in those with depressed conscious level
- Enhanced elimination techniques (multiple-dose activated charcoal, haemodialysis, charcoal haemoperfusion and manipulation of urinary pH) may be required in a minority of cases. Refer to Toxbase for details. Discuss cases with **National Poisons Information Service (0844 892 0111)** if haemoperfusion may be required
- Antidotes only exist for a few specific poisons – refer to Toxbase for details

DISPOSITION

- Patients need to be admitted to an environment capable of providing an appropriate level of monitoring and supportive care (and occasionally specific antidote or enhanced elimination therapies)
- **Emergency Department CDU**: Low risk ingestions (including paracetamol poisoning without evidence of hepatotoxicity) – discuss individual cases with ED senior doctor
- **Acute Medical Unit:** Significant overdoses requiring monitoring and active treatment
- **Intensive Care Unit**: Consider admission to HDU/ITU for high risk ingestions or persistent coma, hypotension or respiratory depression. Request ED senior review

Psychosocial assessment

- For all patients admitted after acute self-poisoning or deliberate drug overdose, follow the steps on the self harm proforma (available in A&E, AMU and short stay ward). This will enable you to decide whether to refer to the RAID team, the CRISIS team or to discharge patient for GP review

DISCHARGE POLICY

- **When discharged from hospital patients should have:**
- been conscious and alert with normal vital signs for at least 6 hr
- no evidence of significant organ dysfunction as a result of poisoning/drug toxicity

ACUTE STROKE ● 1/8

DEFINITION

- Stroke is a neurological deficit of sudden onset:
  - with focal rather than global dysfunction
  - with symptoms still present (if <24 hr) **or** lasting >24 hr, **or** resulting in death before 24 hr
  - in which, after adequate investigation, symptoms are presumed to be of a non-traumatic vascular origin

RECOGNITION AND ASSESSMENT

Treat all patients with symptoms at time of assessment as a stroke, even if minor or improving. Diagnose TIA only if symptoms have completely resolved

Causes of stroke

- **Ischaemic**: large-artery atherosclerosis, small vessel atherosclerosis, cardioembolism, carotid/vertebral dissection and rarer causes: consider especially in younger patients: drugs, vasculitis, infection, sickle cell disease, polycythaemia, haematological condition, sarcoidosis, metabolic disorder – homocystinuria
- **Haemorrhagic**: intracranial, subdural, and subarachnoid haemorrhage

STROKE SYNDROMES

Infarct subtypes[1] (infarcted territory)	Symptoms and signs
Total anterior circulation syndrome (TACS) [involving both deep and superficial middle cerebral artery (MCA) territory]	• New higher cerebral dysfunction (e.g. dysphasia, dyscalculia, visiospatial disorder)[2] **and** • Homonymous visual field defect[2] **and** • Hemiparesis/hemisensory loss affecting at least 2 body areas (2 out of face, arm and leg)
Partial anterior circulation syndrome (PACS) [more restricted cortical infarcts in the MCA territory, including isolated infarctions in the anterior cerebral artery (ACA) territory and striatocapsular infarctions]	• Patients presenting with only 2 of the 3 components of the TACS **or** • Motor/sensory deficit restricted to face or arm or leg
Lacunar syndrome (LACS) (small lacunar infarcts in the basal ganglia or pons)	• Pure motor, pure sensory or sensori-motor deficit **or** • Ataxic hemiparesis (with at least faciobrachial or brachiocrural involvement)[3]
Posterior circulation syndrome (POCS) (infarcts in brainstem, cerebellum and/or occipital lobes)	• Ipsilateral cranial nerve palsy with contralateral motor and/or sensory deficit • Bilateral motor and/or sensory deficit • Disorder of conjugate eye movement • Cerebellar dysfunction without ipsilateral hemiparesis • Isolated homonymous visual field defect

1 As defined by Oxfordshire community stroke project

2 Assume a deficit present if consciousness is impaired and higher cerebral functions or visual fields cannot be tested formally

3 Acute focal movement disorders should probably also be included in this group

Differential diagnosis

- Acute medical problem exacerbating effects of an older established stroke
- Arterial dissection (look out for Horner's syndrome, neck and face pains, whiplash injury, neck trauma)
- Seizures/Todd's paralysis
- Migraine
- Functional
- Subarachnoid haemorrhage, extradural haemorrhage, subdural haemorrhage
- Space-occupying lesion
- Meningitis/encephalitis
- Metabolic (e.g. hypoglycaemia, hyponatraemia)
- Toxic (e.g. overdose)
- Anoxic encephalopathy (e.g. shock, arrhythmia)
- Trauma

ACUTE STROKE CARE PATHWAY

- The ambulance service should pre-alert the stroke team with key patient details (name, date of birth, onset time, expected time of arrival, and contact number of ambulance crew)
- Commence Stroke pathway (yellow forms in A&E or download directly from http://www.thrombolysis.info)
- Take a detailed history (use telephone if necessary) to accurately ascertain onset time to stroke to determine appropriate hyper-acute treatments e.g. thrombolysis
- If an inpatient develops symptoms or signs raising strong suspicion of an acute stroke, arrange immediate CT head scan (plain) via OrderComs and inform radiology SpR. Inform stroke team immediately via bleep 74734

Urgent investigations

- **Immediate CT head scan** – **do not delay –** it is paramount that CT scan is done quickly
- if fit and independent, no contraindications to contrast, significant neurological deficit (NIHSS >7) and within <8 hr of onset and no haemorrhage, order CT angiogram (arch to Circle of Willis) together with plain CT scan to be performed if no signs of established infarction found on CT head scan
- If occlusion of a major intracerebral or extra cerebral artery identified, discuss immediately with stroke consultant of the day
- Consider ENCHANTED, study within 4.5 hr of onset and ECASS-4/Wake-up to 9 hr
- Glucose, U&E, FBC, INR, random cholesterol, LFT, CRP
- if patient on warfarin obtain INR urgently (use point of care device for immediate results)
- ECG

IMMEDIATE TREATMENT

Ischaemic stroke

Patient eligible for thrombolysis within 4.5 hr of presentation

- **Start thrombolysis** immediately if indicated, use care pathway (pink forms in A&E or download directly from http://www.thrombolysis.info)
- **In patients with contraindications to IV thrombolysis** (e.g. post-operative, postpartum), or with severe stroke i.e. proximal MCA thrombus or basilar thrombus, **consider thrombectomy** (arrange CT angiogram – see thrombolysis pathway) – working hours bleep via call centre/out-of-hours call stroke consultant of the day via call centre
- In previously fit and independent patients with occlusions the CCA, ICA, M1, M2, ACA, basilar artery, or PCA – consider mechanical thrombectomy if within 4.5 hr of symptom onset. Alert stroke nurse (74734). Call consultant of the day, anaesthstetist and consultant radiologist. Do not delay thrombolysis, this can be arranged once treatment has been started. **For patients too late for thrombolysis** (4.5–8 hr) ECASS-4 or Wake-up stroke trial
- Bleep research nurse (74739) within hours and bleep 15998 after hours/weekends. If no response or out-of-hours, call 74734 or stroke consultant of the day
- In patients who have been thrombolysed, do not give antiplatelets for 24 hr

Patients not eligible for thrombolysis/too late at presentation beyond 8 hr

- Give antiplatelet, aspirin 300 mg oral, rectal or via nasogastric tube immediately once CT head scan excludes haemorrhage
- Transfer patient to acute stroke unit (ASU) as soon as possible within 4 hr of arrival. Bleep 74734 or ring extension 76232 immediately to assist with this
- If urgent senior advice is required, call stroke physician of the day via call centre

Intracranial haemorrhage

- **For patients with** intracerebral, subdural, subarachnoid haemorrhage, carry out point-of-care INR, check full clotting screen and reverse immediately (even with prosthetic valves)
- Consider for TICH-2 trial for intracerebral haemorrhage
- Reverse anticoagulation with FXa inhibitors (rivaroxaban, apixaben, edoxaban, betrixaben) with adexanet alfa (stock kept in A&E) and enrol into ANNEXA-4 study
- Reverse anticoagulation with dabigatran with idarucizumab (stock kept in A&E)
- Only refer to neurosurgeons if haemorrhage is subdural, cortical, or subarachnoid

Patients on warfarin

- In **intracranial haemorrhage**, reverse anticoagulation immediately (within 3 hr or less), aiming for INR of 1.0 (**even in patients with mechanical heart valves**)
- give Vitamin K_1 (phytomenadione) 5 mg IV immediately as slow bolus
- Contact on-call consultant haematologist to order dried prothrombin complex (e.g. Octaplex or Beriplex) and correct INR as soon as possible within 3 hr (including patients with prosthetic valves)
- In patients with prosthetic valves and disabling cerebral infarct, stop warfarin for 1 week and replace with aspirin 300 mg once daily

General measures

Hypoxia

- **Check and clear airway.** If oxygen saturation falls to <95% in spite of this, give supplemental oxygen. See **Oxygen therapy in acutely hypoxaemic patients** guideline

Fluids

- **Do not catheterise** unless patient in urinary retention
- In patients who are nil-by-mouth, dehydrated or at risk of dehydration, give sodium chloride 0.9% (unless contraindicated) within the first 48 hr, then follow **Fluid maintenance** guideline

Pyrexia (temperature >37.2°C)

- Look for source of infection and treat as indicated

Hyperglycaemia

- Maintain blood glucose between 4–11 mmol/L. See **Control of hyperglycaemia in the ill patient** guideline

Blood pressure

- Correct hypotension and try to prevent BP from falling
- **Do not** lower BP acutely unless >220/120 mmHg
- **In intracranial hemorrhage, use GTN infusions and/or labetalol IV to lower blood pressure rapidly (within 1 hr) to ≤140/80 and maintain this level for 7 days**

Statin

- **If on statin** before stroke, continue
- Immediate initiation of statin treatment not recommended in acute stroke, delay start by 48 hr
- Use atorvastatin 20 mg/day. Consider switching patients on simvastatin to atorvastatin, as this has less risks of adverse interactions. Simvastatin is contraindicated in combination with clarithromycin and restricted to ≤20 mg in patients taking amlodipine. Refer to BNF for all other interactions

Prevention of deep venous thrombosis/pulmonary embolism

- Mobilise (out of bed) on day of admission
- Adequate hydration
- Start antiplatelet therapy as soon as CT head scan has excluded intracerebral haemorrhage
- For all patients not able to mobilise to the toilet independently apply intermittent pneumatic compression stockings (e.g Kendall SCD™ express sequential compression system, Covidien, MA, USA) day and night for first 30 days, until mobile, or until discharged from acute care (whichever comes first)
- stockings may be removed temporarily during therapy, when mobilising, and while out of the ward for diagnostic tests
- Do not use compression stockings
- Do not use heparin/dalteparin routinely (e.g. for age and stroke related immobility or infections alone)
- Consider heparin if patient has non-stroke related increased risk of thromboembolism (e.g. cancer, thrombophilia, past history of thromboembolism, post-operative stroke) since with increasing stroke severity both risk of thromboembolism and haemorrhagic complications increases and there is no evidence of an overall benefit on mortality and recovery

Oral health

- For patients who are nil-by-mouth, use chlorhexidine gluconate 1% dental gel or toothpaste for oral hygiene 8-hrly
- Keep dentures in during the day in all patients (unless very loose and safety risk)

Fracture prevention

- If stroke patient likely to remain housebound, or discharged to an institution, prescribe calcium and vitamin D

Specific syndromes

Acute venous stroke (cerebral sinus venous thrombosis)

- In patients with cerebral sinus venous thrombosis (including those with secondary cerebral haemorrhage) start full dose anticoagulation (initially unfractionated heparin, then warfarin aiming for target INR 2–3) unless contraindicated by other concurrent conditions

Stroke secondary to acute arterial dissection

- Use either anticoagulants or antiplatelet agents

Advice

- Ask for senior/specialist advice about:
- patients in whom unusual cause for stroke suspected (call stroke consultant of the day)
- intracerebral haematoma (do not refer automatically, discuss with stroke consultant whether neurosurgical referral is needed)
- hydrocephalus (bleep neurosurgical team)
- Research related queries: during working hours (including Saturday and Sunday), call 74739 or pager 15998, and via switchboard after hours

CAUSES OF DETERIORATION

Malignant MCA syndrome

- If deterioration of consciousness within first 48 hr National Institute of Health Stroke Scale (NIHSS) item 1a ≥1 (e.g. drowsy patient) in patients with large MCA territory infarcts (NIHSS score >15), consider malignant MCA syndrome
- Arrange urgent CT head scan and discuss with stroke consultant of the day (contact via call centre in working hours) or on-call stroke thrombolysis consultant via call centre after hours
- signs on CT of an infarct of at least 50% of the middle cerebral artery territory with/without additional infarction in the territory of the anterior or posterior cerebral artery on the same side, or an infarct volume of >145 cm^3 on diffusion-weighted MR scan of brain confirm the diagnosis
- Untreated malignant MCA syndrome has 80% mortality but hemicraniectomy within first 48 hr has been shown to reduce mortality significantly – consider urgent referral to neurosurgery (within 24 hr) to allow surgery within 48 hr. Refer early, **do not wait** for midline shift on head CT scan or abnormal pupillary responses
- In patients who are potential candidates for hemicraniectomy, avoid mannitol or hypertonic saline. This may mask signs of deterioration and delay surgery inappropriately

Other brain causes

- Stroke progression/further stroke – highest risk in minor strokes/TIAs: make sure secondary prevention is in place from day 1
- Brain oedema (especially in large parietal strokes)
- Progression of intracerebral haemorrhage – if deterioration in neurological signs/level of consciousness after admission, re-scan immediately and refer to neurosurgeons for advice (unless there are good reasons not to consider surgery). Recheck INR and correct, if necessary
- Haemorrhagic conversion (especially in large infarcts or in thrombolysed patients)
- Cerebral emboli, or vasculitis
- Hydrocephalus (especially in cerebellar strokes or in patients with intracerebral haemorrhage, refer previously fit patients to neurosurgery)

Action

- Treat as emergency
- Confirm by repeating NIHSS score (in yellow pathway). An increase of ≥4 points indicates clinically significant deterioration. Repeat head CT scan and seek senior advice
- Review differential diagnosis
- Consider: MR, EEG (for possible encephalitis or epilepsy), lumbar puncture

Non-brain causes

- Complications – see **COMPLICATIONS**
- Coincident medical condition (e.g. hypoxia, hypoglycaemia, hyperglycaemia, pyrexia, infection, heart failure, fluid/electrolyte disturbance) – see relevant guidelines

SUBSEQUENT MANAGEMENT

Ensure stroke team aware of all patients with stroke not admitted to stroke unit. Members of stroke team will assess patient and arrange transfer to stroke unit, if other concurrent conditions allow

General

- Allow patient to sit up as tolerated (bed/chair) as soon as possible
- Mobilise conscious patients from day 1
- If no haemorrhage on CT, give aspirin 300 mg oral, rectal or via nasogastric tube for 2 weeks unless contraindicated. In patients with previous dyspepsia, add proton pump inhibitor. In patients genuinely allergic to, or intolerant of aspirin, use clopidogrel 300 mg stat followed by 75 mg once daily. After 2 weeks, or when considering discharge, change to clopidogrel 75 mg/day (or warfarin for patients in AF) indefinitely
- Ensure patients who are nil-by-mouth receive all necessary medication (use rectal, IV or nasogastric tube)
- Treat pyrexia (temperature >37.5°C) with paracetamol 1 g oral or rectal 6-hrly
- Avoid sedatives (e.g. temazepam, chlorpromazine, haloperidol)
- Young patients with intracerebral haemorrhage may have an operable vascular abnormality. Request neurosurgical assessment

Further investigations

General

- If random glucose >7.5 mmol/L, request fasting glucose
- Lipid status (<48 hr after stroke or after 6 weeks)
- Chest X-ray

For specific indications

- In patients with cardiac murmurs and/or history of rheumatic fever, and/or no risk factors for atheroma, consider echocardiography to exclude a cardiac source of embolism
- Request bubble contrast echocardiogram in young patients (age <55 yr) with stroke and no vascular risk factors and no cardiac or arterial sources of embolism to exclude atrial septal defect (ASD)/patent foramen ovale (PFO)
- if positive for ASD/PFO, no other cause for the stroke identified (cryptogenic), and aged <55 yr refer to cardiology for consideration of closure
- In patients with no risk factors for atheroma, screen for arteritis (CRP, ANA, ANCA, Rh Factor)
- In young patients with stroke and no atherosclerosis/risk factors, investigate for thrombophilia
- FBC: exclude polycythaemia, thrombocytosis, sickle cell disease (where indicated), lupus anticoagulant, anticardiolipin antibodies, JAK-2 mutation studies: to exclude myeloproliferative disorders, fasting homocysteine levels
- Only in cases with a PFO or patient has a venous thrombosis (concurrent PE, cerebral sinus thrombosis), check protein C, protein S, Factor V Leiden and PT gene mutation. Send sample which will be frozen and stored in the lab (for 6 months). If necessary, stroke team will liaise with Dr Deepak Chandra on a case by case basis
- In younger stroke patients (age <55 yr) and those without vascular risk factors, consider CT or MR angiography to exclude dissection
- In patients without vascular risk factors where the diagnosis is in doubt, consider MR (DWI) scan of brain with ADC mapping to confirm an infarct/show potential alternative pathology, or demonstrate normality. Discuss with neuro-radiologists for protocol (working hours only)
- If several repeated scans considered necessary to exclude recurrent silent ischaemic events, consider MR scan in preference to CT, to reduce radiation exposure

Fluid and nutrition management

Assess swallowing at bedside

- Check patient is:
  - alert and co-operative
  - able to sit up for feeding
  - able to cough on demand
  - not drooling excessively
- Sit patient up, listen to voice and give 5 mL of water on a spoon
- Watch and feel swallow with fingers on larynx
- Observe for 2 min, looking for:
  - choking or impaired breathing
  - delayed swallow
  - cough
  - change of voice
- If 5 mL swallowed without difficulty, give 50 mL of water before giving soft diet
- If there is any doubt about swallowing, recommend nil-by-mouth, give fluid (2 L/24 hr) IV/SC and ask speech therapist or stroke team to assess swallowing – see **Fluid maintenance** guideline

Tube feeding

- In patients with severe strokes and dysphagia, start nasogastric feeding within 24 hr (unless expected to die within hours)
- Prescribe metoclopramide 10 mg 8-hrly (5 mg if <50 kg body weight) via nasogastric tube for 3 weeks or until nasogastric feeding no longer required (whichever occurs earlier)
- In mild strokes, where normal swallow expected to return, review after 48 hr and, if dysphagia still present, pass nasogastric tube
- Where a standard nasogastric tube cannot be kept in place safely and reliably, consider a nasal bridle
- Refer patients with persistent dysphagia after 3 days for dietary advice and consider further investigation (e.g. video fluoroscopy)
- If NG tube not tolerated and patient unable to take sufficient nasogastric/oral diet for 3 or more days, refer urgently for PEG (percutaneous endoscopic gastrostomy)
- If nasogastric feeding successful but no significant recovery of swallowing occurs, consider referral for PEG within 4 weeks
- If there is some recovery of swallowing and nasogastric feeding successful, PEG referral may not be necessary, continue nasogastric feeding until patient able to eat normally

Rehabilitation

- Admit all stroke patients to acute stroke unit and start active rehabilitation on day 1
  - unless consciousness impaired, sit out and mobilise from day 1
- Full multidisciplinary assessment; include nurses, occupational therapist, physiotherapist, doctors, speech and language therapist and clinical psychologist to identify rehabilitation goals. Involve dietitian, social worker, pharmacist, other medical or surgical specialties, at a later date, as necessary

Quick recovery

- If patient recovers rapidly and is left with no significant residual disability after a few days, arrange for urgent carotid Doppler (within 1 working day) and make sure secondary prevention (see below) is in place (12% of patients with minor strokes will extend or have a further stroke within one week)

Secondary prevention

Manage patients with antiphospholipid syndrome who have an acute ischaemic stroke in the same way as patients with acute ischaemic stroke without antiphospholipid syndrome

General

- Advise to stop smoking
- Give dietary advice
- Advise to exercise regularly
- Identify and treat diabetes. Keep HbA_{1c} below 7%

Antiplatelet treatment or anticoagulation

- Aspirin: once haemorrhage excluded by CT, unless contraindicated, 300 mg/day for 2 weeks or until discharge. In patients with history of dyspepsia, add proton pump inhibitor – refer to hospital formulary for choice of PPI. After 2 weeks, or at discharge, change to clopidogrel 75 mg/day indefinitely
- in patients allergic to, or genuinely intolerant of aspirin, use clopidogrel 300 mg stat followed by 75 mg once daily. If allergic to both aspirin and clopidogrel, give dipyridamole MR 200 mg 12-hrly
- Warfarin: for all patients with atrial fibrillation/flutter (AF) who have no contraindications
- 2 weeks after stroke, start slow induction dose of warfarin (no need to achieve rapid anticoagulation). **For stable patients in good health,** see **Warfarin initiation** guideline**: Slow anticoagulation.** For frail, malnourished, multimorbid patients or those on multiple other medications, discuss warfarin starting regimen with stroke consultant since lower doses may be required. Use **OATES regimen** – see **Warfarin initiation** guideline
- once INR >2, stop aspirin, clopidogrel and dipyridamole
- In mild non-disabling stroke, start warfarin between day 2 and day 14. In severe disabling stroke, delay start of anticoagulation to 14 days or longer
- In patients who have recurrent strokes/TIAs on warfarin, who are unable to comply with warfarin, or where INR is out of therapeutic range for >60% of the time consider changing to newer anticoagulants (e.g. dabigatran, rivaroxaban, apixaban)

Other medication

- If non-HDL cholesterol >4.0 mmol/L, give atorvastatin 20 mg/day at night starting 48 hr or later after stroke. Check levels after 3 months and adjust dose to reduce level by 40%. Review annually
- Aim for a non-HDL cholesterol of <4 mmol/L. Patients with atrial fibrillation and a Chads score ≥1, and contraindications to warfarin and to the newer non-vitamin K antagonist anticoagulants should be referred to cardiology for consideration of atrial appendage closure
- Stop contraceptive pill/hormone replacement therapy [unless there is an important reason to continue (e.g. premature ovarian failure)]. In premenopausal women, provide advice on alternative methods of contraception
- Reduce blood pressure to a target of ≤130/80 mmHg starting within 24 hr of minor stroke/TIA and within 2 weeks of moderate to severe stroke
- start treatment slowly – use indapamide 1.5 mg MR [for patients with dysphagia, use 2.5 mg plain tablets, as they can be crushed (unlicensed)] daily in morning and ACE inhibitor or a calcium channel blocker

COMPLICATIONS

Pneumonia after starting oral fluids

- Reassess swallowing, treat as **Hospital-acquired pneumonia** unless diagnosed on admission

Urinary retention

- Relieve by in and out catheter, record drained volume
- Monitor bladder volume by bladder scan, intermittent catheterisation as needed
- Check for faecal impaction and treat
- If retention recurrent, start tamsulosin MR 400 microgram/day. For patients with nasogastric tube *in situ,* doxazosin tablets may be crushed (unlicensed). **Do not use in patients where the blood pressure lowering effect could be a problem**
- Avoid indwelling catheter

Deep venous thrombosis/pulmonary embolism

- If CT head scan has excluded haemorrhage, treat in usual way – see **Deep venous thrombosis** and **Pulmonary embolism** guidelines
- In patients with haemorrhagic stroke and symptomatic DVT/PE, discuss anticoagulation or placement of a caval filter to prevent (further) pulmonary embolism with consultant

Shoulder pain

- Prevent by not pulling on the affected arm and always supporting its weight
- Maintain correct position and adequate support, consult physiotherapist, consider paracetamol
- For subluxation, consider functional electrical stimulation
- If pain persists, consider addition of NSAIDs, supraspinal nerve block, TENS or intra-articular corticosteroids

Depression

- Treat conventionally

Seizures

- Treat conventionally

Pressure sores

- Treat diarrhoea effectively, prevent hypotension, ensure adequate nutrition, check that pressure relief adequate. Involve tissue viability team

DISCHARGE

Acute stroke unit provides information packs for patients and carers, and will assist in discharge planning and arrangements for continued outpatient rehabilitation. They will also contact stroke family support worker where needed

- Use multidisciplinary stroke checklist to ensure all secondary prevention measures are in place and follow-up arranged
- Consider referral to the early supported discharge team
- Consider and record whether a joint care plan with social services is required
- Discharge summary must contain:
- diagnosis including OCSP class and NIHSS score at admission and on discharge
- thrombolysed/not thrombolysed
- details of any clinical trial patient taking part in
- advice for secondary prevention
- driving advice
- NIHSS on discharge, level of dependence, mobility
- Give patient a copy of the discharge summary

Patient and relatives

- Check for hemianopia and hemi-inattention in all drivers. This is not always obvious to patient and disqualifies from driving until resolved
- Give driving instructions verbally and in writing
- do not drive for 1 month and inform insurance of stroke
- if back to normal within 1 month and no recurrence, patient may drive again
- if persistent deficit or recurrence, patient must inform DVLA and await assessment by a doctor
- Ensure patient and relatives are aware of diagnosis, discharge date, follow-up arrangements and secondary prevention measures

FOLLOW-UP

- Follow-up at 6 weeks, 6 months, and annually
- first follow-up in a specialist hospital clinic. Further follow-ups can be carried out by stroke-trained teams in the community (if available)
- Assess functional status (Rankin), continence, pain, mood, cognition, and barriers to return to work, leisure activities and driving in clinic and refer as appropriate
- Include risk factor assessment and instructions for secondary prevention (refer to stroke check list) in discharge documentation

MANAGEMENT OF ALCOHOLIC KETOACIDOSIS (AKA) ● 1/2

AIMS

- To identify patients with alcoholic ketoacidosis
- To initiate treatment of patients with alcoholic ketoacidosis

BACKGROUND

- Occurs in chronic alcohol excess, with a recent history of binge drinking, and subsequent abrupt cessation of alcohol consumption 1–2 days before presentation
- Predisposing factors
  - ↓insulin and ↑glucagon secretion due to starvation
  - alcoholism
  - volume depletion from vomiting and poor oral intake
- AKA results from accumulation of ketoacids, hydroxybutyric acid and acetoacetic acid
- Characterised by:
  - metabolic acidosis with a high anion gap (pH <7.35, low bicarbonate, low pCO_2)
  - severe vomiting may deplete chloride and have metabolic alkalotic effect, masking severity of AKA
  - urinary ketones
  - normal/low glucose

RECOGNITION AND ASSESSMENT

Symptoms and signs

- Nausea, vomiting +/- haematemesis
- Diarrhoea +/- melaena
- Abdominal pain
- Muscle pain
- Dizziness, syncope +/- seizure
- Tremor
- Shortness of breath
- Stigmata of alcohol excess or alcoholic liver disease
- Tachycardia (+/- hypotension)
- Tachypnoea (+/- ketosis)
- Impaired mental status
- Hypothermia

Possible underlying conditions

- GI bleed
- Pancreatitis

Differential diagnosis

- Diabetic ketoacidosis
- Lactic acidosis
- Acute renal failure
- Pancreatitis
- Mesenteric ischaemia
- Poisoning: ethylene glycol, methanol, salicylate

Investigations

- FBC
- INR
- If melaena/haematemesis: group and save
- U&E
- Arterial blood gases
  - calculate anion gap
- Blood ketones
- LFT
- Glucose
- Magnesium
- Phosphate
- Lactate (likely high)
- If epigastric pain, amylase
- If evidence of aspiration or perforation suspected, chest X-ray

MANAGEMENT OF ALCOHOLIC KETOACIDOSIS (AKA) ● 2/2

Complications

- Seizure
- Delirium tremens
- Shock
- Cardiac arrhythmia or arrest
- Infection

TREATMENT

- Give Pabrinex IV High potency injection **one pair** of ampoules (mixed) by IV infusion in sodium chloride 0.9% 100 mL over 30 min
- if clinical symptoms of Wernicke's encephalopathy, give Pabrinex IV High potency injection **two pairs** of ampoules (mixed) by IV infusion in sodium chloride 0.9% 100 mL over 30 min
- Correct dehydration and starvation status with infusion of sodium chloride 0.9% with glucose 5%
- Correct any electrolyte imbalance
- Hypokalaemia and hypophosphataemia are frequently present on admission or occur following fluid therapy
- Treat any other underlying condition (e.g. GI bleed/pancreatitis)
- Monitor for signs of alcohol withdrawal – see **Alcohol withdrawal** in **Medical** guidelines
- If pH<7.1 after adequate fluid therapy, consider bicarbonate therapy
- Admit to medical ward

ANGIOEDEMA IN ADULTS ● 1/1

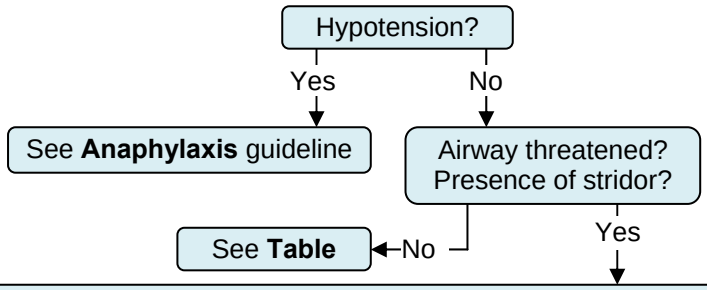
DEFINITION

Swelling of subcutaneous and submucosal tissue usually associated with urticaria and lasting 1–3 days. Angioedema occurring in isolation may be caused by angiotensin converting enzyme inhibitors (ACEi) or hereditary angioedema (HAE), and is bradykinin-mediated

IMMEDIATE TREATMENT

- See **Algorithm**

Algorithm for immediate treatment



- **Non-hereditary angioedema:**
  - adrenaline 500 microgram (0.5 mL of 1:1000) IM (not IV) into anterolateral aspect of thigh, repeat if necessary at 5 min intervals according to heart rate, BP and airway. Consider salbutamol 5 mg via oxygen driven nebuliser (see **Table**)
- **ACE inhibitor-induced angioedema (no urticaria):**
  - icatibant 30 mg SC (relatively contraindicated in pregnancy, stroke or MI)
- **Hereditary angioedema:**
  - C1-esterase inhibitor (Berinert®) 20 units/kg (actual body weight), round up dose to whole number of vials give by IV injection over 5 min
- If no response to C1 inhibitor after 60 min consider icatibant 30 mg SC
  - if C1-esterase inhibitor unavailable, give FFP 1–2 units IV (less desirable)

Table: Angioedema management

Aetiology	Acute management	Further management
Allergic or IgE mediated • Occurs within 1 hr of exposure to allergen	• Chlorphenamine 10 mg IM or **slow** IV injection **or** cetirizine 10 mg oral • if no improvement after 15 min seek senior review • Hydrocortisone 100 mg IM or **slow** IV **or** • Prednisolone 30–40 mg oral once daily in morning (consider 3 day course and use of gastro-protection)	Avoid allergen, management plan for accidental exposure
ACE inhibitor-induced • May not respond to steroids or antihistamines		Stop drug, can have recurrent angioedema for some months after ACEi
Idiopathic • Recurrent allergic type reactions often early morning		• Consider regular anti-histamine e.g. cetirizine 10 mg once daily • Avoid ACEi
Hereditary (or rarely acquired) • May not respond to steroids, antihistamines or adrenaline	For severe abdominal pain give: • C1-esterase inhibitor (Berinert®) 20 units/kg (actual body weight), round up dose to whole number of vials give by IV injection over 5 min • If C1-esterase inhibitor unavailable, give FFP 1–2 units IV (less desirable)	• Complement C4 levels (collected clotted sample) to make diagnosis, refer to clinical immunology • Avoid ACEi and oestrogens

SUBSEQUENT MANAGEMENT

- Allergic cause identified: advise avoidance of allergen and give management plan for accidental exposure [anti-histamine +/- EpiPen® Auto-injector 0.3 mg (300 micrograms IM repeated after 5–15 min as necessary) in those who experience angioedema with airway difficulties]
- If life-threatening refer to clinical immunology
- If no allergic cause identified and no life-threatening features, then follow up with GP if recurrent. Acute idiopathic angioedema and urticarias common

MANAGEMENT OF ATRIAL FIBRILLATION/FLUTTER • 1/3

RECOGNITION AND ASSESSMENT

- Treat patient first and arrhythmia second. AF may represent a coincidental finding in many emergency presentations e.g. sepsis
- A 12-lead ECG is required for accurate diagnosis
- Mode of presentation dictates urgency of assessment and treatment

Symptoms, signs and investigations

- Palpitations
- Dyspnoea
- Syncope/dizziness
- Chest discomfort
- Stroke/TIA
- Irregular pulse
- Tachycardia/bradycardia
- Signs of heart failure

Investigations

- 12-lead ECG
- U&E and TFT
- Urgent K+ level: check heparinised venous blood sample using blood gas analyser
- Check APPT and INR

IMMEDIATE TREATMENT

Choice of treatment dependent on:

- Haemodynamic stability
- Duration of AF/flutter
- Co-morbidities e.g. structural heart disease, uncontrolled thyroid disease
- Stroke risk
- **There are 2 strands to effective management of AF:**
  - rhythm/rate control
  - thromboembolic risk reduction

Rhythm control

Indications

- Haemodynamic instability (if known permanent AF and haemodynamic instability mainly due to poorly controlled ventricular rate: consider **rate control** strategy)
  - life-threatening: proceed to DC cardioversion immediately
- AF present for <24 hr: heparin and proceed to DC cardioversion
- AF present for 24–48 hr: heparin and request urgent cardiology review for transoesophageal echocardiography (TOE) and cardioversion
- Wolf Parkinson White (WPW) syndrome: low molecular weight heparin (LMWH) and proceed to DC cardioversion

DC cardioversion

- Preferred option for rhythm control in the emergency setting
- Fast patient for >3 hr (unless life-threatening haemodynamic instability)
- Request anaesthetic support
- Place pads in anterior-posterior position
- Select synchronized shock at appropriate energy setting
  - atrial flutter: start at 50 Joules
  - atrial fibrillation: start at 100 Joules
- Cardiac monitoring until patient has fully recovered. Ensure a post-cardioversion 12-lead ECG is recorded
- Look for cause (infection/pyrexia, abnormal TFT/U&E, previous abnormal echo, alcohol excess)
- Ensure post sedation advice given and documented
- Arrange follow-up: OrderComs AF/arrhythmia nurse service if not under current cardiology follow-up
- If unsuccessful or patient unsuitable for sedation/anaesthesia, anticoagulate with LMWH and discuss with cardiology on-call

MANAGEMENT OF ATRIAL FIBRILLATION/FLUTTER • 2/3

Rate control

Indications

- Known permanent or persistent AF
- AF with fast ventricular response of unknown onset or duration of >48 hr
- Caution:
- known (or possible) cases of WPW syndrome must be discussed with cardiology on-call before commencing drug therapy
- systolic BP <100 mmHg – consider DC cardioversion

Treatment

- **Unstable patient:** either
- where heart failure is a clinical issue, or if frail elderly, start amiodarone – see **Amiodarone** guideline **or**
- beta-blocker if systolic blood pressure >100 mmHg (atenolol 2.5 mg IV at 1 mg/min, may be repeated at intervals of 5 min to maximum of 10 mg)
- if lower BP consider esmolol
  - load: 0.5 mg/kg IV over 1 min, then
  - maintenance: start 0.05 mg/kg/min IV for 4 min – may increase by 0.05 mg/kg up to 0.2 mg/kg/min
  - if HR/BP not controlled after 5 min, repeat bolus (i.e. 0.5 mg/kg/min for 1 min), then initiate infusion of 0.1 mg/kg/min IV
  - may administer 3rd bolus if needed, then a maintenance infusion of 0.15 mg/kg/min IV
  - higher maintenance doses may be required, up to 0.25–0.3 mg/kg/min (max dose) OR
- A rate limiting calcium channel blocker (verapamil 2.5 mg IV over 3 min, may be repeated at intervals of 5 min to maximum of 10 mg)

Do not use both beta blocker and calcium channel blocker

- **Stable patient:** oral medications are preferred. **Either** bisoprolol 2.5–10 mg/atenolol 50–100 mg or a rate limiting calcium antagonist (diltiazem 60 mg 8-hrly). **Do not use both beta and calcium channel blocker**
- If rate does not fall sufficiently, add digoxin – see **Digoxin** guideline
- If further clinical deterioration, consider DC cardioversion or amiodarone – see **Amiodarone** guideline
- If unwell refer to cardiology for further care
- If patient stable, requiring only rate control, consider observation in CDU otherwise refer to AMU – discuss with ED senior

Thromboembolic risk reduction

- Sustained or paroxysmal AF or flutter, consider appropriate thromboembolic risk reduction
- Consider anticoagulation with one of the newer anticoagulants (DOAC) or warfarin, consider patient choice
- If requiring anticoagulation ensure referral to anticoagulation clinic is completed with CHA_2DS_2VASc score. Give yellow anticoagulation book, discuss options with patient and record in medical record
- See new oral anticoagulation guidelines: http://uhns/media/575342/150212%20At_a_glance_AF_anticoagulation_guide_FINAL_v1.0_Jan2015.pdf
- The decision whether to anticoagulate is patient-specific, guided by weighing the risk of thromboembolic stroke against the adverse risk of bleeding
- Assess the risk of stroke, using the CHA_2DS_2VASc score
- Assess the risk of major bleeding from anticoagulation (a bleed requiring hospital admission, a blood transfusion or causing stroke) by the HAS-BLED score
- If patient receiving clopidogrel for coronary stent, DO NOT DISCONTINUE, contact cardiology SpR

MANAGEMENT OF ATRIAL FIBRILLATION/FLUTTER • 3/3

CHA_2DS_2VASc score

Add 1 point for each category, except 2 points for previous stroke/TIA and age ≥75 yr

C	Congestive heart failure (or LVEF <40%)	1
H	Hypertension (ever, treated/untreated)	1
A	Age ≥75 yr	2
D	Diabetes mellitus	1
S	Stroke/TIA	2
V	Vascular disease (MI, peripheral vascular disease, complex aortic plaque)	1
A	Age 65–74 yr	1
S	Sex female	1
	Score 0 or female 1	**No antithrombotic therapy**
	Score 1 male	**Consider DOAC or warfarin**
	Score ≥2	**Offer DOAC or warfarin unless contraindicated**

HAS-BLED score. Add 1 point for each of the following categories:

H	Hypertension (systolic >160 mmHg)	1
A	Abnormal renal function (chronic dialysis, transplant, serum creatinine ≥200 µmol/L)	1
	Abnormal liver function (chronic hepatic disease or biochemical evidence (e.g. bilirubin >2x upper limit of normal plus AST/ALT/alk phos >3x upper limit of normal)	1
S	Stroke	1
B	Bleeding (history or predisposition e.g. diathesis, anaemia)	1
L	Labile INR (unstable/high INR)	1
E	Elderly (age >65 yr)	1
D	Drugs or alcohol (e.g. NSAIDs, antiplatelet agents, or alcohol abuse)	1 or 2
	Score ≥3	**Bleeding risk high. Caution and regular review following start of DOAC or warfarin**

- In considering whether to start warfarin or DOAC, discuss with patient and carers the risks and benefits, need for regular therapy and, in the case of warfarin, INR checks
- HAS-BLED scoring assesses bleeding risk. A score of ≤3 indicates low bleeding risk. However, a score of >3 does not mean patients are contraindicated for warfarin but caution and closer monitoring is required

How to anticoagulate

- DOAC – see SPC for each drug. Available via: http://www.medicines.org.uk/emc/
- Warfarin – see **Warfarin initiation** guideline: **slow anticoagulation**

If a decision is made not to anticoagulate the patient, document the reason in the notes

MANAGEMENT OF FALLS IN A&E AND WARDS ● 1/3

RECOGNITION AND ASSESSMENT

- Falls are common in the elderly and may be the presenting symptom of an acute illness
- Causes are generally multifactorial with a considerable overlap between falls and syncope
- It is difficult to rule out syncope because patient may have no memory of the event and there may be no eye witness accounts – see **Transient loss of consciousness (blackout/syncope)** guideline

Risk factors

- Gait and balance impairment
- Reduced muscle strength
- Reduced visual acuity
- Cognitive impairment
- Drugs – polypharmacy, sedatives/hypnotics, antidepressants, neuroleptics, diuretics, class 1 anti-arrhythmics, alcohol, anti-cholinergics
- falls are more likely to occur in patients taking any of these agents alone, in combination, or because of interactions with other drugs
- Predisposing conditions – Alzheimer's disease, stroke, Parkinsonism, peripheral neuropathy, arthropathy, depression, visual impairment, cardiac failure
- Environmental hazards – poor lighting, loose carpets, lack of safety equipment, poorly fitting shoes or clothes

History

Circumstances of fall

- Obtain an eye witness account if possible
- Ask for information that may suggest:
- syncope
- vertigo
- dizziness
- unsteadiness
- seizures

Consequences of the fall

- Time spent on floor
- Injuries sustained

Document any risk factors

- Medications that can precipitate postural hypotension (see **Risk factors** above)
- History of falls, including previous fractures
- Impaired mobility
- Fear of falling
- Poor vision
- Incontinent of urine
- Confirmed dementia

Social history

- Carer support
- ? Lives alone
- Environmental hazards

Examination

Cardiovascular

- Check for postural drop (after standing for 3 min) of 20 mmHg in systolic BP or 10 mmHg in diastolic BP. If drop confirmed, review diuretic therapy, antihypertensive medications and major tranquillizers
- Presence of arrhythmias
- Structural heart disease
- Heart failure

Neurological

- Evidence of head injury
- Glasgow Coma Score
- Vision
- Muscle strength
- Tone
- Lower extremity peripheral nerves

- Proprioception
- Extrapyramidal and cerebellar function

Cognitive assessment

- **Six item cognitive impairment test (6 CIT) –** see **Delirium (acute confusional state) in older people** guideline

Locomotor

- Evidence of hip fracture or other bony injury
- Presence of muscle wasting
- Leg ulcers
- Deformities

INVESTIGATIONS

- FBC, U&E
- ECG
- Urinalysis
- Imaging – to identify injuries or acute illness

RISK ASSESSMENT

- In A&E nursing staff will complete Adults Falls Risk assessment

IMMEDIATE TREATMENT (IN A&E)

- Treat injuries

Acute medical problems

- Commence treatment and refer to appropriate medical team (e.g. cardiology for acute MI or stroke team for new stroke)
- If patient meets North Midlands Frailty criteria for frail elderly and requires admission, request elderly care bed

North Midlands Frailty criteria
• Aged >65 yr and 1 of the following: ◦ confusion/dementia/delirium ◦ residential home/nursing home resident ◦ falls with low trauma fracture, not requiring surgery ◦ Parkinson's disease ◦ more than 3 falls in 3 months
• Aged >85 yr with an illness that is not better served by a single organ specialism

- If syncope suspected, see **Transient loss of consciousness (blackout/syncope)** guideline
- If no acute medical problem and patient not independently ambulant, refer to physiotherapy. Consider referral to intermediate care team for supervision at home or, if necessary, in an intermediate care bed
- For A&E patients being discharged home who are at **high** risk of falls, if there is a YES answer to any of the 4 falls risk screening questions, explain this in the A&E summary letter
- If medical team feel further outpatient investigation or attendance at a Falls programme required, refer patient to SSOTP Falls service based at Longton health centre, Drayton Road, Longton If medical team feel further outpatient investigation or attendance at a Falls programme required, refer patient to SSOTP Falls service based at Longton Health Centre, (telephone: 0300 123 0995 extension 4422/4277, fax: 01782 828570)
  - complete a falls service referral form available on Trust intranet>Elderly care>Falls section and fax to number above
  - include relevant medical history
  - reason for referral and information about recent falls and falls-related injuries
  - details of known contributing factors (medical history etc.)

SUBSEQUENT MANAGEMENT AFTER ADMISSION

- Ward nursing staff to complete Adults Falls Risk Assessment in Proud to Care booklet, for all patients. They then proceed to determine a falls prevention care plan; this includes a list of interventions
- Item 6 on this list includes a medication review, which needs to be completed by medical or pharmacy staff; doctors to review treatment and assess if any drugs should be stopped or reduced e.g. antidepressants, night sedation, antipsychotics, and antihypertensives

Investigations

Cardiovascular

- If aortic stenosis or hypertrophic obstructive cardiomyopathy (HOCM) suspected, echocardiogram
- 24 hr tape if:
  - bradycardia
  - first degree atrioventricular block
  - right bundle branch block (RBBB) and left axis deviation
  - second or third degree atrioventricular block
  - recurrent episode of loss of consciousness, with no features of epilepsy
- If inpatient echo and 24 hr tape have been requested, it is the responsibility of the doctor who ordered the test to forward the results to the GP, when they become available, even if this is after discharge
  - if abnormalities on 24 hr tape, cardiology referral may be needed
- If an EEG has been done and is suggestive of epilepsy, refer to First seizure clinic (see **First seizure** guideline)

Osteoporosis assessment

- History of fragility fractures or frequent falls:
  - bone biochemistry
  - TFT
  - if serum corrected calcium low or high, plasma parathyroid hormone (PTH)
  - if osteomalacia suspected, check serum vitamin D_3
- Women ≥75 yr and men of any age with suspected osteoporosis but no history of fragility fracture:
  - DEXA (bone density) scan

Perform full multifactorial assessment

Drugs

- Use RCP guidance re medications that may cause falls – available on Trust intranet>elderly care>falls
- Polypharmacy, especially if patient taking one or more of the following:
  - cardiovascular drugs
  - insulin or oral hypoglycaemic agents
  - hypnotics
  - psychotropic drugs
- Alcohol can increase risk of falls in elderly patients

Environment

- Refer to occupational therapy

Neurovascular problems

- Gait and balance – refer to physiotherapy

Living arrangements

- Social work referral

Specialist referral

- Depending on clinical findings, refer to appropriate specialist

Recurrent falls

- Unless patient has moderate-severe dementia, refer to SSOTP Falls service

When a patient falls in hospital

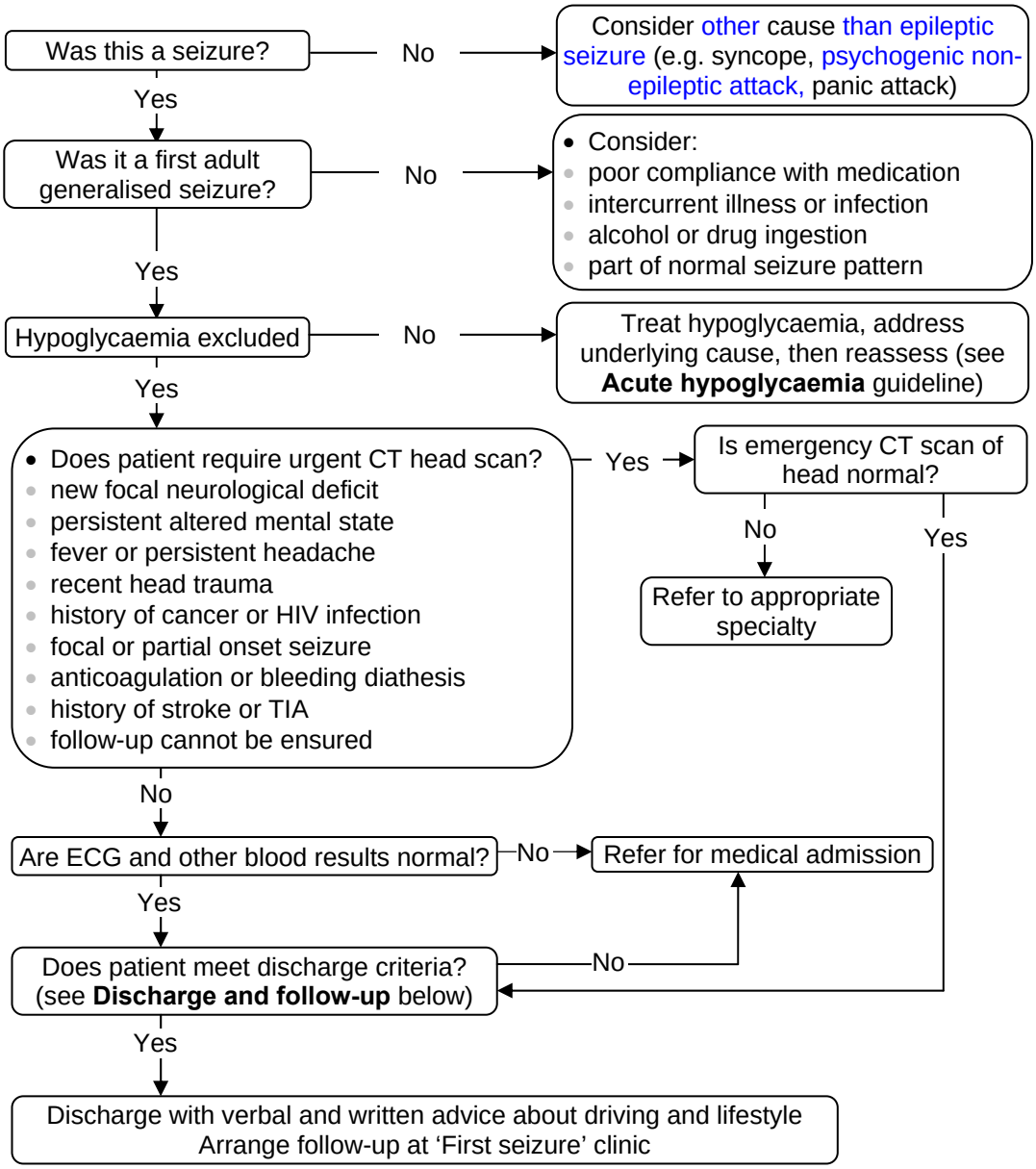
- Complete a post falls proforma to document that the patient has had an appropriate review after the fall. Copies are available on all wards
  - ward nurse to complete top section of form
  - bottom section requires completion by a doctor or advanced nurse practitioner to ensure all interventions required have taken place

FIRST SEIZURE ● 1/3

Approximately 5% of the population will experience at least 1 non-febrile seizure during their lifetime

- **Do not use this guideline for patients presenting with:**
  - known epilepsy
  - seizures related to head trauma
  - seizures related to eclampsia
  - status epilepticus – see **Status epilepticus** guideline

FLOWCHART SUMMARY – for detail, see guideline



RECOGNITION AND ASSESSMENT

Symptoms and signs

Before

- Provoking factors include:
  - sleep deprivation
  - acute alcohol or substance intoxication
  - alcohol withdrawal
- Prodromal symptoms of seizures often bizarre and hard for patients to describe

FIRST SEIZURE ● 2/3

During

- Several conditions can mimic an epileptic seizure – see **Differential diagnosis**. Where possible, obtain eyewitness accounts
- Symptoms/signs that may be present:
  - myoclonic jerking
  - tonic-clonic movements
  - **lateral** tongue biting (biting tip of the tongue or the cheek is not suggestive of a generalised seizure)
  - incontinence (not specific and can occur in any type of collapse in patient with full bladder)

After

- Generalised epileptiform seizures usually followed by a period of at least 10 min (often more), when patient truly confused (post-ictal state). They almost always have amnesia for this period
- Other symptoms (e.g. headache and aching limbs) are more suggestive of seizure than syncope

Differential diagnosis

Differential diagnosis	Symptoms

Vasovagal episode	• Loss of consciousness, usually provoked (e.g. pain)
	• Presyncopal symptoms include:
	  ◦ dizziness
	  ◦ nausea
	  ◦ clamminess
	  ◦ 'feeling faint'
	• Rapid recovery of awareness

Electrolyte abnormalities	• Hypoglycaemia • Hyponatraemia • Hypo- or hypercalcaemia • Uraemia

Cardiac syncope	• Causes include:
	  ◦ ischaemia
	  ◦ Wolff–Parkinson–White (WPW) syndrome
	  ◦ long-QT syndrome
	  ◦ bradycardia
	  ◦ tachycardia
	  ◦ structural heart disease (e.g. aortic stenosis)
	• Syncope can occur with or without cardiac symptoms
	• A Stokes–Adams attack is classically associated with pallor followed on recovery by flushing

Carotid sinus hypersensitivity	• Rare • Usually in an elderly patient • Precipitated by head turning or pressure on neck (e.g. shaving)
Hyperventilation	• Anxiety • Paraesthesia of perioral region or extremities • Palpitations • Chest pain
Postural hypotension	• Within 3 min of standing, systolic BP falls to <90 mmHg or falls by >20 mmHg

Examination

- Look for any injury sustained, including evidence of lateral tongue biting
- Full neurological examination
- Auscultation of heart for murmurs
- Stigmata of other conditions associated with seizures (e.g. chronic liver disease/alcoholism, café-au-lait spots suggesting neurofibromatosis)

Investigations

- Blood glucose
- U&E
- Serum corrected calcium
- FBC
- If alcoholism suspected, LFT
- ECG
- CT scan of head if:
- new focal neurological deficit
- persistent altered mental status
- fever or persistent headache
- recent head trauma
- history of cancer or HIV infection
- focal or partial onset seizure
- anticoagulation or bleeding diathesis
- history of stroke or TIA
- follow-up cannot be ensured

IMMEDIATE TREATMENT

- None required
- Inappropriate use of diazepam can result in unnecessary admission if seizure had already resolved spontaneously, and can cause respiratory depression
- Do not start anticonvulsant therapy before seeking advice from neurology SpR or consultant

If focal neurological abnormalities found or CT scan abnormal, contact on-call neurology SpR while patient in A&E for advice about further action to be taken

DISCHARGE AND FOLLOW-UP

See flowchart

- Admission necessary only if:
- patient remains drowsy or comatose
- neurological examination abnormal
- investigation results abnormal
- patient at high risk of further seizures (e.g. alcohol withdrawal)
- patient cannot be supervised by a responsible adult
- Refer to clinical nurse specialist in epilepsy for further assessment at neurology outpatient 'First seizure' clinic

Advice to patients

- Advise patient to stop driving and to inform DVLA. Record this advice explicitly on casualty card
- following first and single epileptic seizure, Group 1 entitlement drivers (motor cars and motorcycles) may restart driving after 6 months if agreed by appropriate specialist and no abnormality found (e.g. EEG and brain scan normal)
- if any pathology exists, refrain from driving for 1 yr before subsequent medical review
- Patients should inform their employer that they have had a seizure in order to fulfill the requirements of Health and Safety at Work legislation
- Advise patient to return to A&E if a further episode occurs
- Issue contact number for clinical nurse specialist to obtain further advice or to query outpatient appointment at 'First seizure' clinic

HEADACHE ● 1/2

All doses are for adults unless stated. For children please refer to children's BNFC

BACKGROUND

- Most headaches are due to primary disorders (e.g. migraine, tension, cluster) or associated with mild systemic infection
- Life threatening causes occur in a small minority of patients (secondary headache)

RECOGNITION AND ASSESSMENT

History and examination

- A good history is vital to prevent misdiagnosis
- Determine if history suggestive of secondary headache
- Elicit presence of red flag features (see **Table**)
- If aged >50 yr: elicit symptoms and signs of giant cell arteritis
- Previous neurosurgical procedures e.g. CSF shunt *in situ*, aneurysm clipping/coiling
- Neurological assessment: conscious level, cognition and full neurological and gait examination
- Full physical assessment including temperature and blood pressure
- associated stigmata of infection [fever, neck stiffness, photophobia, confusion or systemic inflammatory response syndrome (SIRS)]

Characteristics of secondary headache

- New onset, unremitting and progressively worsening headache
- Red flag features (see **Table**)
- Following clinical syndromes suggest serious secondary causes of headache
- acute thunderclap headache: rapid time to peak headache intensity (seconds to ~1 min)
- acute severe headache (time to peak >5 min) plus red flag features
- progressive, worsening headache (over weeks) plus red flag features

Red flag features	
• New abnormal neurological features (focal or non-focal)	• New onset aged >50 yr
• Change in normal headache frequency, characteristics or associated symptoms	• Symptoms of raised intracranial pressure (headache precipitated by a trigger e.g. cough, strain, sneeze), altering with posture or early morning onset
• Seizures	• Altered behaviour or encephalopathy
• Systemic illness (e.g. fever, neck stiffness, photophobia, confusion, SIRS)	• HIV
• History of cancer	• Known anticoagulant use or coagulopathy
• Known CSF shunt *in situ*	-

Characteristics of primary headache

- In the absence of features suggesting secondary cause of headache, migraine is most likely cause for severe symptoms

Migraine

- May start at any age (peak incidence in early to mid-adolescence)
- Characterised by recurrent episodes of headache with >2 of following:
- moderate or severe pain
- unilateral pain
- throbbing nature
- aggravation on movement
- plus **1** of: nausea + vomiting or phonophobia + photophobia
- Combination of features required for diagnosis but may vary between episodes
- 30% of patients may experience transient neurological symptoms, typically <1 hr duration
- Headache episodes typically last 4–72 hr (>72 hr if status migrainosus)

Cluster headaches

- Attack of severe, strictly unilateral pain which is orbital, supraorbital, temporal regions or any combination of these sites
- associated with ipsilateral autonomic features (conjunctival injection, nasal congestion, lacrimation, facial sweating, eye lid oedema, ptosis or miosis)
- Patients are typically restless during episode

Investigations

- Unless patient has features suggesting a possible secondary cause for their headache, investigations are not indicated acutely. Discharge patient to the care of GP

Investigations to evaluate possible secondary headache

If GCS<15 seek senior EM opinion before CT scanning

- Acute thunderclap headache: CT brain scan, if normal, perform LP to assess opening pressure and CSF for xanthochromia (>12 hr after symptom onset). See **Lumbar puncture** in **Medical** guidelines
- SAH indicated by CT brain scan or presence of xanthochromia – see **Subarachnoid haemorrhage** in **Medical** guidelines
- central venous sinus thrombosis: normal CT brain scan and no xanthochromia but raised opening pressure on LP – request CT venogram and refer to neurology
- Headache associated with stigmata of infection – see **Meningitis** in **Medical** guidelines
- Red flag features with acute severe headache (time to peak >5 min) OR progressively worsening headache:
- CT brain scan
- if giant cell arteritis suspected and aged >50 yr, ESR and CRP

IMMEDIATE TREATMENT

Do not use response to analgesia to exclude secondary cause

Secondary causes of headache

- Treat underlying abnormality (see appropriate guideline where indicated)
- Giant cell arteritis – see **Visual loss** guideline
- Record pain assessment and administer suitable analgesia

Primary headache disorders

Migraine

- Guide treatment by response to previous treatment and severity of attack. Patient's standard therapy may not give a consistent response across all attacks
- if not already used/contraindicated, prescribe aspirin 900 mg oral (dispersible) or ibuprofen 400–600 mg oral
- if nausea/vomiting present and no contraindication, prescribe anti-emetic (metoclopramide 10 mg IV or domperidone 60 mg PR)
- if treatment with analgesic inadequate, prescribe a specific anti-migraine compound – rizatriptan 10 mg oral (contraindicated if on beta-blockers; propranolol significantly increases the concentration of rizatriptan)
- in resistant cases, discuss with neurology

Cluster headaches

- Duration: typically ranges 15–180 min
- Treatment: high flow oxygen (8–15 L/min via reservoir mask) and sumatriptan 6 mg SC
- Refer to neurology

REFERRAL

- If all investigations normal, refer to GP for follow-up
- Patient education – advise patient to:
- reduce/eliminate alcohol and tobacco
- keep headache diary: frequency, time of onset, duration, triggers, treatments used and relieving factors

HYPOTHERMIA IN OLDER PEOPLE ● 1/3

RECOGNITION AND ASSESSMENT

An older person's ability to recognise and to respond both physiologically and practically to cold may be impaired. Hypothermia (core temperature: mild 35–32°C; moderate 31.9–30°C; severe <29.9°C) usually occurs in the presence of other acute or chronic illness, which can obscure its diagnosis. A high level of suspicion of an underlying illness is required. Although much more common in winter, hypothermia can occur at any time of year

Symptoms and signs

In mild cases, patient may complain of being cold but this is not reliable

- Symptoms of a precipitating condition (see **Causative conditions**)
- Shivering may be present in mild cases but is usually absent in severe cases
- Skin (abdomen, inner thigh, axilla) cold, mottled and feels like marble
- Face may appear puffy and myxoedematous
- Muscle rigidity, absent deep reflexes and extensor plantars may be found
- Depressed respiration
- Bradycardia with underlying sinus rhythm or atrial fibrillation
- Hypotension
- Confusional state (delirium)
- Apathy
- Coma when temperature <32°C

Investigations

- Measure core body temperature with tympanic thermometer

Blood

- FBC, U&E, INR
- Troponin I
- **NB**: venous blood pools and may give erroneous results for the above laboratory measurements
- Blood glucose (may be high but falls during rewarming – see **Monitoring**)
- Thyroid function tests
- Blood culture – see **Collection of blood culture specimens** guideline
- Arterial blood gases – remember to enter core temperature into analyser

Other

- Urinalysis
- ECG (may show characteristic J wave on the down stroke of the R wave, best seen in leads II and V6, or QT_c prolongation)
- Chest X-ray (looking for pneumonia, aspiration, pulmonary oedema)

Consider associated/causative conditions

- Hypothyroidism
- Hypopituitarism
- Hypoadrenalism
- Stroke
- Epilepsy
- Parkinson's disease
- Fractures
- Drug overdose
- Dementia
- Pneumonia
- Myocardial infarction
- Over-sedation
- Drug-induced (alcohol, barbiturates, phenothiazines, lithium, tricyclics, opioids)
- Heart failure
- Head injury

IMMEDIATE TREATMENT

Supportive treatment

- Special mattress (to prevent pressure sores)
- If hypoxaemic, give controlled oxygen therapy – see **Oxygen therapy in acutely hypoxaemic patients** guideline
- If pneumonia suspected – see **Community-acquired pneumonia** guideline

Warming

- Nurse at room temperature of 25–30°C
- Warm with blankets (remember to cover head and neck); if available, use Bair Hugger™ (forced air re-warming) blanket

Critical care unit (CCU)

- Transfer to CCU may not be appropriate for some older people with hypothermia unless there are other clinical indications for this, as outcome may not be affected

SUBSEQUENT MANAGEMENT

- Most patients will improve spontaneously without further active treatment
- Avoid unnecessary interventions and movement (these can precipitate cardiac arrhythmia)
- Identify and treat other predisposing factors

Prognosis poor if patient fails to warm. High risk of death if temperature <30°C

- If re-warming fails in moderate-severe hypothermia (<32°C), consultant to consider use of warm IV fluids – IV fluid warmer in A&E, or given via a heated infusion pump. **Never warm IV fluids in microwave.** Observe temperature, pulse, BP every 15 min and with continuous cardiac monitoring

Hypothermia protects against cerebral hypoxia so continue cardiac arrest procedures for longer than usual, if necessary until core temperature reaches 37°C

Multidisciplinary team assessment

- Once re-warming started in A&E, ensure patient admitted straight to an elderly care bed for assessment by full multidisciplinary team

MONITORING TREATMENT

Hourly (if patient requires active re-warming, every 15 min)

- Core temperature with tympanic thermometer. Aim to raise by 0.5–1°C/hr, for mild hypothermia
- For moderate to severe hypothermia aim to re-warm at 1°C/hr
- pyrexia after re-warming does not necessarily indicate infection
- If temperature rises by >1°C/hr, cool by removing blankets to maintain peripheral vasoconstriction
- Heart rate and rhythm (continuous cardiac monitoring)
- bradycardia and AV block can occur and may require temporary pacing
- ventricular ectopics are suppressed by cold and may appear during warming
- BP
- Respiration
- Glucose
- treat hypoglycaemia with glucose infusion – see **Acute hypoglycaemia** guideline
- do not treat hyperglycaemia with insulin unless blood glucose persistently >30 mmol/L – insulin is ineffective in the hypothermic state and should not be used unless re-warming is very slow

2-hrly

- pH (until core temperature >35°C)
- If hypoxaemic or acidotic, $PaCO_2$

COMPLICATIONS

- Paralytic ileus
- Gastric dilatation
- Respiratory failure
- Cardiovascular collapse
- Oliguria
- Gastric ulceration
- Pancreatitis
- Aspiration pneumonia

DISCHARGE AND FOLLOW-UP

- Assess cognitive state immediately before discharge by doing a 6 CIT score – if cognitive impairment is noted, consider referral to RAID team while patient still in hospital or advise GP in the discharge summary to refer to memory clinic
- If patient lives alone, ensure they can summon help by telephone or Care Line
- Ensure home is adequately heated
- Ensure patient and family are aware of risks of hypothermia

INVESTIGATION OF PLEURITIC CHEST PAIN ● 1/2

RECOGNITION AND ASSESSMENT

Typically sharp or stabbing chest pain exacerbated by deep inspiration or movement

Clinical assessment

History

- Breathlessness
- Symptoms suggestive of infection
- Haemoptysis
- Collapse
- Recent trauma or unaccustomed exercise
- Risk factors for pulmonary embolus
- History of sickle cell anaemia

Examination

- Temperature
- Pulse and blood pressure
- SpO_2 and respiratory rate
- See **Differential diagnosis table** for clinical features associated with specific conditions

Differential diagnosis

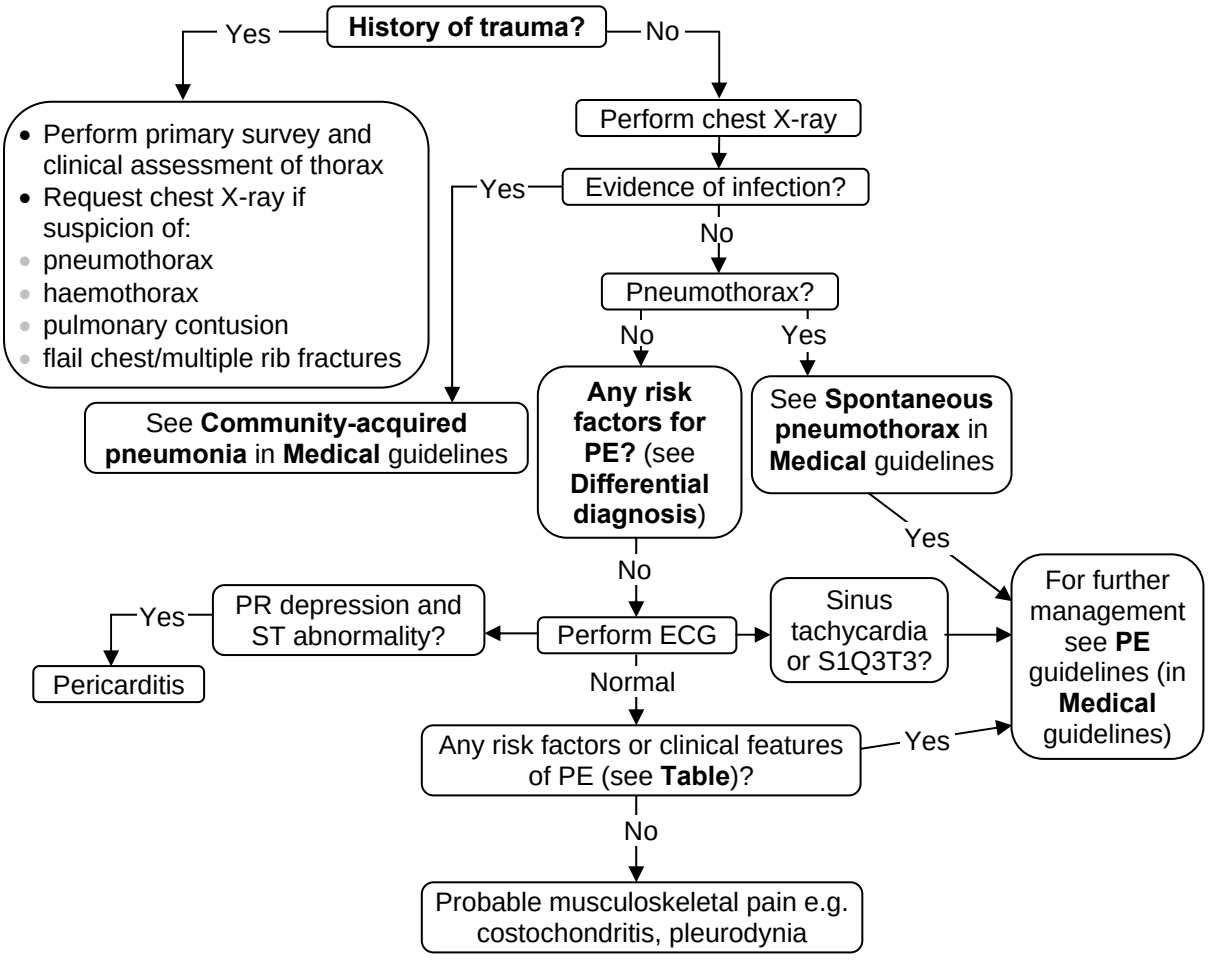
(Note: list not exhaustive)

Diagnosis	Risk factors	Clinical features
Chest injury	• Chest trauma	• Chest wall tenderness, bruises or crepitus • Reduced air entry, crepitations
Costochondritis (Tietze's syndrome)	• Unaccustomed exercise	• Chest wall tenderness, +/- localised oedema
Pericarditis	• Viral illness • Recent myocardial infarction • Rheumatoid arthritis • SLE • Uraemia • TB	• Low grade fever (may be absent) • Malaise, myalgia • Chest pain – worse on lying flat (eased by sitting forward) and during swallowing • Shortness of breath • Friction rub (often transient) • ECG changes: ST elevation (saddle), PR depression – may be absent
Pleurodynia (Bornholm's disease)	• Recent/current viral infection	• Recent/current viral infection • Low grade fever may be present
Pneumonia	• Extremes of age (infants and >65 yr) • Immunodeficiency • Diabetes • Smoking • Alcoholism • Recent hospitalisation or surgery • Chest trauma	• Dyspnoea • Fever and rigors • Cough and purulent sputum • Malaise, myalgia and sore throat • Tachypnoea and low SpO_2 • Confusion • Tachycardia • Localised crepitations or bronchial breathing
Pneumothorax	• Smoking • COPD • Previous pneumothorax • Asthma	• Sudden onset of symptoms • Dyspnoea • Resonance on percussion • Reduced breath sounds
Pulmonary embolism (PE)	• Aged >49 yr • Trauma or major surgery requiring hospitalisation in the last 4 weeks • Previous proven DVT or PE • Exogenous oestrogen use • See **PE** guidelines (in **Medical** guidelines)	• Heart rate >99 beats/min • Low SpO_2 <95% • Haemoptysis • Syncope and collapse • Unilateral leg swelling
Sickle cell acute chest syndrome	• Sickle cell disease	• Low grade fever • Cough (dry/yellow sputum) • Tachycardia • Dyspnoea

IMMEDIATE TREATMENT

- Adequate analgesia for pleuritic pain – paracetamol alone is unlikely to be adequate
  - if not contraindicated, and patient well hydrated, no history of peptic ulcer disease or chronic renal failure and not taking ACE inhibitor: give indometacin 25–50 mg oral 8-hrly for 5 days or diclofenac 75–150 mg in 2–3 divided doses
  - if patient pregnant, give codeine phosphate 30–60 mg 6-hrly. If pain remains uncontrolled consider morphine sulphate 10 mg oral 4-hrly
- If SpO_2 <96%, follow **Oxygen therapy in acutely hypoxaemic patients** guideline
- Therapy should be directed at treating the underlying cause – see relevant **Medical** guidelines for management of **PE, Pneumonia, Pneumothorax** and **Sickle cell disease**

Flowchart



AIM

- To improve outcomes for adult patients presenting with sepsis or developing sepsis whilst an inpatient
- Early identification and intervention to save lives, reduce hospital stay and need for critical care admission
- For neutropenic sepsis in cancer patients – see **Neutropenic sepsis** guideline
- For sepsis management in children – see **Paediatric** guidelines
- For peri-natal sepsis – see **Obstetric** and **Neonatal** guidelines

DEFINITIONS

- **Sepsis** – a life-threatening organ dysfunction due to dysregulated host response caused by an infection. It is a medical emergency
- **Organ dysfunction –** an acute increase in total Sequential Organ Failure Assessment (SOFA) score by ≥2 points consequent to infection (see **Table 1**) which has been used in critical care as a guide to predict sepsis-related morbidity and mortality
- **Septic shock** is associated with a higher risk of mortality (>40%) and refers to patients with sepsis who:
- remain hypotensive despite adequate fluid resuscitation and require vasopressors to maintain a mean arterial pressure (MAP) ≥65 mmHg
- have persistently elevated serum lactate (≥2 mmol/L)

Table 1: Sequential organ failure assessment (SOFA)

Organ	Measure	0	1	2	3	4
Respiratory	PaO_2/FiO_2	≥53.3	<53.3	<40	<26.7	<13.3
Coagulation	Platelets ($x10^9$/L)	≥150	<150	<100	<50	<20
Liver	Bilirubin (µmol/L)	<20	20–32	33–101	102–204	>204
Cardiovascular	MAP (mmHg)	≥70	<70		NA ≤0.1*	NA >0.1*
CNS	GCS	15	13–14	10–12	6–9	<6
Renal	Creatinine (µmol/L)	<110	110–170	171–299	300–400	>440

FiO_2 = Inspired oxygen concentration (%)
*NA = noradrenaline, dose in µg/kg/min

SCREENING

- All patients who have a NEWS ≥5 (or) any individual NEWS element ≥3, screen for sepsis by completing Trust Sepsis Proforma

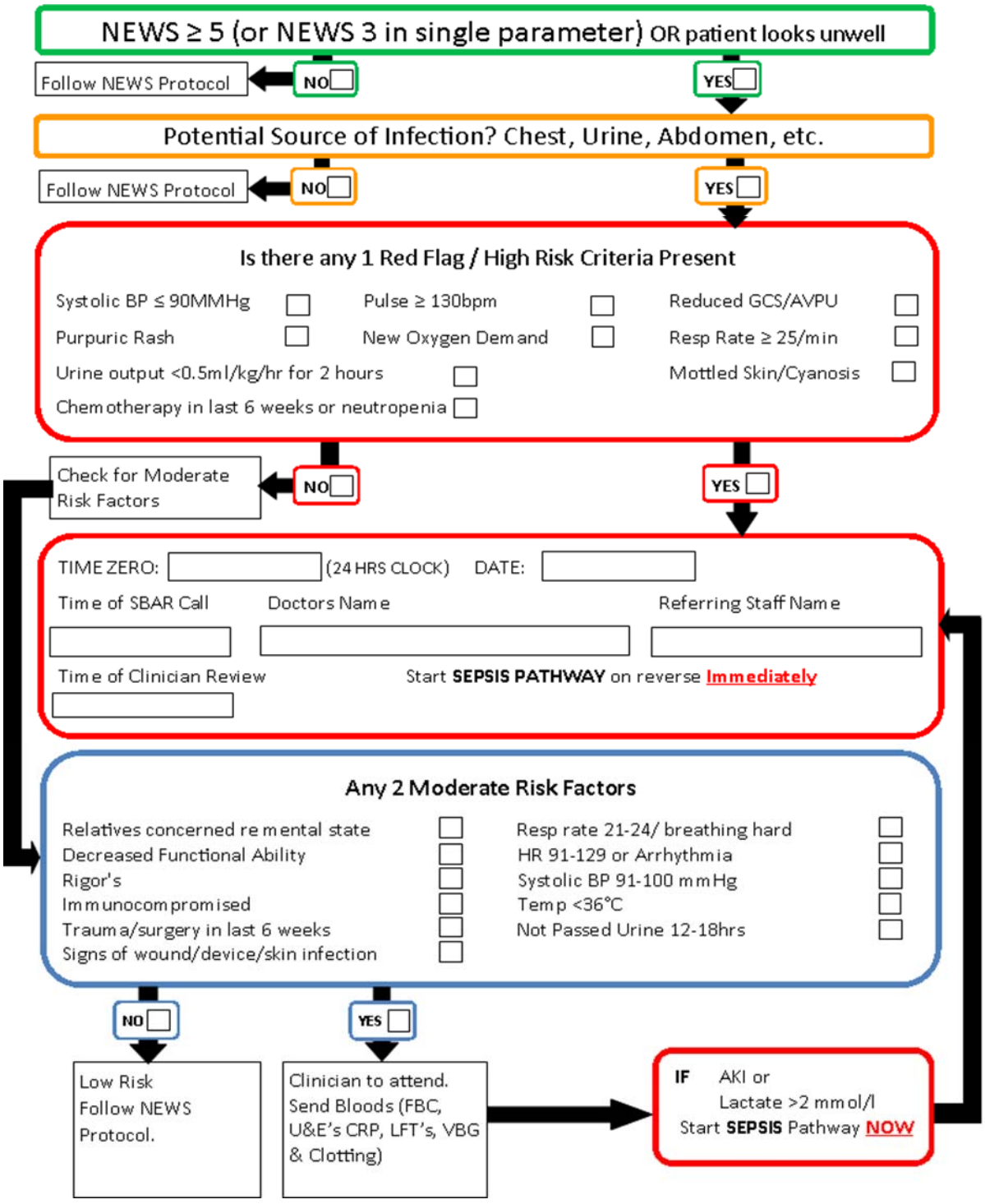
Identification of red flag signs

- Assess whether screened patient has red flag signs and therefore classed as high risk for sepsis
- If patient has 1 red flag sign – start on **Sepsis Six** bundle within 1 hr of screening

Moderate risk factors

- Patient screened for sepsis and negative for any red flag signs: assess for moderate risk factors and if appropriate start on **Sepsis pathway** immediately

Flowchart


NEWS ≥ 5 (or NEWS 3 in single parameter) OR patient looks unwell
Follow NEWS Protocol
NO
YES
Potential Source of Infection? Chest, Urine, Abdomen, etc.
Follow NEWS Protocol
NO
YES
Is there any 1 Red Flag / High Risk Criteria Present
Systolic BP ≤ 90MMHg
Pulse ≥ 130bpm
Reduced GCS/AVPU
Purpuric Rash
New Oxygen Demand
Resp Rate ≥ 25/min
Urine output <0.5ml/kg/hr for 2 hours
Mottled Skin/Cyanosis
Chemotherapy in last 6 weeks or neutropenia
Check for Moderate Risk Factors
NO
YES
TIME ZERO:
(24 HRS CLOCK)
DATE:
Time of SBAR Call
Doctors Name
Referring Staff Name
Time of Clinician Review
Start SEPSIS PATHWAY on reverse Immediately
Any 2 Moderate Risk Factors
Relatives concerned re mental state
Decreased Functional Ability
Rigor's
Immunocompromised
Trauma/surgery in last 6 weeks
Signs of wound/device/skin infection
Resp rate 21-24/ breathing hard
HR 91-129 or Arrhythmia
Systolic BP 91-100 mmHg
Temp <36°C
Not Passed Urine 12-18hrs
NO
YES
Low Risk Follow NEWS Protocol.
Clinician to attend. Send Bloods (FBC, U&E's CRP, LFT's, VBG & Clotting)
IF AKI or Lactate >2 mmol/l
Start SEPSIS Pathway NOW

IMMEDIATE MANAGEMENT

- Start **Sepsis Six** if the patient satisfies 1 of the following:
- presence of 1 red flag sign **or**
- presence of 2 moderate risk factors along with AKI and/or lactate ≥2

Record observations at least every 30 min			
1	**Give oxygen** • Aim O_2 saturations 94–98% (if CO_2 retainer 88–92%)	**4**	**Give IV fluids** • 500 mL over 15 min • Review and repeat as needed (Hartmann's or sodium chloride 0.9%)
2	**Take blood cultures (regardless of temperature)** • FBC, U&E, LFT, clotting • CXR, urine sample • Do not delay antimicrobials	**5**	**Measure lactate** • Repeat after 2 hr of therapy
3	**Give antimicrobials** • Site specific if possible • Follow Trust guidelines • Check allergies	**6**	**Measure urine output** • Commence fluid balance chart • Hourly monitoring

Antimicrobials

- ***Penicillin allergy should only be accepted as genuine hypersensitivity if convincing history of either rash within 72 hr of dose or anaphylactic reaction.***
- ***True penicillin allergy is rare and, in many infections, alternative antimicrobials are less effective with greater risks attached. If a patient reports penicillin allergy, it is imperative to establish, as far as possible, the nature of the reported allergy. In patients able to provide a history, the nature of the penicillin allergy must be recorded on admission.***
- ***If any doubt about whether patient is truly allergic to penicillin, seek advice from a microbiologist or consultant in infectious diseases***

Type of patient	First line	Alternative (penicillin allergy)
Patient **not** tagged for MRSA/ESB/MGNB/CARB on iPortal, and no high risk of MRSA (see below)	Piperacillin/tazobactam 4.5 g IV 8-hrly	Aztreonam 1 g IV 8-hrly **plus** vancomycin IV by infusion – see **Vancomycin** guideline
High risk of MRSA: Recent history of MRSA (check iPortal), patient in other hospital/nursing home in last 12 months, sepsis likely to be hospital-acquired, or line infection suspected	Piperacillin/tazobactam 4.5 g IV 8-hrly **plus** vancomycin IV by infusion – see **Vancomycin** guideline	Aztreonam 1 g IV 8-hrly **plus** vancomycin IV by infusion – see **Vancomycin** guideline
ESBL or MGNB tag on iPortal[1]**:** History of ESBL-producing or multi-resistant Gram-negative Bacilli	Meropenem 1 g IV 8-hrly alone	Meropenem 1 g IV 8-hrly alone. If anaphylaxis to penicillin, discuss with consultant in infectious diseases or microbiologist
ESBL or MGNB tag on iPortal and high risk of MRSA	Meropenem 1 g IV 8-hrly **plus** vancomycin IV by infusion – see **Vancomycin** guideline	Meropenem 1 g IV 8-hrly **Plus** vancomycin IV by infusion – see **Vancomycin** guideline. If anaphylaxis to penicillin, discuss with consultant in infectious diseases or microbiologist

[1] Check iPortal for IC alert under patient alerts. If iPortal not available, then check previous 12 months of microbiology reports: if MRSA present then treat as tagged for MRSA; if ESBL present then treat as tagged for ESBL; if CARB present discuss with microbiologist for empirical treatment

Septic shock

- Consider patient in **septic shock** if any of the following are present despite 30 mL/kg of fluid resuscitation within first 3 hr
- patient's systolic blood pressure ≤90 mmHg **or**
- mean arterial blood pressure ≤65 mmHg **or**
- serum lactate persistently elevated >2 mmol/L on repeated measurements

In such cases, immediate escalation to senior clinician (registrar and above) and/or to critical care team is warranted.

CODING FOR DIAGNOSIS OF SEPSIS

- Correct coding of sepsis enables local and national data to accurately reflect the incidence of sepsis
- Evidence suggests localised infections (non-septic infections) are being documented in medical record as sepsis (e.g. terms like urosepsis, biliary sepsis, chest sepsis etc., may be inaccurately coded as systemic sepsis)
- Current consensus definition clearly states that there needs to be "organ dysfunction" and dysregulated host response secondary to an infectious source
- It remains difficult to objectively clarify the matter; therefore good practice would be for a responsible consultant to confirm that initial diagnosis of sepsis is a "true sepsis". However, if responsible consultant confirms the terms used in the medical record indicate only a localised infection present (rather than generalised sepsis), **code as a localised infection only or a "non-septic infection"**

MANAGEMENT OF SUSPECTED CARDIAC CHEST PAIN ● 1/3

ON PRESENTATION

- ECG – doctor/trained practitioner to check immediately
- Clinical assessment. Include:
  - full history: pain more likely to be cardiac if >15 min duration, exertional or associated with nausea/vomiting, breathlessness, sweating and cardiovascular instability
  - high risk features (see **Flowchart**)
  - cardiac risk factors
  - examination
- **If after clinical assessment, an acute coronary syndrome (ACS) is suspected:**
  - discuss case with senior doctor/cardiac assessment nurse
- Measure troponin I on arrival and, if presentation within 12 hr of onset of pain, repeat measurement >6 hr after presentation – see **Tables 1** and **2**
- **Advise patients in emergency department they will be:**
  - discharged if 'low risk' or
  - referred to medical or cardiology team for admission

Table 1

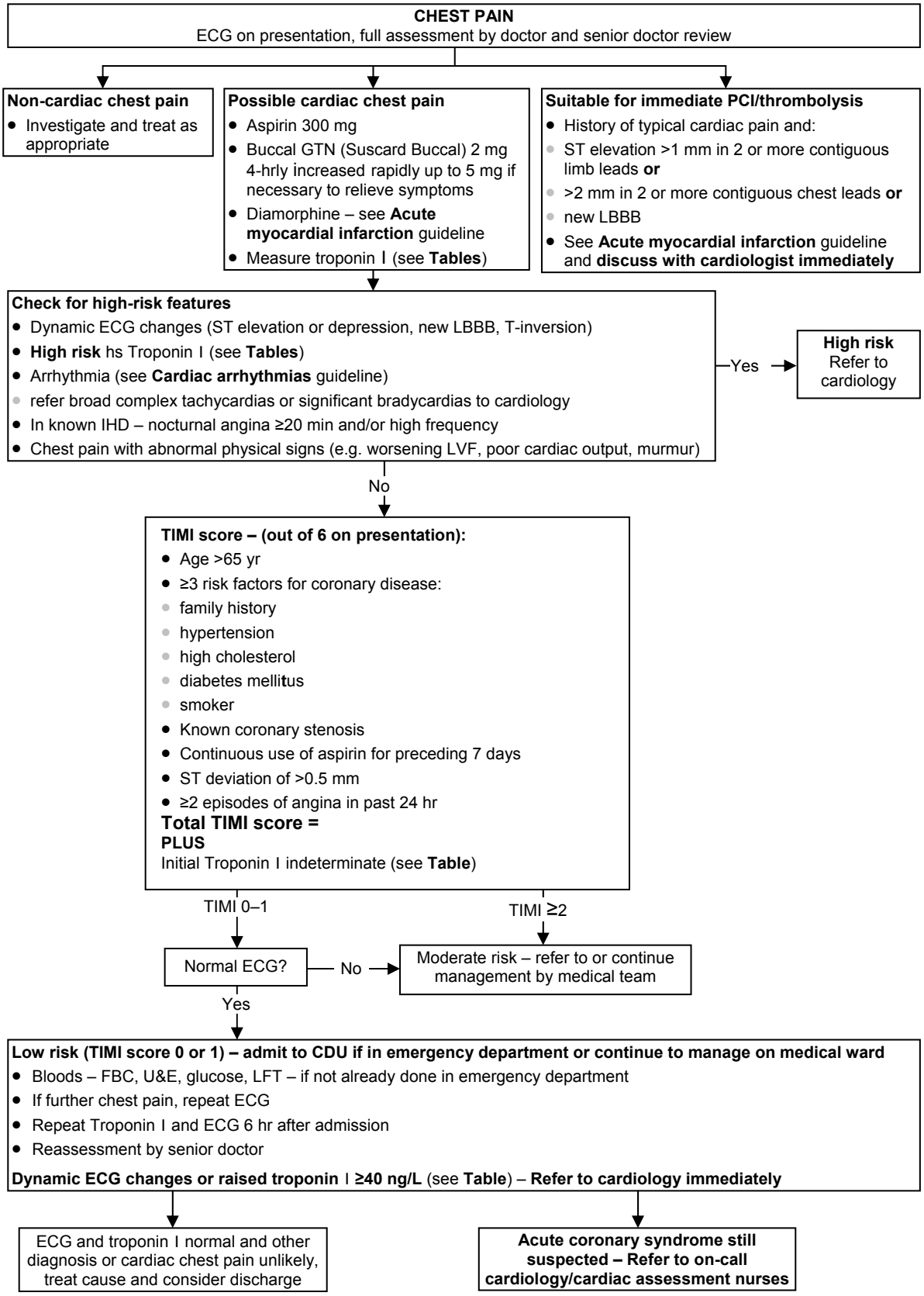
Interpretation of initial troponin I values			
Time since onset of pain	**Admission troponin I value**	**Risk of myocardial necrosis**	**Action**
<12 hr	<40 ng/L	**Indeterminate**	Repeat troponin I in 6 hr (assess absolute value and % change – see **Table 2**)
	≥40 ng/L	**High** (acute myocardial necrosis possible)	Refer to cardiology (repeat troponin I in 6 hr)
>12 hr	<40 ng/L	**Low** (myocardial damage unlikely)	Re-evaluate patient – senior doctor review. Consider alternative cause. If ACS still suspected, refer to cardiology
	≥40 ng/L	**High** (acute myocardial necrosis possible)	Refer to cardiology (repeat troponin I in 6 hr)

Table 2

Interpretation of repeat (>6 hr) troponin I values		
% change in troponin I value	**Risk of myocardial damage**	**Action**
<20% or absolute <14 ng/L	**Low** (myocardial necrosis unlikely)	Re-evaluate patient – senior doctor review. Consider alternative cause If ACS still suspected, refer to cardiology
≥20% rise or fall (and absolute value ≥40 ng/L)	**High** (acute myocardial necrosis likely)	Refer to cardiology

MANAGEMENT OF SUSPECTED CARDIAC CHEST PAIN ● 2/3

Flowchart – Management of chest pain



MANAGEMENT OF SUSPECTED CARDIAC CHEST PAIN ● 3/3

Notes on the clinical interpretation of troponin I results

- Two serial results <40 ng/L indicate a low risk of myocardial necrosis
- A rise or fall in troponin I of 20% reflects a potentially significant change. The greater the magnitude of change between 2 results, the greater the likelihood of acute myocardial infarction (AMI)
- Troponin I is a marker of myocardial necrosis and **not** a specific marker of AMI. Results should always be interpreted in conjunction with clinical history and ECG findings
- A stable elevation in troponin indicates chronic structural heart disease. All troponin I results ≥40 ng/L are important and predict adverse outcome; it is therefore important to determine the cause
- Troponin is a tool to **assist** in a diagnosis. Other findings and clinical judgement **must** be used when determining the cause of acute chest pain

Possible non-ACS causes of troponin elevation

- Congestive cardiac failure (acute and chronic)
- Hypertensive crisis
- Tachy- or bradyarryhthmias
- Pulmonary embolism, severe pulmonary hypertension
- Inflammatory disease e.g. myocarditis
- Acute neurological disease e.g. stroke, subarachnoid haemorrhage
- Aortic dissection
- Aortic valve disease
- Hypertrophic cardiomyopathy
- Cardiac contusion, ablation, pacing, cardioversion, or endomyocardial biopsy
- Hypothyroidism
- Apical ballooning syndrome (Tako-Tsubo cardiomyopathy)
- Infiltrative diseases e.g. amyloidosis, haemochromatosis, sarcoidosis, sclerodermia
- Drug toxicity e.g. adriamycin, 5-fluorouracil, herceptin, snake venoms
- Burns, if affecting >30% of body surface area
- Rhabdomyolysis
- Critically ill patients, especially with respiratory failure or sepsis
- Chronic kidney disease

DISCHARGE AND FOLLOW-UP

- Ensure patient is pain free
- Repeat ECG before discharge
- Request senior doctor review
- Complete discharge summary – inform GP of ECG and troponin I results

TRANSIENT ISCHAEMIC ATTACK (TIA) ● 1/4

DEFINITION

- **TIA:** a clinical syndrome characterised by an acute loss of focal cerebral or ocular function with symptoms lasting <24 hr
- **Crescendo TIAs** are >1 TIA within 1 week. Treat as high risk, even if ABCD2 score <4 (see below)
- **Frequent TIAs** are those occurring at least once per week

Consider all patients with TIA who are in atrial fibrillation (AF) as high risk TIA irrespective of whatever the ABCD2 score is

RECOGNITION

- Consider any patient presenting acutely with focal neurological signs to have had a stroke until signs have completely resolved – see **Acute stroke** guideline
- Diagnose a TIA only once symptoms have resolved
- TIA is more difficult to diagnose than stroke:
- try to obtain a witness account
- syncope is unlikely to be a TIA
- vertigo alone is unlikely to be a TIA

Syndromes

Anterior circulation

- Dysphasia
- Dysarthria
- Visuospatial neglect
- Usually hemiparesis (face, arm and leg)
- Usually hemisensory (face, arm and leg)

Posterior circulation (ischaemia in brainstem, cerebellum and/or occipital lobes)

- Nausea and vomiting
- Vertigo
- Diplopia
- Ataxia
- Crossed syndromes (weakness or numbness on side of face and in contralateral limbs)
- Coma
- Visual field defect (Homonymous hemianopia)

Treat patient who still has symptoms at time of assessment as stroke and consider for thrombolysis (see Acute stroke guideline) if within <4 hr of symptom onset. TIA can only be diagnosed once all symptoms have resolved

ASSESSMENT OF STROKE RISK

- Use ABCD2 score to classify chance of stroke within 7 days as 'low' or 'high'

		Score
A	Age >60 yr	**1**
B	BP >140 mmHg systolic or >90 mmHg diastolic	**1**
C	Clinical hemiparesis **or** Speech problem without hemiparesis	**2** **1**
D	Duration ≥60 min **or** 10–59 min	**2** **1**

ABCD2 score ≥4 or crescendo TIAs 'high risk'

- Treat immediately, initiate referral to TIA service immediately using rapid access TIA referral form from Trust intranet>Clinicians>Clinical services>Neurology>Referral forms>TIA. Specialist appointment target is within 24 hr for high risk TIA, carotid endarterectomy (if indicated) within 7 days
- Complete referral form:
- high risk TIA 24 hr/7 days: bleep 101 or call 74734 to arrange appointment at TIA clinic and fax referral to 08442 448261
- advise patient not to drive or fly until seen in clinic

ABCD2 score <4 'low risk'

- Treat immediately, initiate referral to TIA service immediately using rapid access TIA referral form from Trust intranet>Clinicians>Clinical services>Neurology>Referral forms>TIA. Specialist appointment target is within 1 week for low risk TIA, carotid endarterectomy (if indicated) within 3 weeks of TIA
- low risk TIA Mon–Fri (0900–1700 hr) bleep 101 or call 74734 to arrange appointment and fax referral to 08442 448261
- advise patient not to drive or fly until seen in clinic

IMMEDIATE INVESTIGATIONS

- FBC, clotting, ESR
- Random blood glucose
- U&E
- Random cholesterol
- ECG
- Carotid Doppler
- CT brain plain
- If symptomatic stenosis of >50% by NASCET criteria (RCP **Stroke** Guideline 2012) and considered appropriate for carotid intervention (after checking renal function), CT angiogram from arch to Circle of Willis

For high risk TIA

- On weekdays, request a CT scan of head and carotid Doppler to be carried out on same day (bleep101 or call 74734 if unsure)
- On weekends and bank holidays, request a CT brain scan and CT angiogram (arch to circle of Willis) instead of a carotid Doppler
- Where vascular territory or pathology is uncertain, request a diffusion weighted MRI scan

IMMEDIATE MANAGEMENT

When

- Begin antiplatelet and other therapy immediately **unless** you **STRONGLY** suspect a haemorrhagic stroke (severe headache, loss of consciousness) or BP very high (>180/100)

What

- **Atorvastatin 20 mg straightaway** and then each night regardless of the cholesterol value – non HDL <40% if intolerant to statin ezetimibe 10 mg daily
- **Clopidogrel 300 mg or aspirin 300 mg as loading dose and** then 75 mg oral daily indefinitely
- If dyspepsia experienced with Clopidogrel/aspirin, consider adding proton pump inhibitor. Try to avoid omeprazole, esomeprazole as they reduce the efficacy of Clopidogrel
- If patient's blood pressure in the TIA clinic is >130/80, start antihypertensive treatment. Do not wait for repeated measurements by the GP (2012 Royal College of Physicians **Stroke** guideline)

Summary

- Clopidogrel 75 mg daily monotherapy is first line (unlicensed)
- If patient not able to tolerate clopidogrel, give aspirin 300 mg stat followed by aspirin 75 mg/day and dipyridamole 200 mg MR twice daily
- If both clopidogrel and dipyridamole contraindicated, offer aspirin 300 mg stat followed by aspirin 75 mg once daily
- If both clopidogrel and aspirin contraindicated or not tolerated, offer dipyridamole 200 mg MR twice daily
- Combination of clopidogrel and aspirin is not recommended for long-term prevention after stroke or TIA, unless there is another indication e.g. acute coronary syndrome or recent coronary stent procedure

Patient in AF

- If in AF, discuss anticoagulation options. Discuss options for both warfarin (vitamin K antagonist) and non-vitamin K antagonist oral anticoagulation (DOAC). Base choice on clinical features, patient preferences and use CHADS-VASc to assess stroke risk and HAS-BLED to assess bleeding risk. Refer to **Atrial fibrillation** guideline to assess risk vs benefit

- Choices of anticoagulation include: warfarin, apixaban, dabigatran etexilate, edoxaban and rivaroxaban
- **DOAC initiation:** Screen patient – U&Es, LFTs, FBC, BP, renal function. Always check calculated creatinine clearance and follow prescribing guidelines for each DOAC
- For review and follow-up below, refer to the atrial fibrillation stoke prevention team to carry out follow-up:
- 1 month – review to check adherence, tolerance and side effects
- 6 months – recheck above and assess renal/hepatic function if poor when initiated
- ongoing monitoring – if stable consider 6 month review of the above – at least once a year or more frequently if impaired renal/hepatic function. Continue to check creatinine clearance and refer to prescribing guideline for each DOAC
- Creatinine clearance must be checked on review using tool http://www.nuh.nhs.uk/healthcare-professionals/antibiotics/antibiotics-calculators/creatinine-clearance-calculator
- **Warfarin Initiation** guideline: **Slow anticoagulation** (unless there are contraindications), aiming for an INR of 2–3, and **stop** antiplatelet agents once target INR achieved. Warfarin will be commenced by TIA specialist in the Rapid Access TIA clinic after assessing risk stratification, hence patient can be treated on the same day with a low molecular weight heparin (LMWH) and warfarin combination. Once INR >2, LMWH can be stopped
- Discuss a clear treatment plan with patient and teach them how to administer LMWH (dosage guidance as per treatment dose in **Dalteparin for VTE** guideline). Patient should receive treatment dose of LMWH **not** a prophylactic dose
- Refer all patients who commenced warfarin to the anticoagulation clinic for long-term follow-up
- If patient is on warfarin and developed a TIA with sub-therapeutic INR (<2), give treatment dose LMWH until INR >2
- If patient is already on warfarin with sub-therapeutic INR and time in therapeutic range (TTR) <65%, consider switching to NOAC if compliance and adherence is not an issue
- Contact anticoagulation hub to investigate TTR
- Refer to the "At a Glance Guide for the Prevention of Stroke and Systemic Embolism in Patients with Non-valvular Atrial Fibrillation" http://uhns/media/575342/150212%20At_a_glance_AF_anticoagulation_guide_FINAL_v1.0_Jan2015.pdf
- Note: poor adherence with any oral anticoagulant agent will reduce benefits but may increase risk associated with use
- To discuss anticoagulation – contact Stroke Prevention Team on 79449

Patient advice

- If smoking – advise to stop
- Advise patient not to drive until symptom-free for 1 month and to inform insurance company
- Advise all patients with definite clinical symptoms of TIA who are otherwise fit to dial 999 if they experience any new TIAs lasting more than a few minutes
- Advise patient on healthy lifestyle advice

Patients with TIA who have symptomatic carotid stenosis of 50–99% according to NASECT criteria should:

- Be assessed and referred for carotid endarterectomy to be performed within 1 week of onset of symptoms
- Carotid endarterectomy should be the treatment of choice for patients with symptomatic carotid stenosis, particularly those aged ≥70 yr
- Receive best medical treatment (control of blood pressure, antiplatelet agents, diabetic management, cholesterol lowering through diet and drugs, and lifestyle advice, including smoking cessation)
- Advise all patients with definite clinical symptoms of TIA who are otherwise fit to dial 999 if they experience any new TIAs lasting more than a few minutes
- Use the following link to calculate the 1 yr and 5 yr stroke risk and discuss all cases with vascular surgeon of the week http://www.stroke.ox.ac.uk/model/model.htm
- Following risk assessment, discuss case in the vascular MDT. Discuss management plan with patient (carotid endarterectomy vs medical management)

Patients with TIA who have symptomatic carotid stenosis of <50% according to NASECT criteria should:

- Not undergo surgery
- Receive medical treatment (control of blood pressure, antiplatelet agents, diabetic management, cholesterol lowering through diet and drugs, and lifestyle advice including smoking cessation)

Where patients have repeated attacks of transient neurological symptoms despite best medical treatment, and an embolic source has been excluded, consider an alternative neurological diagnosis

DISCHARGE AND FOLLOW-UP

- For patients with crescendo TIA, frequent TIA, BP uncontrolled or if symptoms unresolved when assessment completed, seek advice from stroke consultant of the day (bleep via call centre working hours) or call 74734
- provide patient with drugs sufficient until appointment time and letter to GP

LONG-TERM RISK FACTOR MANAGEMENT (AT FOLLOW-UP)

- In addition to the factors addressed in **Immediate management**, address the following at follow-up:
- smoking cessation advice
- hypertension – aim for a target BP <130/80 mmHg but do not reduce abruptly
- diabetes mellitus – aim for HbA_{1c} <53 mmol/mol
- oral contraceptive pill or hormone replacement therapy contraindicated
- lifestyle and diet advice
- aim for total cholesterol <4 mmol/L and low-density lipoprotein (LDL) <2 mmol/L

RESEARCH

- Consider enrolment in a research study (e.g. TARDIS if no AF or CROMIS-2 for AF). Contact research team via call centre during working hours for details

TRANSIENT LOSS OF CONSCIOUSNESS (BLACKOUT/SYNCOPE) ● 1/3

RECOGNITION AND ASSESSMENT

Definition

- Transient self-limiting loss of consciousness
- Usually of rapid onset and with spontaneous, complete and prompt recovery
- Underlying pathology is global hypoperfusion
- May be preceded by a feeling of faintness, light-headedness or muscular weakness (presyncope); evaluate presyncope in the same way as true syncope

Aim of assessment

- Majority of patients will have made a full recovery at point of assessment with low risk of serious adverse outcomes. Aim to identify the small proportion with a significant underlying cause at risk of serious outcome

Principal causes

Reflex (neurally mediated) syncope

- Vasovagal (simple faint) – suggested by the presence of **3 P's** (provocation, prodromal and positional elements)
- Situational: micturition, cough, defecation, pain, swallowing
- Carotid sinus syndrome

Syncope resulting from orthostatic hypotension (>20 mmHg fall in systolic BP after 3 min standing)

- Autonomic failure
- Drug-induced
- Volume depletion (e.g. haemorrhage, diarrhoea, vomiting)

Cardiac syncope

- Arrhythmias: bradycardia, tachycardia, implanted device failure
- Structural cardiac or cardiopulmonary disease (e.g. valvular heart disease, LV systolic dysfunction, LV outflow obstruction, cardiac tamponade, pulmonary embolism)
- Syncope during (rather than after) exercise

Differential diagnosis

Disorders with impairment or loss of consciousness

- Epilepsy
- Metabolic (hypoglycaemia, hypoxia, hyperventilation with hypocarbia)
- Intoxication
- TIAs of vertebrobasilar origin. See **Transient ischaemic attack** guideline

Disorders resembling syncope without loss of consciousness

- Falls: See **Management of falls in A&E and wards** guideline
- Cataplexy
- Functional: pseudosyncope, somatisation disorders
- TIAs of carotid origin. See **Transient ischaemic attack** guideline

History

Circumstances

- Before episode (position, activity, predisposing factors or precipitating events)
- Symptoms at onset of episode (nausea, aura, visual, feeling warm/hot, cardiac symptoms)
- Details of episode (eye-witness account, collateral history from paramedics): skin colour, duration of loss of consciousness, breathing pattern, movements, tongue biting, etc
- End of episode: confusion, muscle aches, skin colour, injury, incontinence

Brief non-specific symptoms/signs (e.g. nausea, and diaphoresis) and brief myoclonic jerking are common in syncope
Syncope may present as true seizure, owing to cerebral hypoperfusion

Risk factors

- Previous presyncopal or syncopal episodes
- Previous cardiac and medical history, family history (e.g. sudden cardiac death, epilepsy)
- Medication
- Occupation and driving status

Physical examination

- Clinical assessment to identify serious underlying conditions (e.g. abdominal aortic aneurysm, gastrointestinal bleed)
- Vital signs at rest
- Evidence of orthostatic hypotension (lying and standing BP)
- Evidence of injury

MANAGEMENT IN A&E

Screening investigations

- 12-lead ECG
- If patient has an implanted cardiac monitor ('Reveal' device) *in situ*, request interrogation of the device before discharge
- Blood tests useful only if clinically indicated (e.g. haemoglobin for suspected haemorrhage)
- Blood glucose
- Pregnancy test in women of childbearing age (consider ectopic pregnancy)

High risk clinical features

- Accumulation of comorbidities and age >65 yr
- Admit patients with any of the following features for further evaluation:
- cardiac disease: congestive cardiac failure, ischaemic or structural heart disease
- haematocrit <30%
- abnormal ECG e.g. evidence of ischaemia (pathological Qs, ST or T wave abnormal), conduction defects (LBBB, RBBB, WPW, Brugada, any heart block, sinus pause >3 sec, prolonged QT interval >0.45), marked bradycardia if not on beta-blockers
- persistently abnormal vital signs e.g. hypotension, hypoxia
- family history of sudden cardiac death in relative aged <40 yr and/or an inherited cardiac condition
- onset during exercise

DISCHARGE AND FOLLOW-UP

- Advise patient to:
- avoid precipitating situations
- maintain hydration
- avoid becoming overheated
- take avoiding action if warning symptoms occur
- Adjust cardiovascular medication, especially in elderly patients experiencing giddy spells with postural change and occasional syncope. Discuss with senior clinician and ensure patient and GP receive written instructions of any adjustments
- **Health and Safety:** Advise all patents of the implications of their episode for health and safety at work and any actions they must take to ensure safety
- If underlying cause identified, discharge as indicated in **Table** below
- If patient not admitted, refer to appropriate clinic or back to GP (enclose copies of ECGs)
- **Provide patient with advice on driving restrictions as per DVLA guidelines** – see **www.gov.uk/guidance/neurological-disorders-assessing-fitness-to-drive** for current guidance

TRANSIENT LOSS OF CONSCIOUSNESS (BLACKOUT/SYNCOPE) ● 3/3

Identified cause	Discharge and follow-up
Simple faint (vasovagal episode) Definite **P**rovocational factors with associated **P**rodromal symptoms unlikely to occur whilst sitting or lying (**P**osition). Benign in nature	If social circumstances favourable, discharge
Loss of consciousness/loss or altered awareness likely to be unexplained syncope **Low risk of recurrence:** No relevant abnormality on CVS and neurological examination and normal ECG **High risk of recurrence:** • Abnormal ECG • Clinical evidence of structural heart disease, sudden syncope occurring whilst driving, sitting, lying, on exertion or resulting in injury >1 episode in previous 6 months • Family history of sudden cardiac death in people aged <40 yr and/or inherited cardiac condition	• If social circumstances favourable, discharge • If events frequent and patient sustained injuries, consider referral to falls clinic or programme: • Refer to SSOTP Falls service based at Longton Health Centre (telephone: 0300 123 0995 extension 4422/4277, fax: 01782 828570) • complete a falls service referral form available on Trust intranet>Elderly care>Falls section and fax to number above • include relevant medical history • reason for referral and information about recent falls and falls-related injuries • details of known contributing factors (medical history etc.) • If high risk clinical features present, admit • If patient meets frail elderly criteria, request elderly care bed • If cardiac cause suspected, discuss with cardiologist
Unwitnessed (presumed) loss of consciousness/loss or altered awareness with seizure markers: • Strong clinical suspicion of epilepsy but no definite evidence (see **First seizure** guideline)	• Refer to first seizure clinic (complete referral form and arrange imaging as indicated) and, if social circumstances favourable, discharge

UPPER GASTROINTESTINAL HAEMORRHAGE ●1/5

RECOGNITION AND ASSESSMENT

Symptoms and signs

- Coffee-ground vomit (dark brown, denatured blood in vomit)
- Haematemesis (bright red or clotted blood in vomit)
- Melaena (black, tarry, smelly stool containing digested blood)
- Postural dizziness or fainting
- Evidence of severe bleeding – defined as presence of shock with tachycardia (heart rate >100 beats/min), hypotension (systolic BP <100 mmHg) and clammy skin, or of postural hypotension in patient who is not clinically shocked
- Evidence of anaemia
- Features of precipitating disease, jaundice, stigmata of liver disease
- Features of bleeding disorder (petechiae)
- Buccal or facial telangiectasia

Bright red rectal bleeding in the absence of hypotension is likely to arise from lower gastrointestinal tract

Previous history

- Enquire about:
- peptic ulceration
- previous bleeds
- liver disease
- family history of bleeding
- ulcerogenic medication/anticoagulants
- alcohol
- weight loss

ASSESSMENT OF RISK

It is essential to categorise patients according to their risk of death/rebleeding – use Glasgow Blatchford score (GBS) (see Figure 1): ≥1 high-risk; 0 low-risk

If more than one of the following are present, patient is at high risk

- Heart rate >100 beats/min and systolic BP <100 mmHg, or postural hypotension (fall ≥20 mmHg 3 min after standing)
- Recent syncope
- Melaena
- Heart failure or liver disease
- Haemoglobin (Hb) <130 g/L (male), or <120 g/L (female)
- Urea >6.5 mmol/L

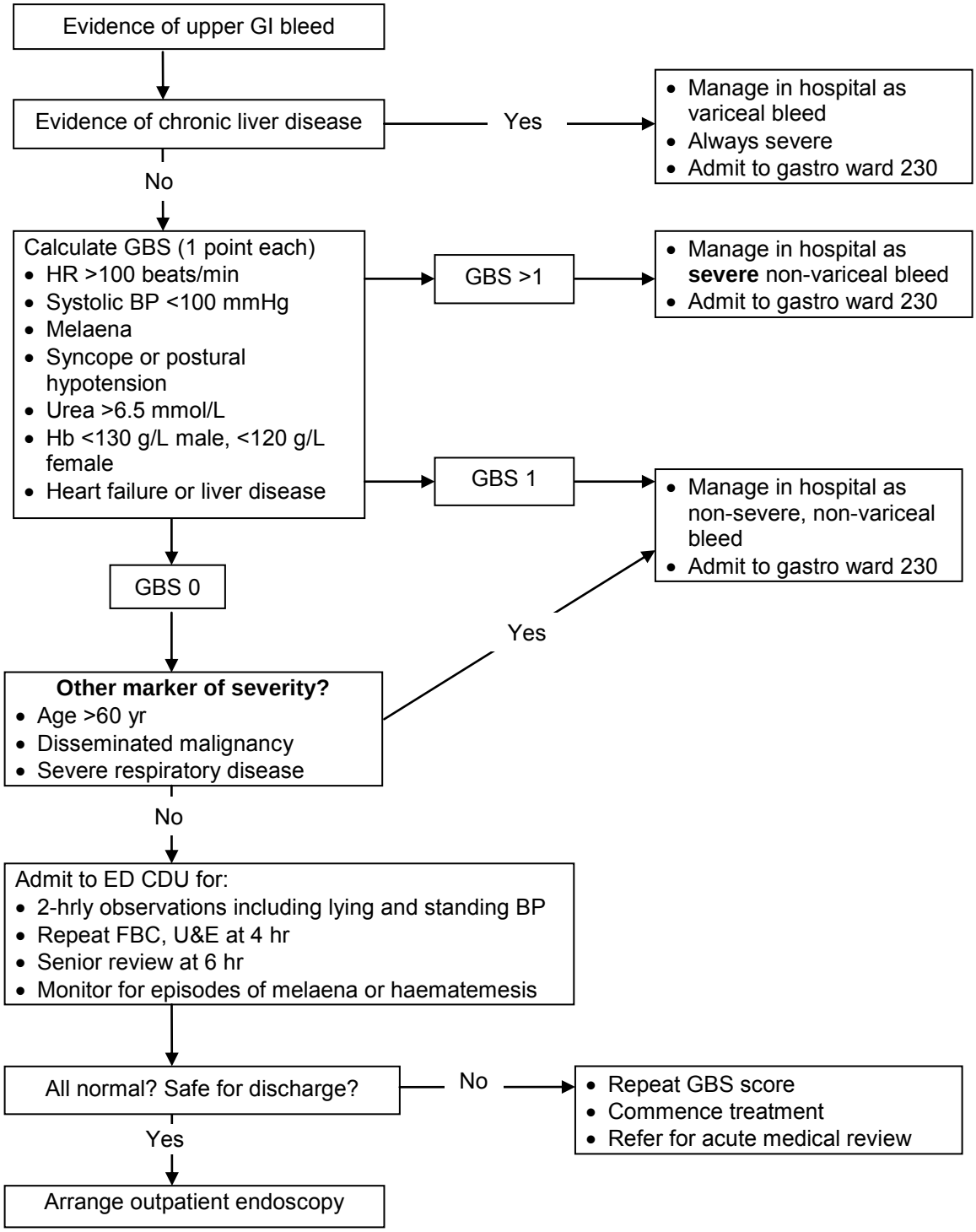
Additional markers of severity

- Rebleeding after admission
- GI bleeding arising after admission with another condition
- Actively bleeding ulcer or visible non-bleeding vessel at endoscopy
- Disseminated malignancy
- Severe respiratory disease

Investigations

- **All**
- FBC
- U&E
- **Non-severe bleeding**
- group and save (non-urgent)
- **Severe bleeding:**
- INR
- LFTs
- crossmatch (4 units), notify blood transfusion laboratory of clinical problem and degree of urgency

Figure 1 is an aid to clinical judgement



PATIENTS FOR POSSIBLE DISCHARGE

Management – clinical decision unit (CDU)

Observations – 2-hrly

- Heart rate
- BP: lying and standing at 3 min

Investigations

- See above
- Repeat FBC and U&E 4 hr after admission to CDU

Treatment

- None, unless specific cause or increase in severity identified

Review

- After 6 hr

Admission criteria

- Glasgow Blatchford score ≥1
- Further episode of GI bleed
- Haemodynamic instability
- Abnormal blood results

Criteria for CDU discharge and outpatient endoscopy

- Glasgow Blatchford score 0
- No co-morbidities requiring acute admission
- Patient information pack provided to patient
- Request OGD on Order Comms (as urgent outpatient)
- Give patient copy of discharge letter

PATIENTS REQUIRING ADMISSION

Non-severe non-variceal bleeding

- Baseline observations with a view to upper GI endoscopy within 24 hr/next available endoscopy list
- Wide bore IV access
- Allow food and drink until 4 hr before endoscopy
- No treatment necessary before endoscopy
- Send patient to GI bleeding reception area on ward 230

Severe non-variceal bleeding

The first priority is to replace fluid loss and restore BP

- Insert 2 large bore (14–16 G) venous cannulae
- Infuse compound sodium lactate (Hartmann's) solution (or, alternatively, sodium chloride 0.9%) 1–2 L over 30–120 min to achieve systolic BP >100 mmHg
- In patients with significant cardiac disease, consider inserting central venous pressure (CVP) line to guide IV fluid replacement
- Stop antihypertensives, diuretics, NSAIDs, anticoagulants
- Measure urine output. Adequately resuscitated patients have urine output of 0.5 mL/kg/hr
- Keep patient nil-by-mouth
- If not already an inpatient **admit**, preferably to GI bleeding reception area on Ward 230
- Transfuse as soon as blood available – see **Blood and blood products** guidelines
- prefer packed cells
- if 50% of total blood volume loss in 3 hr, follow **Massive haemorrhage protocol** with blood bank to obtain blood products rapidly – see **Massive haemorrhage protocol** on Trust intranet>Clinicians>Clinical guidance>Blood and blood products>
- Once resuscitation has begun, give omeprazole 80 mg by IV infusion over 40–60 min, then by continuous IV infusion of 40 mg in 100 mL sodium chloride 0.9% at 20 mL/hr (8 mg/hr) for 72 hr. Arrange upper GI endoscopy by contacting gastroenterology unit 0830–1700 hr weekdays and 0830–1200 hr Saturday and insert request on Order Comms 'Gastroscopy – UGI bleed'
- After preliminary resuscitation, discuss all patients with severe non-variceal bleeding with on-call surgical team. If appropriate, transfer patient to general surgical care for further management:
- if doubt about realistic possibility of surgery, duty surgeon and duty physician to review patient in consultation
- if any difficulties are encountered with this policy, inform on-call consultant physician. Contact a senior gastroenterologist via call centre only if on-call team unable to resolve the clinical management problem satisfactorily with duty surgical team
- Indications for surgical intervention (or interventional radiology under surgical care) are:
- exsanguinating haemorrhage (too fast to replace or requiring >4 units of blood to restore blood pressure)
- failed medical therapy
- special situation (e.g. patients with rare blood group or refusing blood transfusions)

Oesophageal variceal bleeding

Haemorrhage from oesophageal varices is always life-threatening

- Identify patients from clinical history, previous hospital notes or by clinical signs (e.g. jaundice, ascites, spider naevi)
- Insert 2 large bore (14–16 G) IV cannulae, 1 in each antecubital fossa. In patients with significant cardiovascular disease, a CVP line is advisable
- Initially infuse sodium chloride 0.9% 1 L over 2–4 hr:
- if Hb <100 g/L, transfuse 1 unit of blood for every 10 g/L <100 g/L – see **Blood and blood products** guidelines
- Correct raised INR with fresh frozen plasma but prothrombin complex concentrate recommended for major bleeding associated with warfarin (see **Warfarin** guidelines)
- Continue fluid replacement, aiming to restore heart rate <100 beats/min, systolic BP >80 mmHg and Hb ≥100 g/L, but avoid rapid fluid replacement as it increases risk of rebleeding
- Whilst awaiting endoscopy, give terlipressin 2 mg IV bolus then 1 mg 6-hrly, duration directed by endoscopist
- If haemorrhage still not controlled, discuss with gastroenterology team
- Give co-amoxiclav 625 mg oral or if nil-by-mouth, 1.2 g IV 8-hrly for 3 days
- in penicillin allergic patients give aztreonam 1 g IV 8-hrly and metronidazole oral 400 mg 8-hrly or if nil-by-mouth, 500 mg IV by infusion 8-hrly for 3 days. If previously MRSA colonised, add vancomycin IV by infusion – see **Vancomycin** guideline
- penicillin allergy should only be accepted as genuine hypersensitivity if convincing history of either rash within 72 hr of dose or anaphylactic reaction. True penicillin allergy is rare and, in many infections, alternative antimicrobials are less effective with greater risks attached. If a patient reports penicillin allergy, it is imperative to establish, as far as possible, the nature of the reported allergy. In patients able to provide a history, the nature of the penicillin allergy must be recorded on admission. If any doubt about whether patient is truly allergic to penicillin, seek advice from a microbiologist or consultant in infectious diseases
- always obtain blood culture before giving an antimicrobial – see **Collection of blood culture specimens** guideline
- If septic – see **Sepsis, severe sepsis and septic shock** guideline
- In patients with grade 4 encephalopathy – see **Acute liver failure with encephalopathy** guideline, discuss endotracheal intubation with gastroenterology team and, if decided appropriate to intubate, contact critical care team
- If not already inpatient, admit to ward 230
- Contact gastroenterology team for advice on further management

Do not refer to surgical team

SUBSEQUENT MANAGEMENT

Non-variceal bleeding

- Continue observations until outcome of upper GI endoscopy known
- Follow advice appearing on endoscopy report

Preferred eradication regimen for *Helicobacter pylori* is:
omeprazole 20 mg oral 12-hrly
amoxicillin 1 g oral 12-hrly
metronidazole 400 mg oral 12-hrly
for 7 days*

In patients allergic to penicillin:
omeprazole 20 mg oral 12-hrly
clarithromycin 250 mg oral 12-hrly
metronidazole 400 mg oral 12-hrly
for 7 days*

Absolute compliance with regimen essential in order to achieve an eradication rate of 90%

***If ulcer large, or complicated by haemorrhage or perforation, then omeprazole treatment continued for a further 21 days**

Simvastatin contraindicated in combination with clarithromycin see current BNF for other interactions)

- After successful eradication of *Helicobacter pylori* and course of PPI for ulcer healing, if NSAID therapy must be reintroduced, continue omeprazole 20 mg oral daily for as long as NSAID required
- If neoplasm identified, refer to upper GI cancer nurse specialist
- **Patients who rebleed:**
- if an otherwise stable patient who is potentially referable for surgery rebleeds, request **urgent** endoscopy and discuss with on-call surgical team
- **Indications for surgical intervention:**
- exsanguinating haemorrhage (too fast to replace)
- failed endoscopic therapy
- major rebleed after successful endoscopic therapy
- special situation (e.g. patients with rare blood group or patients refusing blood transfusion) – a major bleed may warrant early surgery
- **Once agreed with s**urgical team, transfer high-risk patients to SAU

Variceal bleeding

- Contact gastroenterology team for advice on management:
- if not admitted directly, transfer patient to GI ward 230

MONITORING TREATMENT

All patients

- 4-hrly heart rate and BP
- Observe vomit for blood content and stool chart for melaena
- Daily Hb until it is stable (not falling)
- In patients with severe bleeding, urine output – aim for >30 mL/hr

DISCHARGE AND FOLLOW-UP

- Discharge when stable

Non-variceal bleeding

- If *H.pylori* positive **duodenal** ulcer*,* ask GP to arrange faecal antigen testing for *H pylori* >4 weeks after completion of eradication therapy
- If *H.pylori* positive **gastric** ulcer, ask GP to arrange faecal antigen testing for *H pylori* >4 weeks after completion of eradication therapy and repeat upper GI endoscopy to check healing 6–8 weeks following discharge
- If Hb still <100 g/L, start ferrous sulphate 200 mg oral 8-hrly
- **Non-severe bleeding with transient pathology (e.g. Mallory–Weiss tear, acute erosion):**
- discharge promptly after endoscopy with no follow-up
- **Non-severe bleeding and ulcer-related disease:**
- discharge young stable patients (aged <45 yr) promptly after endoscopy
- discharge older patients (aged >45 yr) when their condition is stable
- **Severe bleeding and ulcer-related disease:**
- discharge when condition and Hb stable

Variceal bleeding

- Start propranolol 40 mg oral 12-hrly, unless contraindicated, as prophylaxis for further variceal bleeding
- Refer to Dr Brind or Dr Bohan for follow-up

Neoplasia

- Discuss further investigation and treatment with upper GI cancer team – contact cancer nurse specialist

ACUTE ABDOMINAL AORTIC ANEURYSM ● 1/2

BACKGROUND

- Any abdominal aorta >3 cm in diameter is aneurysmal
- Probability of rupture increases with size

AAA may present in 3 ways

- Ruptured
  - overall mortality 80–90%, approximately 50% die before reaching hospital
  - more common if diameter >5.5 cm
- Symptomatic – back and/or abdominal pain
- Found incidentally (asymptomatic) – 75% of all diagnosed AAA

RUPTURED AAA

In all cases of suspected ruptured AAA inform emergency theatre, on-call surgical team (including consultant), on-call consultant interventional radiologist and on-call anaesthetic team immediately. A 24 hr/7 day interventional radiology rota is in place and emergency endovascular aneurysm repair (EVAR) can be performed in selected cases. When decision is made to send patient for CT angiogram – inform on-call interventional radiology consultant and consultant vascular surgeon

Symptoms and signs

- Pain in abdomen and back (intermittent or constant) can occasionally imitate MI with retrosternal pain
- Hypovolaemic shock/sudden collapse
- Pulsatile abdominal mass – not always palpable because of low BP or obesity

Rare presentation

- Rupture into duodenum (aorto-enteric fistula) – usually in patients with previous AAA repair, but can occur spontaneously causing a massive GI bleed (aorto-duodenal or graft-duodenal fistula, the latter after previous AAA repair)
- Symptoms of aorto-caval fistula (rupture into inferior vena cava)
  - acute heart failure
  - haematuria
- Haematuria with flank pain – rule out ruptured AAA before diagnosing ‘renal colic’

Note – immediate management and investigations must run simultaneously

Immediate management

If cerebral function remains preserved, low blood pressure does not warrant aggressive IV resuscitation
A systolic BP of 70–100 mmHg is desirable in short-term as fluid replacement can cause dilution of clotting factors and higher BP can cause further expansion and intraperitoneal rupture of a contained retroperitoneal haematoma
As a rule, give no more than 2 L of compound sodium lactate (Hartmann's) solution pre-operatively to maintain BP as above. If crystalloid fails to maintain BP, consider blood and blood products pre-operatively to maintain Hb at around 100 g/L. Consider other causes of hypotension such as cardiogenic shock

- Oxygen 15 L/min – see **Oxygen therapy in acutely hypoxaemic patients** guideline
- Insert 2 large bore cannulae and take blood for crossmatch and investigations (see below) and give compound sodium lactate (Hartmann’s) solution at a rate to maintain systolic BP as described in box above
- Group and crossmatch – activate **Major Haemorrhage pathway** and request **MH Pack 1,** see Trust intranet>uhns>clinicians>clinical-guidance>blood-and-blood-products
  - inform laboratory of possibility of needing more platelets and/or FFP than usual
- Monitor pulse, BP, oxygen saturation
- Arrange investigations urgently as below
- Give morphine, 5 mg IV (2.5 mg if very frail or poor renal perfusion likely). If required, give further aliquots of 1–2 mg at 5 min intervals until patient is comfortable – see **Opioids – route of administration** guideline
  - prevention/treatment of mild nausea: 6 mg buccal prochlorperazine 12-hrly (3 mg 12-hrly if aged >60 yr)
  - treatment of severe nausea/retching or vomiting: ondansetron 4 mg **slowly** IV 6-hrly

- If rupture confirmed, immediate surgery required unless pre-existing co-morbidity contraindicates it. On-call vascular surgery consultant and interventional radiology consultant will decide together whether to operate in the emergency (surgical) theatre or perform emergency EVAR (stent-graft repair) in the interventional suite
- Transfer to theatre or interventional suite accordingly
- Catheterise bladder

Investigations

- FBC, U&E, APTT, INR, ESR, amylase, glucose
- ECG
- Ultrasound scan (USS) of abdomen
  - confirms presence and size of AAA
  - may show whether suprarenal (and therefore at higher operative risk)
  - cannot confirm rupture
- CT scan of abdomen (and chest if thought to be thoraco-abdominal) unless vascular surgeon specifically does not require it
  - shows AAA morphology and relationship to renal and visceral arteries
  - usually confirms rupture

Post-operative care

- Will be decided by vascular surgical and anaesthetic teams and will usually involve critical care admission

SYMPTOMATIC BUT NOT RUPTURED AAA

Symptoms and signs

- Pain in abdomen and/or back associated with tender AAA
- Symptoms related to effect on adjacent structures (e.g. ureteric obstruction)
- Acute embolism of lower limb(s) as a result of thrombus dislodged from aneurysm wall

Differential diagnosis

- Renal colic – always keep AAA in mind when a patient presents for first time with renal colic
- Myocardial infarction
- Acute pancreatitis
- Peptic ulcer
- Mesenteric infarct
- Diverticulitis
- Lumbar spine pathology

Investigations

- As for **Ruptured AAA,** including immediate USS and CT scan

Immediate management

- Notify on-call surgical SpR and consultant vascular surgeon
- Manage patient as ruptured AAA until rupture has been excluded. If CT scan confirms no leak, consultant vascular surgeon will decide management

INCIDENTALLY FOUND AAA

- Usually as a pulsatile abdominal mass found during routine examination, or during imaging of abdomen requested for an unrelated problem
- Confirm with USS of abdomen if not already done
- Refer to vascular team for evaluation and further management
  - <3 cm do not need follow-up
  - between 3.0–5.4 cm, send a non-urgent referral via fax to the vascular office for the on-call vascular surgeon (VoW)
  - ≥5.5 cm, fax referral and telephone next day to the VoW

If an incidental AAA found on a CT scan seems to be leaking – treat as an emergency, even if patient is stable and showing no obvious signs of a leaking AAA

ACUTE LIMB ISCHAEMIA ● 1/3

DEFINITION

Acute limb ischaemia (ALI) results from sudden decrease or interruption of limb blood supply by thrombus (often in an artery containing atherosclerotic plaque/stenosis), embolus, trauma or external compression that causes potential threat to limb viability which has been present <14 days. It carries a high morbidity, including loss of limb. There are 2 major categories of non-traumatic limb ischaemia that **must be regarded as vascular emergencies**

Acute limb ischaemia

Most commonly caused by an embolus from the heart that lodges, often at bifurcations, in otherwise normal arteries – most commonly femoral, followed by brachial and aortic (saddle embolus on aortic bifurcation). An embolus carries a higher morbidity than a thrombus because the extremity has not had time to develop collateral circulation

Acute-on-chronic limb ischaemia

Existing atherosclerosis in patient with a history of peripheral vascular disease (PVD), acutely compounded by thrombus

Risk factors

Acute embolus	Thrombus
• Atrial fibrillation • Valvular heart disease • Previous myocardial infarction • Hypercoagulable states, including malignancy • Abdominal aortic aneurysm and/or femoral/popliteal aneurysm	• Smoking • Diabetes • Hypertension • Pre-existing PVD/claudication • Vascular grafts • Hypercholesterolaemia

CLINICAL FEATURES

Symptoms and signs

- Limb becomes:
  - pale (later mottled and cyanosed)
  - painful
  - pulseless
  - 'perishing' cold
  - paraesthetic/anaesthetic
  - paralysed
- Acute total ischaemia with an acute 'white leg' risks muscle necrosis within 6–12 hr

Assessment

ALI should be distinguished from critical limb ischaemia caused by chronic disorders in which the duration of ischaemia exceeds 14 days

Assess likely nature of occlusion

- Thrombus suggested by:
  - pre-existing claudication with sudden deterioration
  - no obvious source for emboli
- Ask about:
  - claudication
  - night pain
  - previous tissue necrosis (e.g. ulcers)

Acute embolus

Suggested by:

- Sudden onset of painful leg (<24 hr)
- No history of claudication
- Clinically obvious source of embolus (e.g. atrial fibrillation, recent myocardial infarction)
- No evidence of peripheral vascular disease (normal pulses in contralateral limb)
- Evidence of proximal aneurysm (e.g. abdominal, femoral or popliteal)

Determine site of occlusion

- Assess quality and regularity of pulse, noting AF in particular
- Check presence of all palpable pulses, including abdominal aortic, femoral and popliteal pulses
- Auscultate for bruits (e.g. subclavian, axillary, femoral)
- Reduced or absent pulses in contralateral limb
- Evidence of widespread vascular disease (e.g. myocardial infarction, stroke, TIA, previous vascular surgery)
- Previous lower limb vascular surgery, consider acute occlusion of a bypass graft
- Assess for neurological (sensory and/or motor) deficit and blood flow, clinically and using bedside Doppler scanner

Clinical classification of ALI

Category	Clinical findings		Doppler		Prognosis
	Sensory change	Motor deficit	Arterial	Venous	
I Viable	None	None	Present	Present	No immediate threat
II Threatened					Salvageable
a Marginally	Minimal (toes)	None	Absent	Present	Prompt vascular referral
b Immediately	Severe rest pain	Mild/moderate	Absent	Present	Immediate vascular referral
III Irreversible	Anaesthetic	Paralysis/rigor	Absent	Absent	Non-salvageable

† Doppler performed by vascular team. Do not delay contacting the vascular team because a Doppler is unavailable on the ward

INVESTIGATIONS

- Bloods:
  - FBC, U&E
  - INR, APTT, platelet count, group and save
  - thrombophilia screen (for young patients, unexplained event no obvious cause for ALI)
- ECG
- Chest X-ray
- Ankle Brachial Pressure Index (ABPI)
- Consider Duplex scan
- CT angiogram – in acute setting best imaging modality (if patient has renal failure discuss with radiologist)

IMMEDIATE TREATMENT

General

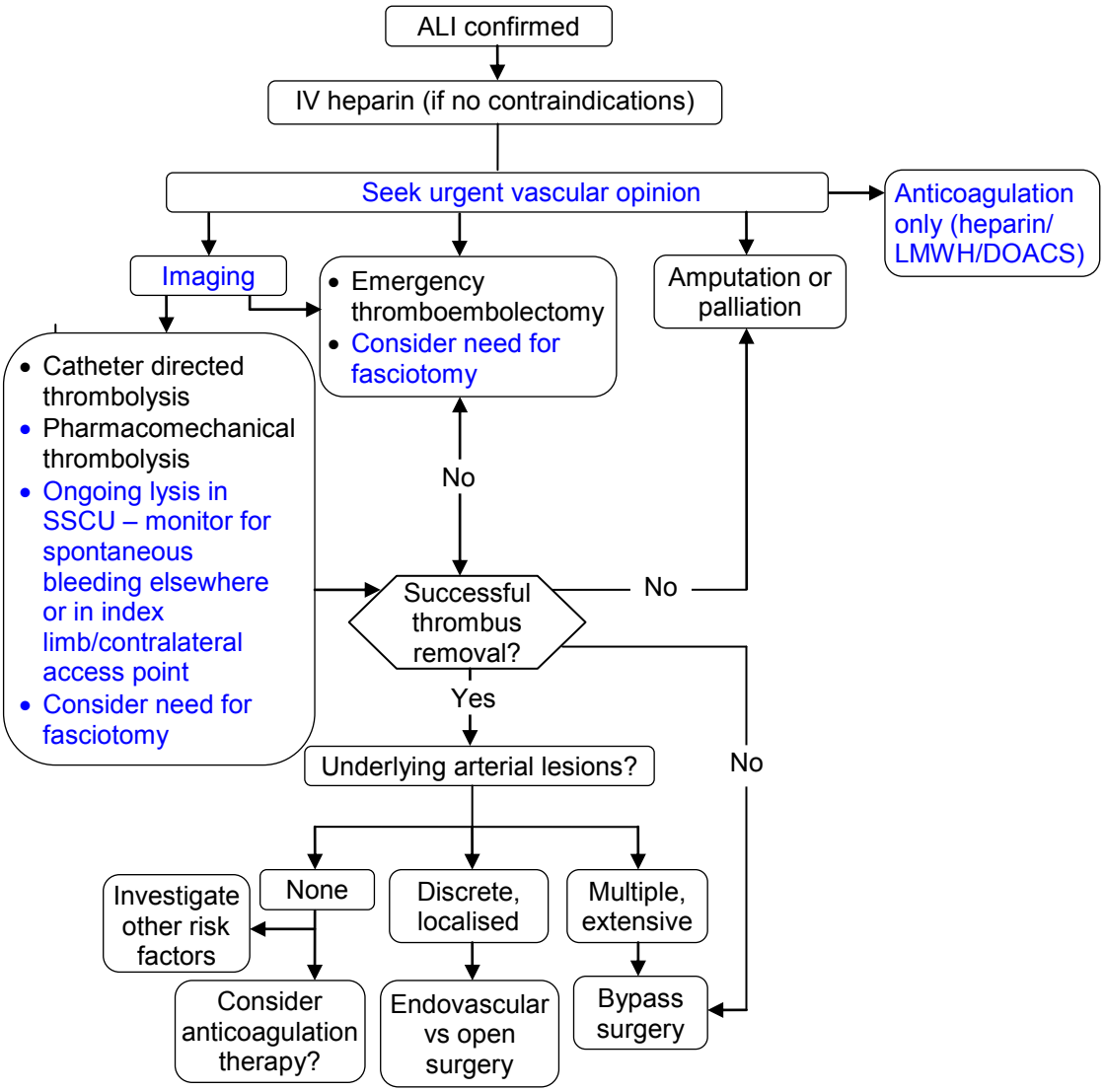
- Assess airway, breathing and circulation, and resuscitate as required
- Give oxygen – see **Oxygen therapy in acutely hypoxaemic patients** guideline
- Give adequate non-NSAID analgesia: clinician to decide based on individual needs of patient
  - prevention/treatment of nausea/retching or vomiting: prescribe anti-sickness/anti-emetic medication depending on severity
- Nil-by-mouth until opinion of vascular team obtained
- Give IV fluids as dehydration can lead to increased blood viscosity (and further impairment of blood flow) – see **Fluid resuscitation** guideline and **Maintenance fluid therapy** guideline
- Monitor input/output (catheterise if required)
- **Specific management – see Flowchart: Management of ALI**

Vascular team opinion

Seek opinion from vascular team as soon as possible. Include in discussion:

- Length of history
  - if out-of-hours and history ≥1 week, discuss giving pain relief until next working day as ischaemia likely to be irreversible. A senior member of the referring on-call team must assess these patients
  - if history <1 week, particularly <24 hr, consider immediate operation or thrombolysis
- If not for surgery within 4 hr, start IV heparin infusion to prevent propagation of thrombus – see **IV unfractionated heparin** guideline
- Duplex and/or CT angiography (if evidence of renal impairment, cover angiography with sodium bicarbonate – See **Prevention of contrast induced acute kidney injury** guideline). Monitor vital signs and condition of limb regularly

Flowchart: Management of ALI



SUBSEQUENT MANAGEMENT

- Monitor condition of limb closely post-operatively or post-thrombolysis (an occasional alternative to surgery) to detect early re-occlusion
- Treat atrial fibrillation as required – see **Atrial fibrillation** in **Medical** guidelines
- Investigate and identify the risk factors listed above
- Vascular surgeon to decide regarding subsequent anticoagulation with heparin/warfarin/DOACS
- If anticoagulation recommended, ensure APTT/INR within target range and checked regularly
- Give patient appropriate advice regarding lifestyle change:
  - smoking cessation
  - diet
  - exercise
- Treat hypertension and hyperlipidemia
- Encourage early mobilisation
- Ensure appropriate outpatient follow-up with vascular team

ACUTE PANCREATITIS ● 1/3

RECOGNITION AND ASSESSMENT

Symptoms and signs

- Epigastric pain +/- radiation to back
- Vomiting
- Abdominal tenderness/peritonism
- Abdominal distension (more likely in severe cases)
- Discolouration in lumbar region and/or peri-umbilical area because of bleeding into retroperitoneal space
- Systemic inflammatory response syndrome (SIRS) with/without organ dysfunction

Causes

- Gallstones/alcohol (80%)
- Idiopathic (10%)
- Iatrogenic (e.g. endoscopic retrograde cholangiopancreatography; ERCP) (3%)
- Miscellaneous (7%):
- hypertriglyceridaemia
- trauma
- hyperparathyroidism
- viral
- drugs (e.g. thiazides, aminosalicylates, exenatide)
- chronic pancreatitis
- pancreatic malignancy
- sphincter of Oddi dysfunction
- pancreas divisum

Investigations

- FBC
- U&E
- Serum amylase*
- LFT
- CRP
- Blood glucose
- Serum calcium
- Arterial blood gases
- Calculate Glasgow score for pancreatitis – see below
- If pyrexial, blood culture
- ECG
- Erect chest X-ray
- Abdominal X-ray (‘sentinel loop’ of small bowel may be seen)
- Abdominal ultrasound scan within 24 hr to identify gallstones/bile duct dilatation:
- if admitted 0900–1500 hr: ultrasound at 1500 hr
- if admitted 1500–0900 hr: ultrasound at 0900 hr
- **ONLY if diagnosis unclear**, abdominal CT scan. **Early CT scan is not indicated otherwise due to risk of contrast medium-induced renal dysfunction**

Serum amylase usually >3 × normal. Lower concentrations do not rule out diagnosis because amylase may fall within first 24–48 hr. Serum amylase can be raised in perforated peptic ulcer or ischaemic bowel, but usually <3 × normal

Severity

- CRP >150 mg/L 48 hr after onset of acute attack predicts early and late complications
- Presence of ongoing SIRS (persisting tachycardia, tachypnoea, pyrexia or elevated WCC)
- Persisting rather than transient organ dysfunction

Modified Glasgow score for pancreatitis

To predict severity, score 1 point for each variable. A score of ≥3 predicts, but does not define, a severe episode of acute pancreatitis

Variable	Score one point if:
Age	>55 yr
PaO_2	<8.0 kPa
WCC	>15 × 10^9/L
Ca^{2+} (uncorrected)	<2.0 mmol/L
ALT	>100 IU/L
LDH	>600 IU/L
Glucose	>10 mmol/L
Urea	>16 mmol/L
Albumin	<32 g/L

By changing the order of variables, an easy mnemonic to remember the Glasgow score is:

P = PaO_2
A = age
N = neutrophils (WCC)
C = calcium
R = renal function (urea)
E = enzymes (ALT/LDH)
A = albumin
S = sugar (glucose)

Differential diagnosis

- Biliary colic or acute cholecystitis
- Peptic ulcer
- Perforated viscus – stomach, duodenum, large and small bowel, gall bladder (rare)
- Intestinal ischaemia
- Ruptured aortic aneurysm
- Myocardial infarction

IMMEDIATE TREATMENT

Mild

- Give clear oral fluids as tolerated. Give IV fluids to make up shortfall – see **Maintenance fluid therapy** guideline
- In the presence of abdominal distension or vomiting, nasogastric tube drainage, limited fluids by mouth with most fluid IV – see **Maintenance fluid therapy** guideline
- Oxygen (maintain arterial saturation – see **Oxygen therapy in acutely hypoxaemic patients** guideline)
- Analgesia – morphine may be required, see **Opioids – route of administration** guideline and **Opioids – monitoring and dose adjustment** guideline

Severe

- Institute treatment listed under **Mild**
- In the presence of organ dysfunction not improving on initial resuscitation, admit to SSCU/HDU/critical care
- Insert CVP line – degree of hypovolaemic shock often underestimated
- Insert arterial line for blood gas monitoring – patients are usually hypoxaemic
- Anticipate need for large volumes of IV fluids (crystalloid) to maintain CVP over first 24–48 hr. If difficulty maintaining CVP and BP with crystalloid, discuss fluid management with critical care – see **Fluid resuscitation** guideline
- Target urine output >0.5–1 mL/kg/hr
- Avoid routine prophylactic antimicrobials and treat only proven infection

COMPLICATIONS

- Acute respiratory distress syndrome (ARDS) – discuss with critical care
- Renal failure (see **Acute renal failure** guideline)
- Deterioration despite maximum support – consider infection/pancreatic necrosis

SUBSEQUENT MANAGEMENT

- ERCP recommended within 72 hr in presence of:
  - severe attack resulting from gallstones and
  - jaundice and/or
  - cholangitis and/or
  - dilated bile ducts
- If patient has gallstones, ideally perform cholecystectomy on same admission or no later than 2 weeks after discharge. For patients unfit for cholecystectomy, ERCP and sphincterotomy may be protective against future attacks
- Contrast-enhanced CT scan can help to grade severity of pancreatitis in the presence of a complicated clinical course or to detect necrosis and is best performed 7–10 days after onset
- Refer patients with severe pancreatitis who do not rapidly improve to upper GI team; percutaneous drainage and/or necrosectomy of pancreas may be necessary. Do not drain acute peri-pancreatic fluid collections without discussion with upper GI team

ACUTE UPPER ABDOMINAL PAIN ● 1/2

RECOGNITION AND ASSESSMENT

Symptoms

- Pain
  - may be constant or colicky
  - may radiate to back or chest

Associated symptoms

- Pyrexia, particularly in acute cholecystitis
- Vomiting of food, dark brown, denatured blood ('coffee-grounds') or fresh blood (haematemesis)
- Melaena (black, tarry, smelly stool containing digested blood) suggests peptic ulcer

Previous history

- Enquire about:
  - peptic ulceration
  - ulcer-causing medication (particularly non-steroidal anti-inflammatory drugs)
  - gallstones
  - alcohol intake
  - dysphagia
  - weight loss
  - liver disease
  - pancreatic disease
  - inflammatory bowel disease

Examination

- Pulse, BP, temperature
- Anaemia
- Jaundice (suggests gallstones, cholangitis, or severe hepatic or pancreatic disease)
- Abdominal tenderness
- Rebound tenderness
- Guarding/rigidity
- Murphy's sign
- Grey Turner's sign
- Mass (including palpable gall bladder)

Differential diagnosis

- Biliary colic (consider stone position, Hartmann's pouch or CBD)
- Acute cholecystitis
- Pancreatitis/carcinoma pancreas
- Acute peptic ulceration (including perforation)
- Hiatus hernia
- Perforation lower oesophagus (spontaneous/iatrogenic/foreign body)
- Traumatic – ruptured spleen/liver/bowel/diaphragm
- Ruptured or dissecting abdominal aortic aneurysm – see **Acute abdominal aortic aneurysm** guideline
- Referred chest pain in association with:
  - myocardial infarction
  - pulmonary embolus
  - pleurisy
  - pericarditis

Investigations

- FBC
- U&E
- Serum amylase
- LFT and INR
- If pyrexial, blood cultures

- Plain abdominal X-ray is indicated in the following:
  - suspicion of bowel obstruction or perforation. **Do not consider for** biliary colic, but if you feel there is a risk of perforation, perform an erect chest X-ray looking for free gas. **Note:** 15%–20% of all perforated viscus events do not show free air
  - constipation
  - acute exacerbation of inflammatory bowel disease
  - acute and chronic pancreatitis
  - foreign body
- If suspecting:
  - upper GI perforation – erect chest X-ray
  - biliary colic or acute cholecystitis – ultrasound scan of abdomen
  - malignancy – CT scan of abdomen
  - acute abdominal aortic aneurysm – see **Acute abdominal aortic aneurysm** guideline
  - peptic ulcer – upper GI endoscopy

IMMEDIATE TREATMENT

- ABC
- Baseline observations:
  - temperature, pulse, blood pressure
  - supplemental oxygen if indicated
- Establish IV access and administer fluids – see **Fluid resuscitation** and **Maintenance fluid therapy** guidelines
- Initiate pain relief – choice will depend on severity and cause
- If infective cause suspected (e.g. cholecystitis/cholangitis), give appropriate antimicrobial – see **Antimicrobial Microguide** on Trust intranet. Do not start antimicrobials for pain. There must be evidence of infection clinically or on blood investigations
- Insert nasogastric tube if required e.g. patient has uncontrolled vomiting and there is risk of aspiration. **Do not** insert nasogastric tube if not required
- You **must** calculate and document the modified Glasgow score for pancreatitis in patient notes and act appropriately – see **Acute pancreatitis** guideline
- Seek senior help (at least SpR)
  - consider transfer to SSCU/HDU for resuscitation and invasive monitoring
  - if emergency surgery anticipated – see **Arranging a theatre list** guideline

Antimicrobial therapy

- See **Antimicrobial Microguide** on Trust intranet

SUBSEQUENT MANAGEMENT

- Dependent on clinical response of patient and investigation findings

DISCHARGE AND FOLLOW-UP

- Patients with neoplasia may need further investigation and treatment – discuss with upper GI team cancer nurse specialist
- Patients with *H. pylori*-positive peptic ulceration, faecal antigen test to confirm eradication of *H. pylori* >4 weeks post therapy
- Patients with investigations pending must have outpatient appointments made anticipating when results will be available
- Arrange appropriate follow-up at discretion of consultant in charge

ANORECTAL PROBLEMS – ADULTS ● 1/2

Elderly patients with PR bleeding, particularly if blood present on rectal examination will require referral for surgical assessment

RECOGNITION AND ASSESSMENT

Symptoms and signs

Pilonidal abscess

- Infected pit in natal cleft
- pain
- swelling
- offensive discharge

Anorectal abscess

- Most begin as an infection involving anal crypt and gland
- Infection spreads between sphincter muscles to a variety of sites
- Pain and swelling in peri-anal region
- Symptoms may be less evident with deep infections
- PR examination may reveal a mass or indurated area

Anal fissure

If fissures are not in the midline and are multiple, be suspicious. Consider differential diagnosis: Crohn's, anal or rectal Ca

- Tear in squamous epithelium of anal canal
- severe pain on defecation and for 1–2 hr after
- blood may be present on toilet paper
- Most simple fissures located posteriorly in midline, just inside anal orifice

Haemorrhoids

- Painless bright red bleeding (commonest complication)
- usually occurs on defecation, blood is not mixed with stool

Rectal prolapse

- Patients present with a lump at the anal verge, typically after defecation, due to extrusion of the full thickness of the wall of the rectum
- May co-exist with a rectocele
- Patients may report difficulty emptying rectum or faecal incontinence

IMMEDIATE TREATMENT

General measures

Pilonidal abscess

- Refer to on-call surgical team

Anorectal abscess

- Refer to on-call surgical team

Anal fissure

- Soften stools with a bulk forming laxative: ispaghula husk 1 sachet 12-hrly preferably after meals (not at bedtime)
- If pain, prescribe GTN 0.4% ointment – apply 2.5 cm of ointment to anal canal every 12 hr until pain stops; maximum duration of use 8 weeks
- Refer to GP – recommend urgent referral to specialist if fissuring is atypical in appearance

Haemorrhoids

- Check abdomen and anus (including PR examination)
- Recommend a trial of bulk forming laxative (e.g. ispaghula husk) and Anusol®
- Refer to GP

ANORECTAL PROBLEMS – ADULTS ● 2/2

Rectal prolapse

- Acute prolapse will usually reduce spontaneously or with gentle digital pressure
- Associated oedema may make reduction more difficult. Reduction can be facilitated by application of ice wrapped in a cloth or sugar to prolapsed rectum
- If unable to reduce prolapse refer to surgical team
- Give patients who report difficulty emptying rectum a trial of osmotic laxative (Movicol 1 sachet 12-hrly)
- Patients with incontinence and soft or loose stools benefit from stool modification with constipating agents, such as codeine phosphate 30 mg 6-hrly
- Refer to GP

LARGE BOWEL OBSTRUCTION ● 1/2

AETIOLOGY

- Cancer
- Sigmoid volvulus
- Caecal volvulus
- Diverticular disease
- Rare strictures
- Crohn's
- ischaemic
- post-radiotherapy

RECOGNITION AND ASSESSMENT

Symptoms and signs

- Abdominal pain
- Constipation
- Abdominal distension
- Vomiting (particularly if incompetent ileo-caecal valve)
- Tenderness (particularly in RIF when ileo-caecal valve competent and impending caecal perforation)

Differential diagnosis

- Constipation with impacted faeces
- Colonic pseudo-obstruction (functional obstruction of colon leading to megacolon in the absence of obvious colonic diseases or mechanical obstruction)
- Toxic dilatation of colon

Do not perform laparotomy until imaging has ruled out pseudo-obstruction

Investigations

- FBC
- U&E
- Erect chest X-ray: particularly if perforation suspected
- Abdominal X-ray: Look for caecal distension vs small bowel dilatation
- if caecum >10 cm diameter, risk of caecal rupture increases. Probability of caecal perforation increased by competent ileo-caecal valve, causing 'closed-loop' obstruction
- small bowel dilatation infers incompetent ileo-caecal valve is decompressing caecum, lessening threat of rupture
- Contrast enema – **essential** to differentiate mechanical obstruction from pseudo-obstruction
- CT scan – particularly useful in malignant large bowel obstruction as CT can also identify presence of metastases

MANAGEMENT

- Decision on method of decompression/laparotomy must be made by a consultant or SpR

General

- IV fluids – see **Fluid resuscitation** and **Maintenance fluid therapy** guidelines
- If incompetent ileo-caecal valve and associated small bowel obstruction, insert nasogastric tube – see **Nasogastric tube insertion** guideline
- Analgesia – remember that opioid-induced constipation can exacerbate ileus
- Stop all motility stimulants/prokinetics e.g. metoclopramide/senna. Avoid calcium resonium
- Urinary catheter
- Oxygen – see **Oxygen therapy in acutely hypoxaemic patients** guideline
- If nil-by-mouth, review regular medication and ensure any essential medications (e.g. anti-epileptics, immunosuppressants) are given by alternative routes. Medicines should not be omitted and ward staff must do their upmost to obtain medicines both in and out of hours
- Seek advice from ward pharmacist or medicines information for dosage conversions and obtaining medicines within normal hours. If out-of-hours contact on-call pharmacist (bleep via switch). Also refer to critical medicines list on Trust intranet/clinicians/support-services/pharmacy/obtaining-critical-medicines/
- ensure suspension of non-essential drugs is recorded in patient notes and on drug chart, and that they are recommenced as appropriate
- If not for immediate surgery, consider thromboprophylaxis – see **Prophylaxis against venous thromboembolism** guideline

LARGE BOWEL OBSTRUCTION ● 2/2

Non-operative decompression

- Rigid sigmoidoscopy and passage of flatus tube decompresses sigmoid volvulus in 80% of cases and may decompress colon in acute colonic pseudo-obstruction
- If decompression with rigid sigmoidoscope fails in sigmoid volvulus or pseudo-obstruction, and there are no signs of ischaemic or gangrenous colon, attempt colonoscopic decompression
- In malignant large bowel obstruction, self-expanding metal stents can decompress the colon:
- temporarily – to relieve obstruction and allow semi-elective surgery with reduced morbidity and mortality
- definitively – if metastases present or surgery inappropriate

Operative management

- Most appropriate procedure (bowel resection and/or colostomy/ileostomy/caecostomy) will be decided by senior surgeon

RENAL (URETERIC) COLIC ● 1/3

RECOGNITION AND ASSESSMENT

Definition

Acute, severe pain caused by obstructed or partially obstructed ureter. Most commonly caused by calculi

History

- M:F = 3:1, peak incidence between ages 20–40 yr
- History of previous episodes (first presentation rare in children and elderly)
- Precipitating factors:
  - dehydration (seen more in summer months)
  - gout, increased protein intake
  - history of renal disease, urinary tract abnormalities
  - family history of renal stones
  - drugs (e.g. protease inhibitors, sulfasalazine, thiazide diuretics, calcium-containing antacids)

Symptoms and signs

- Pain
  - sudden onset – severe, spasmodic
  - background, constant dull pain
  - classically loin-to-groin pain
  - costovertebral angle tenderness (abdominal examination otherwise normal)
- Restlessness – seeking to obtain a more comfortable position (different from peritonitis)
- Sweating
- Nausea and vomiting
- Dehydration
- Tachycardia, sweating
- Haematuria – usually microscopic, sometimes macroscopic

Possible associated problems

- Urinary tract infection (UTI)

Investigations

- Urinalysis – blood detectable in >90%, also check for nitrites, leucocytes, pregnancy test
- MSU for MC&S
- FBC, U&E, Ca^{2+}, urate, glucose
- If pyrexial, blood culture
- Non-contrast CT KUB (kidney, ureter, bladder) with 99% of stones visible
  - for haematuria positive patients, 24 hr access
  - for haematuria negative patients, working hours access. Out-of-hours, discuss with radiology SpR
- Ultrasound scan (USS) instead of CT KUB
  - pregnant patient
  - patient aged <30 yr with typical symptoms

Complete obstruction may require urgent intervention. It is vital to identify patients with bilateral ureteric obstruction, or with a single functioning/transplanted kidney and ureteric obstruction. If sepsis suggested by rigors or fever, urgently consider intervention, such as nephrostomy

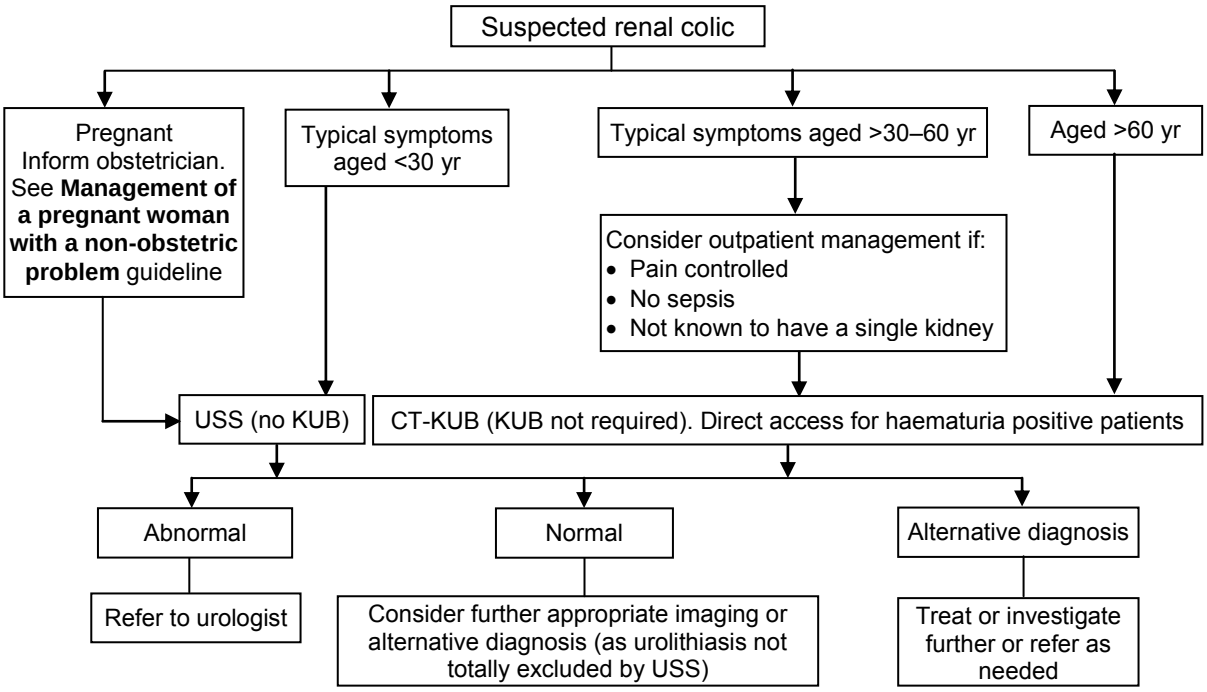
Differential diagnosis

- Ruptured/symptomatic abdominal aortic aneurysm (AAA), especially in men presenting with renal colic for the first time – see **Acute abdominal aortic aneurysm** guideline

Beware: new onset flank/back pain may represent a ruptured/symptomatic AAA (even in presence of haematuria)

- Pyelonephritis, UTI
- Appendicitis, biliary colic, other bowel pathology (always ask about GI symptoms)
- Gynaecological cause, including ectopic pregnancy (always ask about menstrual history)
- Musculoskeletal pain especially of spinal origin

IMAGING MANAGEMENT FLOWCHART



IMMEDIATE TREATMENT

Analgesia

Ensure no contraindications for NSAIDs and patient has not self-administered NSAIDs before admission. Consider PPI in patients with dyspepsia

- Diclofenac 100 mg rectal (preferred route) immediately followed by 50 mg rectal/oral 8-hrly (maximum 150 mg daily); stepping down to naproxen 250 mg oral 6-hrly
- see also **Paracetamol and NSAIDs** guideline

Do not issue diclofenac on discharge

- Opioid: see **Opioids – route of administration** guideline and **Opioids – monitoring and dose adjustment** guideline
- morphine sulphate: titrate dose to optimise pain relief, seek advice from acute pain service

Supportive

- Anti-emetic for nausea or vomiting
- Rehydrate with oral fluid
- if patient unable to tolerate oral fluids or severely dehydrated, give fluid IV – see **Maintenance fluid therapy** guideline
- Monitor fluid balance status and urine output, particularly in patients with potential complete obstruction

Antimicrobial therapy

- If clinical suspicion of UTI or sepsis
- Choice of agent – see microbiology guidelines and seek further advice from microbiologist
- Initial therapy may be modified once results of urine or blood cultures available

Patients with ureteric obstruction may have renal impairment; seek advice when selecting antimicrobial and dosage – contact medicines information

MONITORING TREATMENT

- Monitor pain relief and administer analgesia as appropriate
- Ensure adequate fluid resuscitation and monitor fluid balance and urine output regularly (6–8 hrly if mild symptoms and signs, 1–2 hrly if severe symptoms and signs)
- Monitor heart rate, BP, and temperature
- If significant abnormalities, repeat biochemical screen within 24 hr

SUBSEQUENT MANAGEMENT

Indications for admission

- Large calculi on imaging:
  - calculi >1 cm unlikely to pass spontaneously and will require intervention
  - calculi between 5 mm–1 cm pass spontaneously in 50% of patients
  - calculi <5 mm pass spontaneously in 80% of patients. Most patients who present to A&E with ureteric colic have calculi <5 mm diameter
- Persistent/worsening pain despite rectal/oral analgesia
- Nausea and vomiting, intolerance of oral intake despite anti-emetics
- Pyrexia, rigors or evidence of co-existing sepsis
- New or worsening renal failure – **review all medication as reduction/omission may be necessary**
- Risk of complete obstruction: bilateral obstruction, single functioning kidney with ureteric obstruction or transplanted kidney with ureteric obstruction

Consider admitting patient

- With diabetes
- With poor social support
- If pregnant

Do not admit if

- Pain has subsided either spontaneously or with analgesia
- Adequate follow-up arranged (as detailed below) and social support adequate

DISCHARGE AND FOLLOW-UP

If no inpatient urology review

- Advise patient to:
  - keep well hydrated
  - attend follow-up as arranged
  - seek medical advice if severe pain recurs, or pyrexia or rigors occur
- Arrange follow-up:
  - urgent outpatient CT KUB (if not arranged during admission)
  - urgent urology outpatient clinic follow-up

If inpatient urology review

- As per urology team plan

RETENTION OF URINE ● 1/2

RECOGNITION AND ASSESSMENT

Definition

Inability to pass urine, with a significant quantity of residual urine (usually over 500 mL) in the bladder. It is more common in men. Acute retention is usually painful, whereas chronic retention is usually painless

Beware acute painless retention as a symptom of neurological dysfunction such as acute spinal cord or cauda equina compression

Symptoms and signs

- Inability to pass urine, often after frequent failed attempts
- Pain – usually suprapubic – may be severe
- Bladder palpable and dull to percussion
- Dribbling of urine, particularly at night, is a common symptom

Risk factors

- Enlarged prostate
- History of symptoms of bladder outflow obstruction
- Previous catheterisation
- Recent anaesthetic/surgery, particularly lower abdominal or peri-anal (e.g. haemorrhoidectomy)
- Increased fluid intake
- Diuretic therapy

Differential diagnosis

- Anuria (renal failure)
- Ovarian mass
- Large uterus
- Dilated bowel

IMMEDIATE MANAGEMENT

- Exclude neurological causes of acute retention – assess patient's neurological function – retention resulting from a spinal cord lesion needs rapid treatment if there is to be any chance of recovery. If presentation suggests this is a possibility, emergency referral to spinal surgeon
- Catheterise immediately to relieve distress – see **Urethral catheterisation** guideline
- postoperative acute retention frequently resolves once ambulant and off parenteral opioids; if persistent refer to urology
- U&E, FBC
- if U&E normal, send patient home with leg bag after arranging urology outpatient appointment
- if U&E abnormal, admit for correction of fluid and electrolyte balance. Review all medication as dose reduction/omission may be necessary
- low Hb may indicate chronic retention, but exclude other causes (e.g. colon cancer)
- Review any medication with anticholinergic effects (e.g. tricyclic antidepressants)

INPATIENT MANAGEMENT

- Oral fluids are usually adequate for maintaining fluid balance
- If postural hypotension develops or weight continues to decrease after 48 hr, give IV fluid only
- estimate daily requirement as daily output plus 500 mL, give as sodium chloride 0.9% infusion with K+ replacement as needed – see **Hypokalaemia** and **Hyperkalaemia** guidelines
- Some patients may require dialysis short or long-term

INPATIENT MONITORING

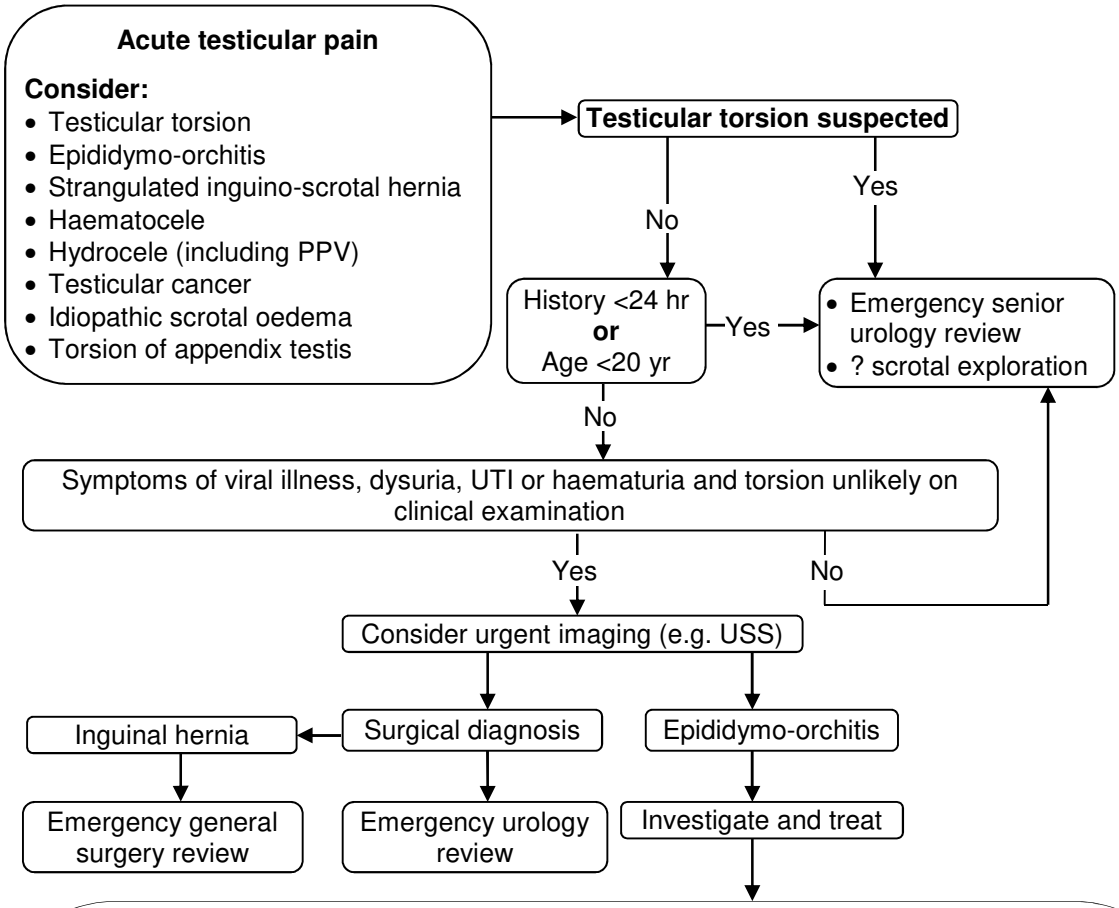
- Measure blood pressure lying and standing at least 4 times per day
- Weigh daily
- U&E daily

RETENTION OF URINE ● 2/2

SUBSEQUENT MANAGEMENT

- Failure of renal function to improve suggests that obstruction may have been longstanding
- consider ultrasound scan of urinary tract to assess amount of renal tissue present and degree of hydronephrosis
- if renal function does not recover, refer to renal team
- If residual bladder volume (total amount of urine drained on initial catheterisation) was not too large (<1 L) or if there was a precipitating event, such as an anaesthetic or large fluid intake, give trial without catheter (TWOC)
- give tamsulosin 400 microgram once daily or alfuzosin MR 10 mg once daily (check renal function before prescribing alfuzosin) for at least 48 hr before TWOC and for 24 hr after removal. Can cause postural hypotension
- If residual volume >1 L, patient will usually be offered surgery
- Refer all patients to urology, usually as outpatient

SCROTAL PAIN/SWELLING • 1/1



Investigations

- Midstream specimen of urine for culture and sensitivity, and for chlamydia PCR
- Urethral swab for culture
- Request copy of results sent to patient's GP
- If STD suspected advise patient to attend GU medicine clinic (Cobridge Health Centre 0900–1130 hr next working day)

Treatment

- Antimicrobials
  - **aged <35 yr:** Ceftriaxone 1 g IM **single dose** (reconstituted with 1% lidocaine hydrochloride as per manufacturer's instructions) **plus** doxycycline 100 mg oral 12-hrly. If anaphylaxis to penicillin, contact consultant microbiologist/infection diseases
  - **aged >35 yr:** Piperacillin/tazobactam 4.5 g IV 8-hrly. Oral stepdown or if penicillin allergy: ciprofloxacin 500 mg oral 12-hrly
- Duration: adjust according to culture results
  - aged <35 yr: 10–14 days
  - aged >35 yr: 10 days
- NSAIDs if not contraindicated, patient well hydrated ibuprofen 400 mg oral 8-hrly for 5 days.
  - if prescribing >5 days NSAIDs and patient at high risk of gastro-intestinal complications (e.g. aged >65 yr, history of peptic ulcer disease), consider prescribing omeprazole 20 mg oral once daily

SMALL BOWEL OBSTRUCTION ● 1/3

AETIOLOGY

Within the lumen

- Gallstone
- Food bolus
- Bezoars
- Parasites (e.g. *Ascaris*)
- Enterolith
- Foreign body

Within the wall

- Inflammation: Crohn's disease/radiation enteritis
- Infection: TB
- Ischaemia: superior mesenteric artery embolus/superior mesenteric vein thrombosis
- Tumour:
- primary – adenocarcinoma (rare), lymphoma, carcinoid
- secondary

Outside the wall

- Adhesions:
- congenital (e.g. bands)
- acquired – post-operative or inflammatory (e.g. appendicitis/diverticulitis)
- Hernia:
- inguinal
- femoral
- incisional
- umbilical
- internal (e.g. diaphragmatic, paraduodenal)
- Intussusception (in adults usually caused by tumour)
- Volvulus
- Most common cause of small bowel obstruction in UK is adhesions secondary to previous surgery. Spontaneous resolution will occur in up to 70% of patients

Carcinoma of caecum/ascending colon with incompetent ileocaecal valve will cause clinical small bowel obstruction (SBO)

SYMPTOMS AND SIGNS

History

- Central colicky abdominal pain
- Vomiting
- may be faeculent with established obstruction
- occurs early with high small bowel obstruction
- Abdominal distension – may not be significant with high small bowel obstruction
- Absolute constipation (often a late symptom) – bowels not open and no flatus passed
- Previous abdominal surgery

Physical examination

- Pulse
- Blood pressure
- Temperature
- Hydration
- Chest
- Abdomen
- scars
- lumps
- herniae
- distension
- tenderness
- masses
- peritonism
- Rectal examination

Differential diagnosis

- Gastric outlet obstruction (e.g. duodenal ulcer or stomach malignancy)
- Infective conditions [e.g. gastroenteritis, *Salmonella*, *Shigella* (usually with accompanying diarrhoea)]
- Ascites/carcinomatosis
- Pancreatitis

INITIAL INVESTIGATIONS

To assess general state, confirm diagnosis and establish cause

- FBC
- U&E
- LFTs/amylase/CRP
- Clotting studies
- If unstable, consider arterial blood gases (metabolic acidosis may indicate bowel ischaemia)
- Plain supine abdominal/erect chest X-ray
  - minimal small bowel dilatation
  - consider gallstone ileus – calcified gallstone and possible air in biliary tree, confirm by ultrasound scan

INITIAL MANAGEMENT

Resuscitation

- Give oxygen – see **Oxygen therapy in acutely hypoxaemic patients** guideline
- IV fluids – see **Fluid resuscitation** and **Maintenance fluid therapy** guidelines

Specific

- Nasogastric (NG) tube with initial and 4-hrly aspiration, left on free drainage to decompress upper GI tract and reduce aspiration risk – See **Nasogastric tube insertion** guideline

In established small bowel obstruction, do not wait for vomiting before inserting NG tube

- Give analgesia early and in adequate doses (escalating analgesia requirements may indicate need for surgery)
- Stop all motility stimulants/prokinetics (e.g. metoclopramide, senna)
- If nil-by-mouth, review regular medication and ensure any essential medications (e.g. anti-epileptics, immunosuppressants) are given by alternative routes. Note: medicines should not be omitted and ward staff must do there upmost to obtain medicines both in and out-of-hours
- Seek advice from ward pharmacist or medicines information for dosage conversions and obtaining medicines within normal hours. If out-of-hours contact on-call pharmacist (bleep via call centre). Also refer to the critical medicines location list on the Trust intranet
  - ensure drugs to be omitted are documented
- Catheterise and monitor urine output hourly
  - consider central venous line to monitor resuscitation/rehydration in elderly or patients with cardiac disease
- If not for immediate surgery, consider thromboprophylaxis – see **Prophylaxis against venous thromboembolism** guideline

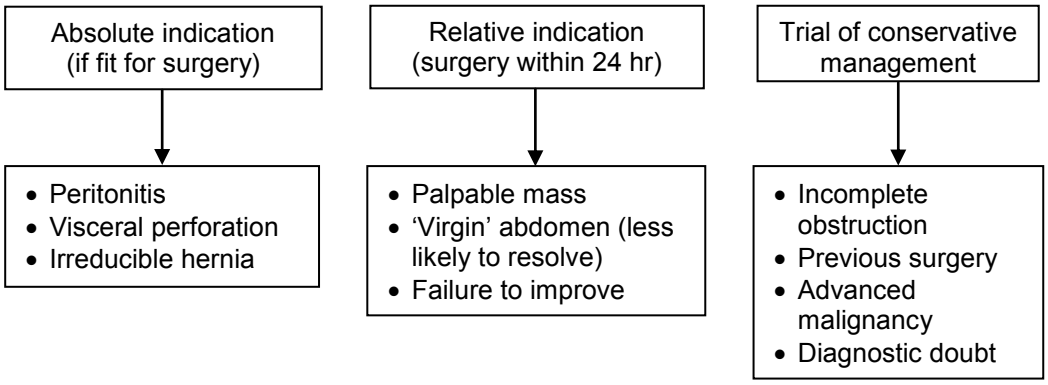
SUBSEQUENT INVESTIGATIONS

- CT scan of abdomen with or without oral contrast can identify level of obstruction and/or presence of malignancy including metastases
- Contrast radiology (e.g. small bowel follow-through)

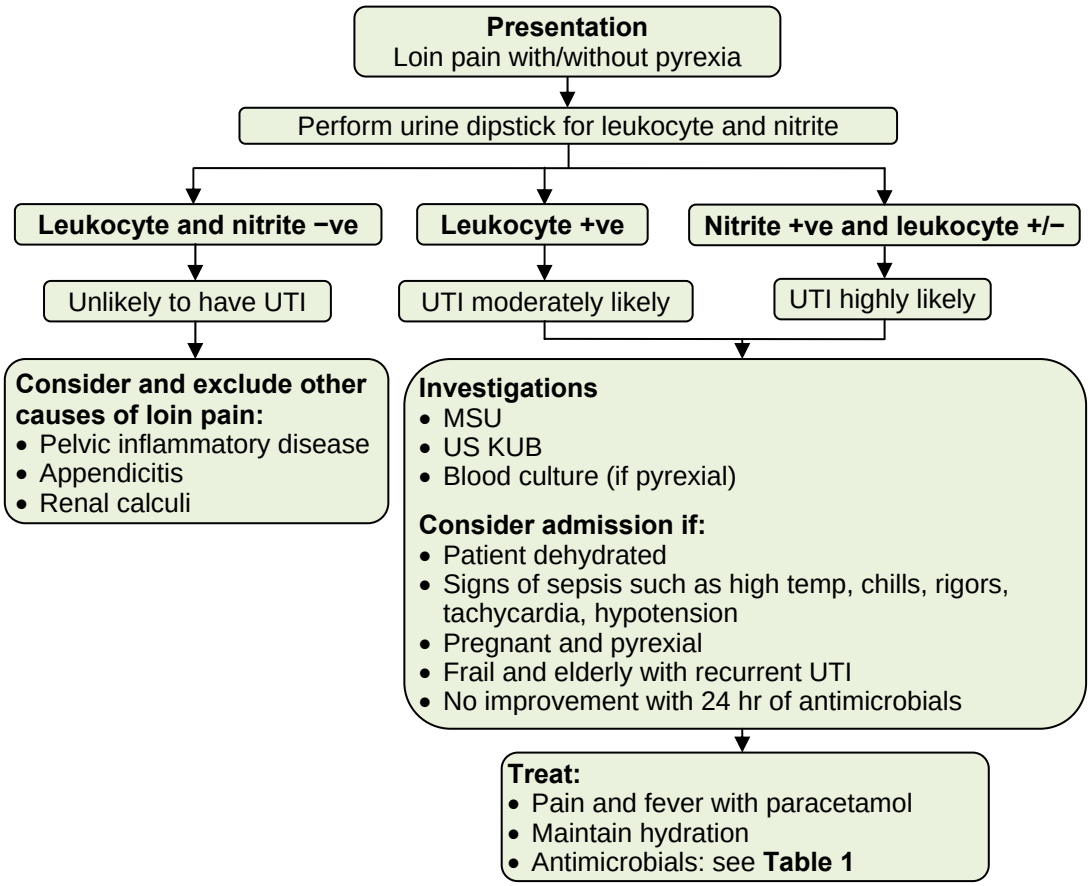
MONITORING

- Temperature, pulse and BP (if condition stable 4-hrly, if unstable more frequently as per NEWS/patient's condition)
- Urinary output hourly
- Adequacy of resuscitation
- Progress of obstruction
- Any deterioration
  - abdominal signs (e.g. developing tenderness)
  - volume of aspirate – increasing or reducing
  - quality of aspirate – becoming faeculent
  - repeated bloods – increasing leucocytosis, rising CRP

INDICATIONS FOR SURGERY



SUSPECTED ACUTE PYELONEPHRITIS ● 1/1



If patient managed as an outpatient, ask GP to refer to urology if:
- Male patient
- Recurrent UTI
- MSU positive for Proteus species
- **Request a copy of MSU results to be sent to GP**

Table 1: Antimicrobial treatment of pyelonephritis

Treatment	First line	Alternative (penicillin allergy)
Community acquired	Co-amoxiclav 1.2 g IV 8-hrly **plus** Gentamicin IV (see prescribing regimen)* **single dose** **Oral stepdown:** Co-amoxiclav 625 mg oral 8-hrly	Aztreonam 1 g IV 8-hrly **or** Gentamicin IV (see prescribing regimen)* Monitor for signs of deafness and balance problems which may occur at normal levels
Hospital acquired (if sepsis suspected, see **Sepsis management** guideline)	Piperacillin/tazobactam 4.5 g IV 8-hrly	Aztreonam 1 g IV 8-hrly **or** Gentamicin IV (see prescribing regimen)* Monitor for signs of deafness and balance problems which may occur at normal levels
Tagged for ESBL	Ertapenem 1 g IV by infusion daily	If anaphylaxis to penicillin contact consultant microbiologist or consultant in infectious diseases
In pregnancy	Discuss with on-call obstetric team and refer to **Obstetric** guidelines for treatment	
Duration	**Adjust treatment according to culture and sensitivities** **Review IV route after 24–48 hr:** convert to oral therapy, if available and tolerated, as prolonged IV therapy has been shown to have no clinical benefit as compared to oral **14 days total**	

* Monitor U&E and gentamicin levels. Discuss with consultant microbiologist or consultant in infectious diseases if there are any concerns regarding gentamicin toxicity

Check iPortal for IC alert under patient alerts. If iPortal not available, then check the previous 12 months of microbiology reports: if MRSA present then treat as tagged for MRSA; if ESBL present then treat as tagged for ESBL; if CARB present discuss with microbiologist for empirical treatment

THE ACUTELY PAINFUL TESTIS ● 1/1

DIFFERENTIAL DIAGNOSIS

- Testicular torsion
- Epididymo-orchitis
- Strangulated inguino-scrotal hernia
- Haematocele
- Hydrocele
- Testicular cancer
- Idiopathic scrotal oedema
- Torsion of appendix testis

TESTICULAR TORSION

- Can occur at any age but more common in adolescence

Symptoms

- Pain of acute onset in groin or scrotum
- Pain may be in loin or abdomen, not groin
- Swollen or high-riding testis
- onset usually <24 hr – chronic testicular pain is not an emergency

Signs

- Testicular tenderness
- Testicular swelling
- Scrotal erythema
- Fever suggests acute epididymo-orchitis

Investigations

- Consider surgical exploration if suspicion of testicular torsion. If long history (>24 hr) or significant diagnostic doubt consider ultrasound scan and nuclear medicine investigation

MANAGEMENT

- Immediate surgical exploration – an acutely painful swollen testis in an adolescent is the result of torsion until proved otherwise. If in doubt, explore. Even if pain has been present for >6 hr, immediate surgery can still rescue many torted testes, although after 24 hr of continuous pain salvage rates are poor
- Intermittent pain in adolescents may be due to intermittent torsion and may still require urgent elective fixation (discuss with urology)
- Follow antimicrobial policy for treatment of epididymo-orchitis with urology follow-up, or admission if severe pain or abscess (may require drainage)

CHILD NOT USING A LIMB ● 1/2

RECOGNITION AND ASSESSMENT

History

- Duration and nature of symptoms
- Presence of systemic symptoms (pyrexia, anorexia, etc.)
- Exact mechanism of any injury
- Previous similar episodes
- Remember the possibility of non-accidental injury (NAI), if suspected request ED senior review

Examination

- Temperature
- Look for deformity
- Localised pain/tenderness/heat or erythema
- Examine all joints for pain and range of movement
- Perform neurological examination of limb
- Check neurovascular status of distal part of limb

Investigations

- Include X-rays of possible fractured limb

DIFFERENTIAL DIAGNOSIS

Septic arthritis, Perthes disease and slipped upper femoral epiphysis (SUFE) – refer to orthopaedics

Soft tissue injury or fracture

- Most common diagnosis
- Always be suspicious about fractures in infants, they may represent non-accidental injury

Septic arthritis/osteomyelitis

- Can occur at any age and in any joint
- Constant severe pain, especially with movement: child often holds joint absolutely still
- Pyrexia
- Systemic upset: loss of appetite, miserable
- Hot swollen joint – may not always be apparent
- Inability to fully weight bear – see **Limping child** guideline

Upper limb

- Common fractures include clavicle, neck of humerus, supracondylar, radius and ulna
- Supracondylar fractures of the elbow are at particularly high risk for neurovascular damage

Pulled elbow

- Subluxation of radial head and impaction in orbicular ligament
- Unique to children aged ≤5 yr
- History must include specific pulling injury (e.g. being pulled up by hands or fall resulting in child being suspended by the parent on one arm)
- Child presents with a limp arm and pain on elbow movements
- it is difficult to localise tender spot
- Diagnosis is clinical
- X-rays will be normal and are not indicated unless there is doubt about the history
- Treatment
- explain diagnosis and warn parents that you are about to make child cry
- simply supinate forearm whilst applying a little pressure in a proximal direction
- if child uses the arm within a few minutes, no splinting is required
- if not, reconsider diagnosis and ask for senior advice

CHILD NOT USING A LIMB ● 2/2

Lower limb

A toddler with a fractured tibia may still be able to weight bear
Knee pain in children is commonly referred from hip

- Child presenting with a limp should have the whole leg examined including sole of foot

Hip pain

- See **Limping child** guideline
- Septic or reactive arthritis (any age)
- Juvenile idiopathic arthritis (any age)
- Malignancy (any age)
- Slipped upper femoral epiphysis (SUFE) (puberty)
- Perthes disease (aged 4–10 yr)
- Transient synovitis (aged 1–10 yr)

Transient synovitis

- Commonest atraumatic cause – usually occurring in children aged 3–8 yr
- Male predominance
- Diagnose with caution in aged <3 yr due to increased risk of NAI/septic arthritis
- Recent history of URTI (not always)
- Usually presents as a limp
- pain at limit of hip movements
- no temperature and no systemic symptoms
- Discuss case with ED senior doctor:
- if septic arthritis/osteomyelitis possible, take blood for FBC, ESR, CRP and blood culture (see **Septic arthritis/osteomyelitis** above) – refer to on-call orthopaedic team
- X-rays often not required – consider ultrasound scan as alternative
- Prescribe oral analgesia: paracetamol 15 mg/kg 6-hrly (max 4 g in 24 hr) and ibuprofen (unless known renal impairment or asthmatic) 5–10 mg/kg 8-hrly (max 2.4 g in 24 hr), for 72 hr
- Discharge patient
- Advise to return if symptoms worsen, fail to improve within 72 hr, or child becomes systemically unwell

Fractured tibia

- Toddlers with fractured tibia may still weight bear
- Toddler fractures may not always be apparent on acute X-rays; child may need to be treated as a fracture until repeat films can be taken at 2 weeks
- Remember toddler fractures are stable and decisions regarding treatment will depend on symptoms – discuss with ED senior doctor
- Fractured tibia in a non-walking child is result of NAI unless proven otherwise – request review by ED senior doctor in all cases

FEVER (CHILD AGED <5 YR) ● 1/3

ASSESSMENT AND INITIAL MANAGEMENT

- Fever, in a child aged <5 yr, usually indicates underlying infection
- infants aged <3 months, low temperature could indicate infection
- consider vaccination induced fever in infants aged <3 months
- **Parental perceptions of fever are usually accurate and must be taken seriously**

IDENTIFYING RISK OF SERIOUS ILLNESS

3 stages of clinical assessment

1. Identify life-threatening features [utilising Airway, Breathing, Circulation (hydration) and Disability assessment]
2. Assess risk of serious illness (see **Traffic light system for assessment**) – can be used with Paediatric Early Warning Score (PEWS)
3. Attempt to identify source of infection/features of specific serious conditions. If child has a learning disability, take this into account when interpreting the traffic light system

Traffic light system for assessment

	Low risk	Intermediate risk	High risk
Colour	• Skin, lips and tongue normal	• Pallor reported by carer	• Pale, mottled, ashen or blue
Activity	• Responds to normal social cues • Content/smiles • Stays awake/ wakes quickly • Strong normal cry/settled/smiles	• Not responding normally to social cues • Wakes only with prolonged stimulation • Decreased activity • No smile	• No response to social cues • Looks ill • Unrousable/doesn't stay awake after rousing • Weak, high pitched or continuous cry
Breathing	• Normal	• Nasal flare • Tachypnoea • respiratory rate ≥50/min (aged <1 yr) • respiratory rate ≥40/min (aged >1 yr) • Oxygen saturation ≤95% • Crackles on auscultation	• Grunting/nasal flare • Tachypnoea • respiratory rate >60/min (any age) • Chest wall recession (moderate/severe)
Circulation and hydration	• Normal skin and eyes • Moist mucous membranes	• Dry mucous membranes • Poor feeding (infants) **Age** / **Heart rate** (bpm): <1 yr >160; 1–2 yr >150; 2–5 yr >140 • CRT ≥3 sec • Reduced urine output	• Reduced skin turgor
Other	• No amber/red features	• Temperature ≥39°C (aged 3–6 months) • Rigors • Fever ≥5 days • New lump >2 cm diameter • Swelling of joint/limb • Not using a limb/weight bearing	• Temperature ≥38°C (aged <3 months) • Non-blanching rash • Bulging fontanelle • Neck stiffness • Status epilepticus • Focal neurological signs • Focal seizures • Bilious vomiting

Observations

- Measure and record in **all** febrile children:
- temperature: aged <4 week – electronic thermometer in the axilla
  aged >4 week – infrared tympanic or electronic thermometer in the axilla
- respiratory rate, heart rate, capillary refill time
- signs of dehydration: skins turgor, respiratory pattern, weak pulse, cool extremities
- travel history
- Look for life-threatening, traffic light and specific diseases symptoms and signs – see **Traffic light system for assessment** above

Clinical features of specific serious diseases in conjunction with fever

Condition	Clinical features
Meningococcal disease	• Non-blanching rash with ≥1 of the following: ◦ ill-looking child ◦ lesions larger than 2 mm in diameter (purpura) ◦ capillary refill time of ≥3 sec ◦ neck stiffness#
Meningitis	• Neck stiffness • Bulging fontanelle • Decreased level of consciousness# • Convulsive status epilepticus
Herpes simplex encephalitis	• Focal neurological signs • Focal seizures • Decreased level of consciousness
Pneumonia	• Tachypnoea, measured as: ◦ aged 0–5 months: respiratory rate >60 breaths/min ◦ aged 6–12 months: respiratory rate >50 breaths/min ◦ aged >12 months: respiratory rate >40 breaths/min • Crackles in the chest • Nasal flaring • Chest indrawing • Cyanosis • Oxygen saturation ≤95%
Urinary tract infection	• Vomiting (in children aged >3 months) • Poor feeding • Lethargy • Irritability • Abdominal pain or tenderness • Urinary frequency or dysuria • Offensive urine or haematuria
Septic arthritis or osteomyelitis	• Swelling of a limb or joint • Not using an extremity • Non weight bearing
Kawasaki disease	• Fever lasting >5 days and ≥4 of the following: ◦ bilateral conjunctival injection ◦ change in upper respiratory tract mucous membranes (e.g. injected pharynx, dry cracked lips or strawberry tongue) ◦ change in peripheral extremities (e.g. oedema, erythema or desquamation) ◦ polymorphous rash ◦ cervical lymphadenopathy

INVESTIGATIONS

Discuss all children aged <3 months with fever ≥38ºC with a senior emergency medicine (EM) clinician and refer to paediatrics for a period of observation and investigations

- There is no replacement for a **thorough** clinical assessment. If source of fever apparent, perform investigations as appropriate – see relevant section in **Paediatric guidelines**
- Fever without apparent source is a relatively common problem
- In the absence of an apparent focus, perform the following 'screening' investigations (whenever possible, before commencing antimicrobial therapy)

FEVER (CHILD AGED <5 YR) ● 3/3

Investigations for fever without apparent source

If all green features and no amber or red	If any amber features and no diagnosis reached	If any red features and no diagnosis reached
• Perform urine test for urinary tract infection • Assess for symptoms and signs of pneumonia • Do not perform routine blood tests or chest X-ray	• Perform: ◦ urine test for urinary tract infection ◦ FBC ◦ blood culture ◦ C-reactive protein (CRP) **or** procalcitonin • Chest X-ray if ◦ fever >39°C **and** ◦ WCC >20 × 10^9/L • If child aged >1 yr consider lumbar puncture	• Perform: ◦ blood culture ◦ FBC ◦ urine test for urinary tract infection ◦ CRP • Consider (guided by clinical assessment): ◦ lumbar puncture in children of all ages ◦ chest X-ray irrespective of WCC and body temperature ◦ serum electrolytes ◦ blood gas

IMMEDIATE TREATMENT

Antipyretic treatment

- Tepid sponging not recommended
- Do not over or under dress a child with fever
- If child appears distressed or unwell, consider **either** paracetamol or ibuprofen
- Do not routinely administer both drugs at the same time with the sole aim of reducing fever or preventing febrile convulsions
- Alternate if distress persists or recurs before next dose due

Antimicrobials

- Do not prescribe oral antibiotics to children with fever without apparent source
  - if aged >3 months consider admission and observation with/without investigations

Treatment/advice according to traffic light risk category

Category	Treatment/advice
Low risk (no amber/red features)	• Child can be managed at home with appropriate care advice including: ◦ antipyretic use ◦ keep child off nursery/school ◦ check child at night ◦ regular fluids ◦ observe for signs of dehydration ◦ observe for non-blanching rash • Advise when to seek further help e.g.: ◦ condition worsening ◦ seizures ◦ non-blanching rash ◦ fever duration >5 days ◦ other parental concerns
Intermediate risk (no red features)	• If no focus of infection found – **do not prescribe oral antibiotics** • Discuss **all cases** with a senior EM doctor **and** consider referral to paediatrics for completion of investigations/ extended period of observation • If investigations complete and child well enough for discharge: ◦ provide appropriate care advice (see **Low risk** column) ◦ safety-net instructions, including advice on warning symptoms, follow-up etc.
High risk	**Move child to resus if signs of:** • Hypoxia (oxygen saturation <92%), give oxygen • Shock, give sodium chloride 0.9% 20 mL/kg; repeat according to response in heart rate and BP • Reduced conscious level/poorly responsive: ◦ parenteral antimicrobials (aged >1 month: cefotaxime 50 mg/kg or ceftriaxone 80 mg/kg) ◦ aged <1 month: discuss with on-call paediatric team • Consider aciclovir 10 mg/kg 8-hrly ***All cases must be seen by EM senior doctor and discussed with on-call paediatric consultant***

FEBRILE SEIZURES ● 1/2

RECOGNITION AND ASSESSMENT

Symptoms and signs

- Detailed eye witness account of type of seizure (generalised or focal) and duration
- History of fever (may not be febrile at time of admission)
- Symptoms to suggest focus of infection
- Other potential causes of seizure (e.g. head trauma, ingestions)
- Underlying problems: previous seizures, neurological or developmental delay
- Recent antimicrobial use (consider partially treated meningitis)
- Full physical assessment to detect focus of infection and serial evaluation of Glasgow Coma Score (GCS) and neurological status
- Blood pressure to exclude hypertension
- Exclude signs of meningism

Investigations

- Capillary blood glucose (CBG)
- **Febrile seizure <15 min with full recovery:**
- routine laboratory tests are often not required
- if no focus of infection apparent consider urinalysis and blood tests – see **Fever (child aged <5 yr)** guideline
- **Febrile seizure >15 min, recurring or focal:**
- FBC
- INR, APPT
- blood culture
- CRP
- U&E
- calcium
- magnesium

Differential diagnosis

- Neurosepsis: meningitis, encephalitis, brain abscess
- Metabolic disorders: hypoglycaemia, hypocalcaemia, hyponatraemia
- Acute head injury
- Intracranial bleed: CVA, SAH
- Drugs or toxins
- Other CNS abnormality: tumour, neurocutaneous or degenerative disorders
- Rigors

IMMEDIATE TREATMENT

- Active seizures – see **Status epilepticus** in **Paediatric** guidelines
- Post-ictal patients: supportive care and antipyretics. If aged >1 month paracetamol 20 mg/kg 6-hrly
- Identify and treat source of infection appropriately
- Address parental anxiety and fear needs with reassurance and education

DISCHARGE AND FOLLOW-UP

- Admission often unnecessary for simple febrile convulsions
- Before discharge:
- observe patients in the ED until fully alert and responding to normal social cues
- source of infection identified and treated
- a senior review must be undertaken
- GP review within 48 hr advised (with discharge letter)

Referral to paediatric team

- Aged <6 months or >6 yr
- >1 seizure within 24 hr
- Red 'high risk' features – see **Febrile child (aged <5 yr)** guideline
- Serious underlying cause suspected
- Antimicrobial use at time of seizure
- Aged <12 months and incomplete 2/3/4 month immunisations
- Persistent lethargy beyond post-ictal period
- Uncertain home situation or follow-up care
- Parental anxiety

FEBRILE SEIZURES ● 2/2

Parent education

- Parents should be:
  - taught what to do if their child suffers another seizure
  - advised to call paramedics if seizure lasts >5 min or child takes >30 min to wake after seizure has ended. If seizure is brief and not requiring urgent hospital admission, child should be reviewed by GP to identify source of the fever
  - reassured that simple febrile seizures have no adverse effects on future behaviour, school performance or development
- Febrile seizure occur in 3–5% of normal children (aged between 3 months and 5 yr) and are associated with febrile illness
- Children with simple febrile seizures only have a slightly increased risk of developing epilepsy compared to the general population (2% vs 1%)

LIMPING CHILD ● 1/4

DEFINITION

- Abnormal gait usually caused by pain, weakness or deformity
- Typically due to shortened 'stance phase' in gait cycle
- Parents/carers may use the term 'limping' to describe any abnormality of gait

RECOGNITION AND ASSESSMENT

History

- Trauma
- Weight loss
- Tiredness
- Birth history including presentation at delivery and hip screening
- Development disorders, e.g. cerebral palsy
- Fever
- Recent viral infection
- Joint swelling
- Joint stiffness (particularly early morning if considering inflammatory causes)
- Sickle cell status
- Duration of symptoms
- if delay in presentation consider non-accidental injury (see **Child protection** in **Paediatric** guidelines)

Examination

- Observations including:
- temperature
- weight
- Look for:
- rashes
- pallor
- lymphadenopathy
- hepatosplenomegaly
- Torsion can present as limp – examine testes

pGALS screening

- Gait – is it antalgic/Trendelenberg?
- Toe and heel walking
- Arms
- look for:
  - restricted range of motion
  - stiffness
  - swelling
  - erythema
- Legs
- look for:
  - bruising
  - deformity
  - erythema
  - is the pelvis level and leg lengths equal?
- feel for:
  - knee effusion and warmth
  - passive and active knee flexion with internal and external rotation of hip – compare internal rotation of both hips, restricted internal rotation is a sensitive sign of hip pathology
- Spine
- observe from side and behind
- ask child to touch toes and observe curve
- If joint abnormality found on screening examination: more detailed **LOOK, FEEL, MOVE** approach may be needed
- Interaction between child and parents
- in non-accidental injury mechanism may not fit injury found (see **Child protection** in **Paediatric** guidelines)

DIFFERENTIAL DIAGNOSIS

Always consider septic arthritis, malignancy and non-accidental injury as possible causes of a limp in childhood

Primary differentials of atraumatic limp by age

0–3 yr	• Septic arthritis/osteomyelitis • Developmental hip dysplasia • Fracture/soft tissue injury (toddler's fractures/non-accidental injury)
3–10 yr	• Transient synovitis/irritable hip • Septic arthritis/osteomyelitis • Perthes' disease • Fracture/soft tissue injury (stress fracture)
10–15 yr	• Slipped upper femoral epiphysis (SUFE) • Septic arthritis/osteomyelitis • Perthes' disease • Fracture/soft tissue injury (stress fracture)
Other important differential diagnoses	• In all age groups consider non-accidental injury • Neoplastic disease, e.g. acute lymphoblastic leukaemia • Haematological disease, e.g. sickle cell anaemia • Infective disease, e.g. pyomyositis or discitis • Metabolic disease, e.g. rickets • Neuromuscular disease, e.g. cerebral palsy or muscular dystrophy • Primary anatomical abnormality, e.g. limb length inequality • Rheumatological disease, e.g. juvenile idiopathic arthritis (see **Arthritis** in **Paediatric** guidelines)

Transient synovitis

- Commonest atraumatic cause of limp – usually occurring in children aged 3–8 yr
- Male predominance
- Diagnose with caution in aged <3 yr due to increased risk of non-accidental injury/septic arthritis
- Recent history of URTI (not always)
- Child able to walk but in pain
- Otherwise well – afebrile and with normal systemic examination
- Mild reduction of internal rotation of hip
- Diagnosis of exclusion – always consider septic arthritis
- Symptoms <48 hr and following brief period of observation child systemically well, afebrile and able to weight bear: no further investigations necessary
- Follow-up in 48 hr and investigate if symptoms persist
- Aged >8 yr and risk factors for SUFE: further investigations including AP and frog lateral X-rays of pelvis

Septic arthritis

- If not treated urgently joint destruction and growth arrest may occur
- Predominantly due to haematogenous spread
- blood cultures +ve in majority of cases
- Particularly prone joints:
  - hip
  - ankle
  - shoulder
  - elbow
- *Staph. aureus* most common cause (can be caused by group B streptococcus in neonates)
- Aged <18 months more vulnerable as physis does not prevent blood entering epiphysis

Children aged <3 yr are vulnerable to septic arthritis and non-accidental injury, with transient synovitis being a rare diagnosis. Investigate all aged <3 yr

Perthes' disease

- Idiopathic avascular necrosis of capital femoral epiphysis
- More common in boys aged 4–8 yr
- Diagnosed on plain AP pelvis X-ray showing sclerosis, fragmentation and flattening of capital femoral epiphysis – may need bone scan/MRI
- Symptoms >2 weeks
- 20% bilateral

Slipped upper femoral epiphysis

- Typically affects children aged >10 yr
- Male predominance
- Often overweight
- Associated with hypothyroidism and growth hormone deficiency
- May present with knee pain
- Hip can appear shortened and externally rotated
- Plain AP films may be normal – lateral projection required if suspected
- Urgent fixation improves outcome
- Can be bilateral
- If aged >9 yr consider slipped capital femoral epiphysis – request AP and lateral X-rays/pelvis

RED FLAGS

- Child aged <3 yr
- Unable to weight bear
- Pseudoparesis
- Fever
- Systemically unwell
- Lymphadenopathy/hepatosplenomegally
- Night pain/night sweats
- Multiple joints affected/symptoms lasting >6 weeks
- Child aged >9 yr with pain/restricted hip movement

INVESTIGATIONS

- FBC and blood film
- ESR
- CRP
- If febrile, blood cultures
- X-ray 2 views; site of pain and pelvis
- If SUFE suspected obtain AP and frog lateral views of pelvis
- Effusion can be confirmed on ultrasound, but will not identify underlying pathology
- If no clear diagnosis or symptoms persist further investigations may be needed; may include bone scan, MRI (with/without contrast), CK, sickle screen

SEPTIC ARTHRITIS

- Fever >38.5°C
- Unable to weight bear
- ESR >40 mm in first hour
- CRP >20 mg/L
- White cell count >12 x 10^9/L

Septic arthritis can still be present in the absence of these criteria

MANAGEMENT

- If any features consistent with septic arthritis:
  - severe pain
  - range of movement <75% normal
  - fever >38.5°C
  - unable to weight bear
  - ESR >40 mm in first hour
  - CRP >20 mg/L
  - WBC >12 x 10^9/L

or

  - X-ray abnormal or suggests orthopaedic problem (e.g. Perthes' disease, SUFE)
- Refer to orthopaedics for diagnostic aspiration/washout – **before** starting antibiotics (see **Osteomyelitis and septic arthritis** in **Paediatric** guidelines)

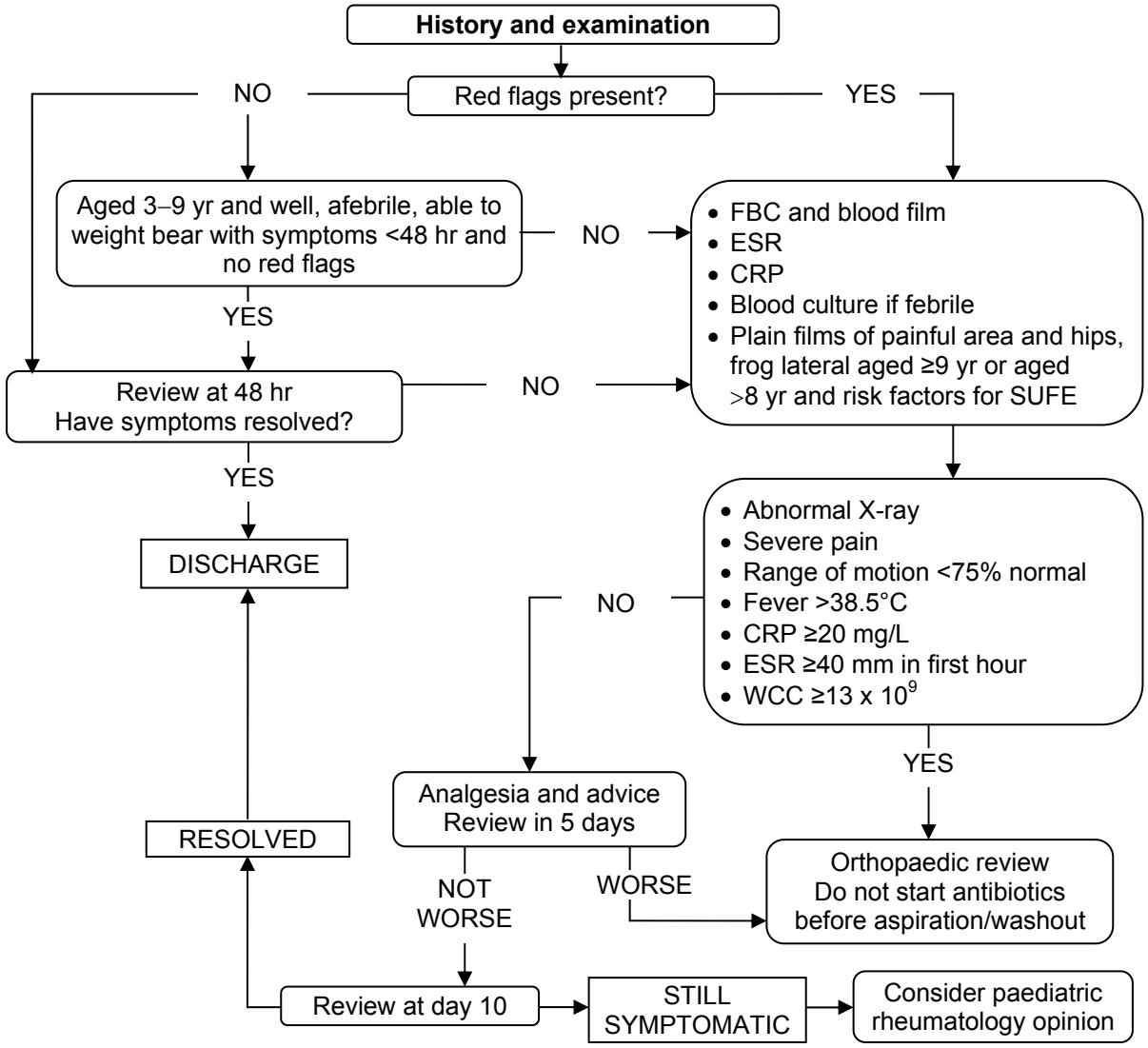
DISCHARGE AND FOLLOW-UP

- If blood tests and X-ray normal, irritable hip (reactive arthritis) likely
  - discharge with analgesia and reassurance
  - advise return if fever occurs or problem becomes worse

Review after 5 days

- If worse, refer for orthopaedic opinion
- If no worse, review after a further 5 days
- If still no better, arrange joint orthopaedic/paediatric review, and consider referral for paediatric rheumatology opinion
- If normal at 5 or 10 days, discharge

Algorithm for management of limp in childhood



AMIODARONE – EMERGENCY IV ADMINISTRATION IN ADULTS ● 1/1

INDICATIONS

- Refractory ventricular fibrillation/pulseless VT
- Ventricular tachycardia (VT)
- Atrial fibrillation (AF) with fast ventricular response (rhythm and rate control)

Cautions

- Amiodarone may paradoxically be arrhythmogenic; concurrent administration with drugs that prolong QT interval is contraindicated – refer to BNF

Adverse effects (immediate)

- Hypotension
- Bradycardia
- Thrombophlebitis (when administered peripherally)
- Nausea and vomiting
- Rapid administration or overdosage can result in circulatory collapse
- Extravasation can cause tissue damage

DOSAGE

Patients must receive cardiac monitoring at all times during administration

- Administer via a long-line or central venous line when possible to minimise vein irritation
- in an emergency, e.g. cardiac arrest, may be given via large peripheral vein
- **Compatible syringes and tubing:**
- rigid plastic syringes (e.g. Gillette Sabre, Brunswick Disposable, BD Plastipak)
- polyethylene tubing (e.g. Vygon Lectrocath, David Bull Laboratories Types A261 or A2001)
- **Incompatible:** polyvinylchloride (PVC) infusion bags (e.g. Steriflex, Boots, Viaflex, Travenol)

Preparations

- Pre-filled syringes (ready diluted): amiodarone 300 mg/10 mL
- Ampoule: amiodarone 150 mg/3 mL

Loading

- Refractory VF/pulseless VT: 300 mg amiodarone (use pre-filled syringe – administer as rapid IV bolus)
- VT (pulse present): 300 mg amiodarone made up to 250 mL with glucose 5% (infuse over 20–60 min)
- AF with fast ventricular response: 300 mg amiodarone made up to 250 mL with glucose 5% (infuse over 20–60 min)

Maintenance

- VT (pulse present) and AF: amiodarone 900 mg made up to 500 mL with glucose 5% (infuse over 24 hr)

DIGOXIN ● 1/2

INDICATIONS

- See **Cardiac failure** guideline and **Atrial fibrillation** guideline

INSTRUCTIONS FOR USING NOMOGRAM

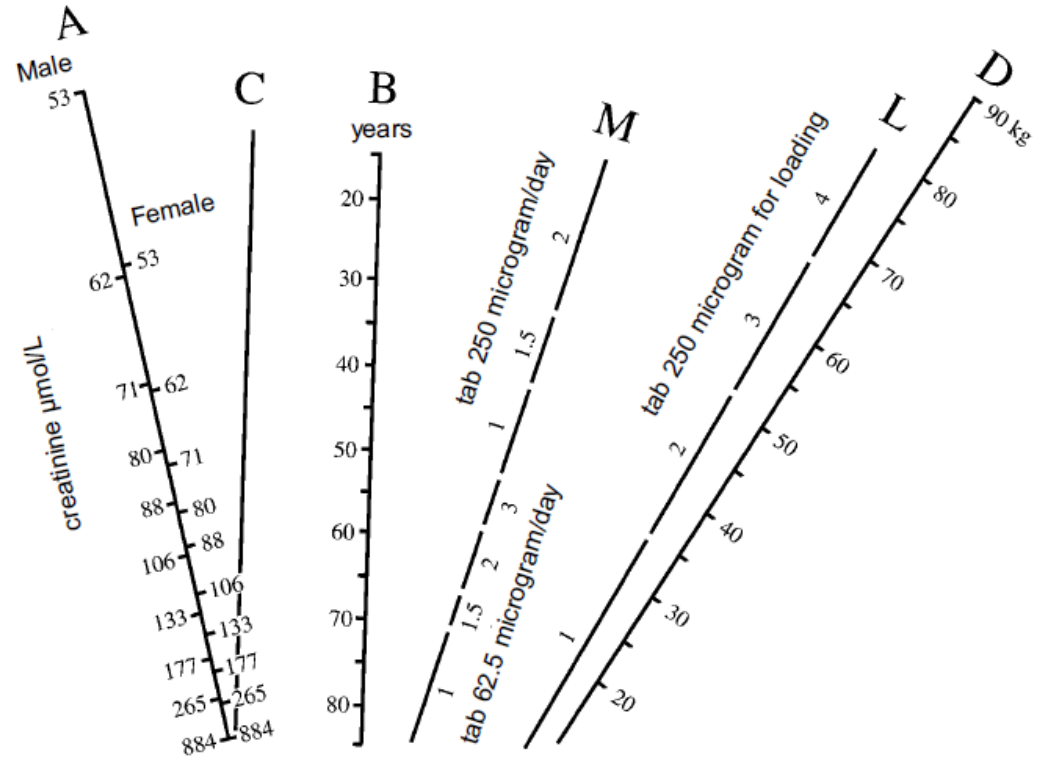
The nomogram for digoxin dosage provides a loading (L) and maintenance dose (M) for an adult patient whose plasma creatinine (A), age (B), and body weight (D) are known

Method

- Join A to B with a line that crosses C
- Join this intercept on C to D with a line that crosses M and L
- Note the intercept on L, which provides the total number of 250 microgram tablets to be taken on day 1 (if the loading recommendation is ≥3 tablets, it is usual to give 2 immediately followed by the third 6 hrs later)
- Note the intercept on M, which provides the number and strength of tablets to be prescribed as a single daily dose from day 2

Specific circumstances

- Do not give loading dose if patient currently taking digoxin, and consider reducing recommended loading dose if digoxin (or other cardiac glycoside) given in preceding 2 weeks
- In elderly patients with reduced muscle mass, serum creatinine may be artificially low and will not reflect renal function. Assume a value of 100 micromol/L for A in such patients
- In obese patients, body weight will not reflect distribution volume of digoxin. Use ideal body weight calculated from height (see **Ideal body weight** guideline) for D in such patients
- In patients with heart failure and in sinus rhythm, do not give a loading dose and give maintenance dose of 62.5–125 microgram/day



Nomogram reproduced from the original devised by Prof George Mawer, with permission

MONITORING

Indications for measurement

- To question need for continued treatment in patients with sinus rhythm
- To monitor effect of concurrent disease or drug treatment
- To confirm diagnosis of suspected toxicity, and to aid dose reduction
- To investigate suspected treatment failure or non-compliance

Sampling

- Steady state is not achieved until 1–3 weeks after starting therapy or changing the dosage, depending on patient's renal function
- Take samples at least 6 hr post-dose. It is often easier to sample immediately before a dose is due

Target range

- 0.8–2.0 microgram/L
- concentrations <0.8 microgram/L have no useful inotropic effect
- Sensitivity to digoxin is affected by thyroid function, oxygen saturation, and serum concentrations of potassium and calcium. Sensitivity is increased by hypothyroidism, hypoxia, hypomagnesaemia, hypokalaemia and hypercalcaemia, and decreased by hyperthyroidism and hyperkalaemia. This should be taken into account when interpreting individual serum digoxin concentrations in relation to the target range. Decisions about dosage adjustment should always consider the clinical effect of the drug as well as the serum concentration
- In atrial fibrillation, once treatment is established, ventricular rate is the best guide to the appropriate dosage for patients taking digoxin alone for rate control

DOBUTAMINE HYDROCHLORIDE ● 1/2

INDICATIONS

- Inotropic support in low output cardiac failure associated with myocardial infarction, cardiogenic shock. Dobutamine hydrochloride is contraindicated in septic shock

Administer dobutamine through a central line, if available. Dobutamine should only be given peripherally on the advice of a consultant; use a large vein high up in a limb, preferably the arm, in order to reduce risk of tissue necrosis and administer the 2 mg/mL solution only

DOSAGE

Seek advice from cardiology team before commencing dobutamine

- By continuous IV infusion 0.5–10 microgram/kg/min, adjusted according to response. Monitor heart rate and rhythm, BP, cardiac output (if possible), and urine output. If no response, seek advice of cardiology team **before** increasing dose further

NOTES

- IV solutions prepared as below are stable for 24 hr at room temperature. The solutions may turn pink and the colour may intensify with time, owing to slight oxidation of the drug, but there is no significant potency loss over 24 hr
- Where dobutamine is being infused via a peripheral vein (on advice of consultant) only the 2 mg/mL solution must be used
- When withdrawing treatment, decrease dosage gradually by small decrements according to response, rather than discontinuing therapy abruptly

PREPARATIONS

- Dobutamine hydrochloride 250 mg in 20 mL vials

DILUENTS

- Sodium chloride 0.9% or glucose 5%
- Dobutamine hydrochloride is incompatible with sodium bicarbonate and other strongly alkaline solutions

Infusion via syringe pump

- See **Table 1** for dosage and corresponding pump rate
- Using a 50 mL syringe make up 250 mg dobutamine (20 mL) to 50 mL with diluent (see **Diluents**) = 5 mg/mL = 5000 microgram/mL

Table 1: Infusion via syringe pump (flow rate mL/hr)

Dosage microgram/ kg per min	Weight (kg)													
	45	50	55	60	65	70	75	80	85	90	95	100	105	110
0.5	0.3	0.3	0.3	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.7
1	0.5	0.6	0.7	0.7	0.8	0.8	0.9	1	1	1.1	1.1	1.2	1.3	1.3
2	1.1	1.2	1.3	1.4	1.6	1.7	1.8	1.9	2	2.2	2.3	2.4	2.5	2.6
3	1.6	1.8	2	2.2	2.3	2.5	2.7	2.9	3.1	3.2	3.4	3.6	3.8	4
4	2.2	2.4	2.6	2.9	3.1	3.4	3.6	3.8	4.1	4.3	4.6	4.8	5	5.3
5	2.7	3	3.3	3.6	3.9	4.2	4.5	4.8	5.1	5.4	5.7	6	6.3	6.6
6	3.2	3.6	4	4.3	4.7	5	5.4	5.8	6.1	6.5	6.8	7.2	7.6	7.9
7	3.8	4.2	4.6	5	5.5	5.9	6.3	6.7	7.1	7.6	8	8.4	8.8	9.2
8	4.3	4.8	5.3	5.8	6.2	6.7	7.2	7.7	8.2	8.6	9.1	9.6	10.1	10.6
9	4.9	5.4	5.9	6.5	7	7.6	8.1	8.6	9.2	9.7	10.3	10.8	11.3	11.9
10	5.4	6	6.6	7.2	7.8	8.4	9	9.6	10.2	10.8	11.4	12	12.6	13.2
12	6.5	7.2	7.9	8.6	9.4	10.1	10.8	11.5	12.2	13	13.7	14.4	15.1	15.8
14	7.6	8.4	9.2	10.1	10.9	11.8	12.6	13.4	14.3	15.1	16	16.8	17.6	18.5
16	8.6	9.6	10.6	11.5	12.5	13.4	14.4	15.4	16.3	17.3	18.2	19.2	20.2	21.1
18	9.7	10.8	11.9	13	14	15.1	16.2	17.3	18.4	19.4	20.5	21.6	22.7	23.8
20	10.8	12	13.2	14.4	15.6	16.8	18	19.2	20.4	21.6	22.8	24	25.2	26.4
25	13.5	15	16.5	18	19.5	21	22.5	24	25.5	27	28.5	30	31.5	33
30	16.2	18	19.8	21.6	23.4	25.2	27	28.8	30.6	32.4	34.2	36	37.8	39.6
35	18.9	21	23.1	25.2	27.3	29.4	31.5	33.6	35.7	37.8	39.9	42	44.1	46.2
40	21.6	24	26.4	28.8	31.2	33.6	36	38.4	40.8	43.2	45.6	48	50.4	52.8

Minibag infusion via controlled-infusion device

- See **Table 2** for dosage and corresponding infusion rate
  Withdraw 40 mL from a 250 mL bag of diluent (see **Diluents**). Add 2 × 250 mg vials of dobutamine (40 mL) to the bag and mix well. 500 mg in 250 mL = 2 mg/mL = 2000 microgram/mL

Table 2: Minibag infusion via controlled-infusion device (flow rate mL/hr)

Dosage microgram/ kg per min	Weight (kg)													
	45	50	55	60	65	70	75	80	85	90	95	100	105	110
0.5	1	1	1	1	1	1	1	1	1	1	1	2	2	2
1	1	2	2	2	2	2	2	2	3	3	3	3	3	3
2	3	3	3	4	4	4	5	5	5	5	6	6	6	7
3	4	5	5	5	6	6	7	7	8	8	9	9	9	10
4	5	6	7	7	8	8	9	10	10	11	11	12	13	13
5	7	8	8	9	10	11	11	12	13	14	14	15	16	17
6	8	9	10	11	12	13	14	14	15	16	17	18	19	20
7	9	11	12	13	14	15	16	17	18	19	20	21	22	23
8	11	12	13	14	16	17	18	19	20	22	23	24	25	26
9	12	14	15	16	18	19	20	22	23	24	26	27	28	30
10	14	15	17	18	20	21	23	24	26	27	29	30	32	33
12	16	18	20	22	23	25	27	29	31	32	34	36	38	40
14	19	21	23	25	27	29	32	34	36	38	40	42	44	46
16	22	24	26	29	31	34	36	38	41	43	46	48	50	53
18	24	27	30	32	35	38	41	43	46	49	51	54	57	59
20	27	30	33	36	39	42	45	48	51	54	57	60	63	66
25	34	38	41	45	49	53	56	60	64	68	71	75	79	83
30	41	45	50	54	59	63	68	72	77	81	86	90	95	99
35	47	53	58	63	68	74	79	84	89	95	100	105	110	116
40	54	60	66	72	78	84	90	96	102	108	114	120	126	132

GENTAMICIN ● 1/4

Do not prescribe gentamicin treatment for >3 days unless advised in a guideline or by consultant in infectious diseases or consultant microbiologist. In all patients being treated with gentamicin, measure serum creatinine daily and serum gentamicin where recommended. As gentamicin has a narrow therapeutic index, accurate dosing is essential to prevent toxicity
Note – deafness and balance problems may occur at therapeutic levels. If they occur, stop gentamicin

ONCE-DAILY DOSING

DO NOT use this protocol for patients in the following categories:
- ***Ascites***
- ***Pregnant women***
- ***Endocarditis***
- ***Cystic fibrosis (CF)***
- ***Major burns***
- ***Creatinine clearance (CrCl) <20 mL/min***

In these situations, unless a specific protocol exists, use gentamicin nomogram for multiple daily dose regimens (see* Multiple daily dosing*) to select an initial dosage and regimen, then adjust on the basis of serum gentamicin concentration (see* Monitoring multiple daily dose regimens*)

- If there are no contraindications to its use, once-daily dosing with gentamicin is safer, more convenient, and cheaper than multiple daily dose regimens

First dose

- Weigh patient and calculate ideal body weight (IBW). See **Ideal body weight** guideline. Choose which of these 2 weights to use according to instructions below
- If unfit to be weighed, estimate weight

If patient emaciated and unfit to be weighed do not use IBW. Estimate weight (this estimate will be lower than ideal body weight in emaciated patients)

- Use lowest weight [actual (or estimated) or ideal] to select dose from **Table 1**
- Dilute gentamicin dose in 100 mL glucose 5% or sodium chloride 0.9% and administer by IV infusion over 1 hr
- Record time infusion started on drug chart

Table 1:
Dose banding for gentamicin 7 mg/kg (maximum dose 560 mg daily) IV by infusion over 60 min

Lowest weight (actual or ideal) (kg)	Dose of gentamicin (mg)
44–48	320
49–54	360
55–60	400
61–65	440
66–71	480
72–77	520
≥78	560

Monitoring of first dose

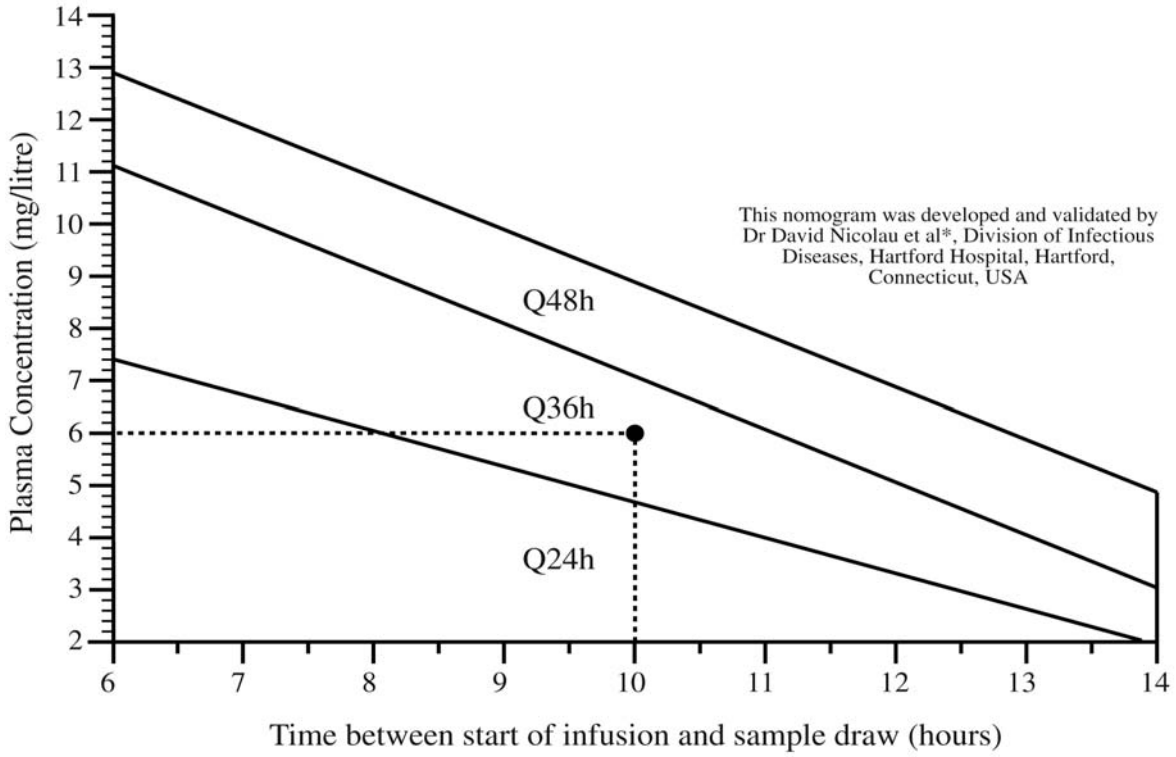
Measure concentration 6–14 hr after first infusion started

- Take blood samples for gentamicin (10 mL clotted blood) and creatinine 6–14 hr after start of infusion. Do not sample via cannula used for infusion
- Request measurement of gentamicin concentration and document in patient record**. It is imperative that time when infusion began and time when sample was taken are accurately documented on the microbiology request card; this will appear on the report**
- **Complete blue microbiology request form (or request on Order comms) as follows:**
- antimicrobial assay type – tick gentamicin box
- dose frequency – tick once daily box
- enter dose and date and time of last dose
- sample(s) taken – tick random box for samples taken after 6–14 hr
- enter date and time of random sample taken
- enter date taken and time taken again at bottom of form

Interpretation and dose interval

- Check blood results for gentamicin level on iCM/iPortal
- Calculate time interval between start of gentamicin infusion and time level taken
- Plot time interval against gentamicin level to select dosing interval on **Figure 1**

Figure 1: **Use values of plasma gentamicin concentration and time interval to find intercept**
Example: a concentration of 6 mg/L after 10 hr yields a dose interval of 36 hr (i.e. give dose every 36 hr)



Antimicrob Agents Chemother 1995;39(3):650-655

- For additional information on dose intervals and subsequent monitoring, see **Table 2**
- Give next dose (7 mg/kg by infusion – see **Table 1**) at time after interval plotted in **Figure 1**

Table 2: Additional information on gentamicin dose intervals and subsequent monitoring

Serum gentamicin concentration result at 6–14 hr	Action and interval
Falls on the line dividing time intervals	Select the longer time interval
Above upper limit for Q48h	Abandon once daily regimen. Stop gentamicin and discuss indication and adjustment of dose and time interval with microbiologist
Falls in Q36h or Q48h area	Patient is likely to have impaired renal function. Continue with dose recommended in intermittent dosing regimen **Table 1**, but increase dose interval to 36 hr or 48 hr, depending upon where plot falls in **Figure 1** graph. Monitor gentamicin concentration 6–14 hr after every subsequent dose
Falls in Q24h sector or is <2 mg/L	Continue with once-daily regimen at dose interval of 24 hr. Check gentamicin concentration in 3 days, (using the same method), or earlier if patient's condition suggests renal function may have deteriorated

If serum gentamicin concentration taken between 6–14 hr from first dose not available within 24 hr of first dose

Calculate provisional dosing interval according to patient's renal function as follows:

- Measure serum creatinine and calculate CrCl from 1 of the following equations (do not use eGFR)
- **If patient's creatinine <60 µmol/L use 60 µmol/L as a minimum value to avoid falsely producing high creatinine clearance**
- **Females:**

$$\text{CrCl} = \frac{1.04 \times (140 - \text{age}) \times \text{weight*}\ (\text{kg})}{\text{Serum creatinine}\ (\mu\text{mol/L})}$$

- **Males**:

$$\text{CrCl} = \frac{1.23 \times (140 - \text{age}) \times \text{weight*}\ (\text{kg})}{\text{Serum creatinine}\ (\mu\text{mol/L})}$$

***weight – use IDEAL body weight (IBW) *unless* patient appears underweight** – see **Ideal body weight** guideline

- If patient appears underweight and is fit to be weighed, use ACTUAL body weight
- If patient appears underweight AND is unfit to be weighed, ESTIMATE body weight
- Use **Table 3** to select dose interval according to CrCl

Table 3: Gentamicin dose interval according to CrCl

CrCl (mL/min)	Dosing interval (hr)
>60	24
40–59	36
20–39	48
<20	Do not use this protocol

- Prescribe gentamicin according to calculated starting dose and interval. Cross off sections of drug chart to ensure correct dosing interval is followed
- Note time infusion commenced
- give next dose (7 mg/kg by infusion as above – see **Table 1**) after interval indicated by **Table 3** above

After measuring gentamicin concentration, do not give more than one dose to any patient without knowing the assay result

Further monitoring

- Check serum creatinine daily. Calculate CrCl from serum creatinine to check dose interval has not changed
- If dose interval has to be changed, check gentamicin concentration 6–14 hr after start of next infusion (note time of start of infusion and time of sampling) and use **Figure 1** to verify correct dose interval

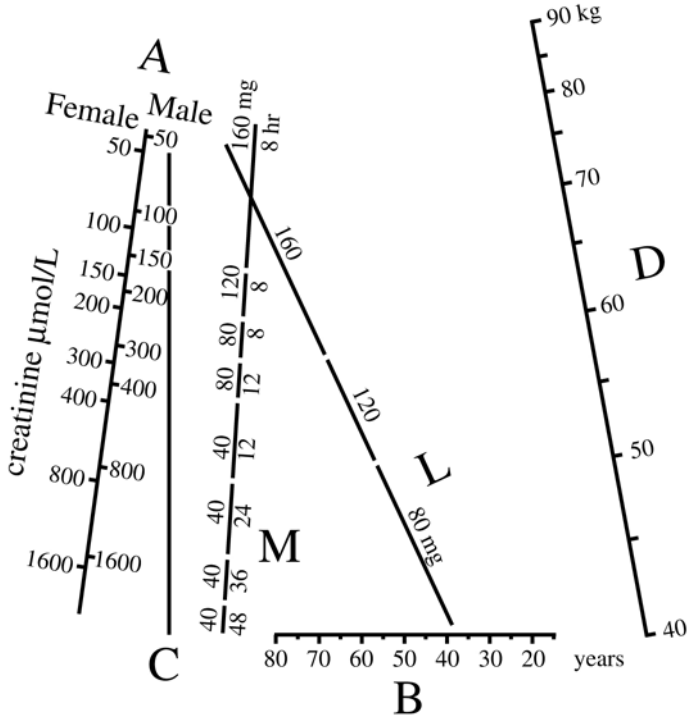
Do not send pre-dose (to measure trough concentration) or 1 hr post-dose (to measure peak concentration) sample unless treatment is following multiple daily dose regimen

MULTIPLE DAILY DOSING

Gentamicin nomogram for multiple daily dose regimens

This nomogram is NOT to be used for children or patients with cystic fibrosis (CF)

Nomogram for gentamicin dosage (devised by Prof. G. Mawer), which provides a loading dose (L), a maintenance dose (M), and a suitable interval between doses for an adult patient whose serum creatinine concentration (A), age (B) and body weight (D) are known



To use, join A to B with a line that crosses C; then join this intercept on C to D with a line that crosses M and L

Monitoring multiple daily dose regimens

- For patients with CF, discuss with respiratory consultant
- For patients with infective endocarditis, refer to **Infective endocarditis** guideline as **target levels differ in this indication**
- Measure serum gentamicin after 24 hr. Take a trough sample immediately before third dose, and a peak sample 1 hr after dose (doses are given by IV injection NOT infusion)
- Target peak concentration is 5–10 mg/L
- Trough concentration should be maintained <2 mg/L
- The relationship between maintenance dose and steady state concentration is linear. Doubling the dose will double peak and trough serum concentrations, assuming renal function stable

Measurement of trough and peak concentrations

- Take blood samples for gentamicin (10 mL clotted blood) just before IV injection for pre-dose trough concentration and 1 hr after IV injection for post-dose peak concentration. Do not sample via cannula used for IV injection
- Request measurement of gentamicin concentration and document in patient record**. It is imperative that time when IV injection was given and time when sample was taken are accurately documented on the microbiology request card; this will appear on the report**
- **Complete blue microbiology request form (or request on 'order coms') as follows:**
- antimicrobial assay type – tick gentamicin box
- dose frequency – tick 8-hrly or 12-hrly box. If dosing interval longer than this (e.g. 24-hrly or 36-hrly), tick ….. hrly box and complete frequency
- enter dose, date and time of the dose around which trough and peak are to be measured
- sample(s) taken – tick pre-dose or post-dose box as applicable
- enter date and time of sample taken
- enter date taken and time taken again at bottom of form

IDEAL BODY WEIGHT ● 1/1

Use this guideline for drug dose calculations. Do not use as a dietary advice guideline

CALCULATION

- Calculate ideal body weight (IBW) from height/length, using formula:
- 1 cm = 0.394 inch and 1 foot = 12 inches

Males

IBW (kg) = 50 + [2.3 × (height in inches − 60)]

Females

IBW (kg) = 45 + [2.3 × (height in inches − 60)]

TABLES

- Read ideal body weight from tables below for heights in feet and inches or centimetres

MALE		
Height (feet and inches)	**Height (cm)**	**Ideal body weight (kg)**
5’ 0”	152	50.0
5’ 1”	155	52.3
5’ 2”	157	54.6
5’ 3”	160	56.9
5’ 4”	163	59.2
5’ 5”	165	61.5
5’ 6”	168	63.8
5’ 7”	170	66.1
5’ 8”	173	68.4
5’ 9”	175	70.7
5’ 10”	178	73.0
5’ 11”	180	75.3
6’	183	77.6
6’ 1”	185	79.9
6’ 2”	188	82.2
6’ 3”	191	84.5
6’ 4”	193	86.8
6’ 5”	196	89.1
6’ 6”	198	91.4
6’ 7”	201	93.7
6’ 8”	203	96.0
6’ 9”	206	98.3

FEMALE		
Height (feet and inches)	**Height (cm)**	**Ideal body weight (kg)**
4’ 10”	147	40.4
4’ 11”	150	42.7
5’ 0”	152	45.0
5’ 1”	155	47.3
5’ 2”	157	49.6
5’ 3”	160	51.9
5’ 4”	163	54.2
5’ 5”	165	56.5
5’ 6”	168	58.8
5’ 7”	170	61.1
5’ 8”	173	63.4
5’ 9”	175	65.7
5’ 10”	178	68.0
5’ 11”	180	70.3
6’	183	72.6
6’ 1”	185	74.9
6’ 2“	188	77.2
6’ 3”	191	79.5

NORADRENALINE ● 1/1

All doses are for adults unless stated. For children please refer to children's BNFC

Potent alpha-adrenergic agonist with minimal beta-agonist effects

INDICATION

- Inotropic support in severe sepsis associated with persistent hypotension (SBP <90 mmHg or MAP <65 mmHg) **after** initial fluid resuscitation – see **Sepsis management** guideline
- Seek advice of critical care team/ED consultant before commencing therapy

Administer noradrenaline via a central venous cannula

PREPARATIONS

- Noradrenaline acid tartrate 2 mg/mL in 4 mL ampoules (equivalent to noradrenaline base 1 mg/mL)

DOSAGE

- By continuous IV infusion 10–20 mL/hr, adjusted according to response
- Dose range for noradrenaline is not based on weight of the patient

MONITOR

- Heart rate and rhythm
- BP
- Urine output

Diluents

- Glucose 5%
- Glucose 5% with sodium chloride 0.9%
- Noradrenaline acid tartrate is incompatible with sodium bicarbonate or other alkalis

Infusion via syringe pump

- Using a 50 mL syringe dilute 4 mg noradrenaline acid tartrate (2 mL) with 48 mL diluent
- Commence flow rate at 0–20 mL/hr, adjust according to response

Discontinuing therapy

- When withdrawing treatment, decrease dosage gradually by small decrements according to response, rather than discontinuing therapy abruptly

OXYGEN THERAPY IN ACUTELY HYPOXAEMIC PATIENTS ● 1/4

INDICATIONS

- Critically ill patient (see list of possible critical illnesses below)
- Documented hypoxaemia (SpO_2 <94% or PaO_2 <8 kPa)
- Acute hypoxaemia suspected on clinical grounds
- Risk of intermittent hypoxaemia in surgical post-operative patient

Aim

- To deliver oxygen at the minimum concentration required to achieve adequate tissue oxygenation and minimise complications of hyperoxia

OXYGEN PRESCRIPTION

Include

- Oxygen saturation target:
- SpO_2 88–92% for non-critical patients at risk of type 2 (hypercapnic) respiratory failure
- SpO_2 94–98% for all other patients
- Oxygen flow rate
- Delivery device (e.g. simple face mask, Venturi mask, nasal cannulae, reservoir mask)
- Frequency (continuous or PRN use)
- For post-operative surgical patients at risk of intermittent hypoxaemia who require continuous oxygen regardless of their saturations – see **Surgical high-risk post-operative patients** for suggested oxygen flow rate, device and escalation strategy

CRITICAL ILLNESS

Indications for oxygen therapy

- Cardiac/respiratory arrest or resuscitation
- Acute life-threatening asthma
- Shock/severe hypovolaemia/haemorrhage
- Sepsis
- Major trauma
- Near-drowning
- Anaphylaxis
- Major pulmonary haemorrhage
- Major head injury
- Carbon monoxide poisoning
- Acute neurological or respiratory compromise caused by drugs (e.g. opioids), injury or suspected intracerebral pathology
- Acute localised tissue ischaemia (e.g. acute peripheral vascular disease, reduced bowel perfusion)

Management

- Follow ABC approach and address underlying cause
- **Initial oxygen therapy is via reservoir mask at 15 L/min** (use bag-valve-mask for active resuscitation during cardiac/respiratory arrest)
- Once stable, reduce oxygen dose and aim for target saturation range of 94–98%

Patients with COPD and other risk factors for hypercapnia who develop critical illness should have the same initial target oxygen saturation as other critically ill patients pending blood gas results, after which these patients may need controlled oxygen therapy or supported ventilation if there is severe hypoxia and/or hypercapnia.
***See* Flowchart**

OXYGEN THERAPY IN ACUTELY HYPOXAEMIC PATIENTS ● 2/4

SURGICAL HIGH-RISK POST-OPERATIVE PATIENTS

Who

- Patients who have had general anaesthetic within previous 72 hr and one of the following:
- ischaemic heart disease, known or suspected
- obstructive sleep apnoea
- receiving drugs known to reduce respiratory drive, especially patients using PCA or epidural for analgesia or other systemic opioids

Risks of surgery

- Hypoventilation and consequent significant desaturation during sleep despite normal SpO_2 when awake

Management (even if SpO_2 normal)

No risk of hypercapnic respiratory failure

- Give oxygen 2 L/min via nasal cannulae or 5 L/min via simple face mask. If SpO_2 falls below 94%, follow **Flowchart for oxygen administraton on general ward**
- If patient tachypnoeic, seek advice in accordance with MEWS escalation strategy

Risk of hypercapnic respiratory failure

- These are high-risk surgical patients – follow specific advice regarding oxygen therapy and ABG monitoring given by anaesthetist (or critical care if involved). Document this advice on the anaesthetic chart, in patient notes and/or on prescription chart. If unsure, contact anaesthetist who cared for patient, duty anaesthetist or critical care team

Length of oxygen therapy

- Continue oxygen therapy until systemic opioids discontinued or, for IHD/OSA groups, 72 hr have elapsed since anaesthesia

NON-CRITICAL ILLNESS

All other patients with documented hypoxaemia (PaO_2 <8 kPa or SpO_2 <94%) other than those with critical illnesses, follow **Flowchart for non-critical illness requiring moderate amounts of supplemental oxygen**

MONITORING

- Monitor SpO_2 continuously. Follow **Flowchart for oxygen administration on general ward**
- If oxygen requirement increases, seek senior advice
- Closely observe patients at risk of CO_2 retention for signs of reduced respiratory effort, or conscious level, (GCS <14 or V on the AVPU scale)
- if patient at risk of CO_2 retention, repeat ABGs in 30–60 min after any further adjustment to FiO_2 or if conscious level deteriorates
- Discuss any deteriorating patient with consultant responsible for management of co-morbidity and critical care team

Do not restrict oxygen therapy below minimum target saturations of 88% in patients retaining CO_2

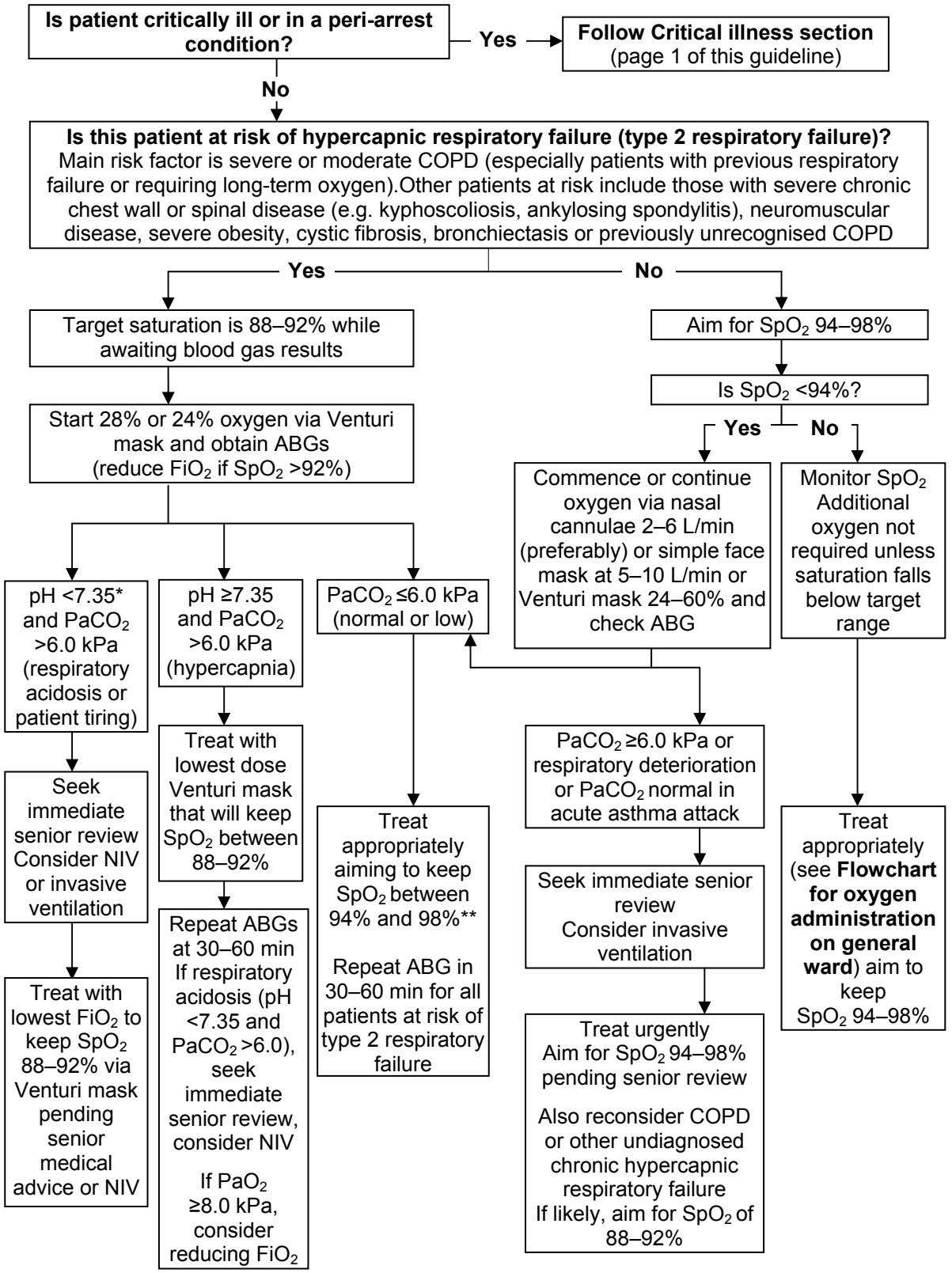
Patients with obstruction or pseudo-obstruction of bowel and reduced conscious level may not be suitable for non-invasive positive pressure ventilation (NIPPV)

WEANING FROM OXYGEN

- When oxygen therapy is no longer indicated, step down oxygen to room air as soon as possible, monitoring SpO_2 – see **Flowchart for oxygen administration on general ward**

OXYGEN THERAPY IN ACUTELY HYPOXAEMIC PATIENTS ● 3/4

Flowchart for non-critical illness requiring moderate amounts of supplemental oxygen (See separate advice in guideline for high-risk post-operative surgical patients)



A need for an increase in FiO_2 requires a medical review. Patients at risk of carbon dioxide retention must be monitored by repeat ABGs in 1 hr (or sooner if conscious level deteriorates)

* If pH is <7.35 with normal or low $PaCO_2$, investigate and treat for metabolic acidosis and keep SpO_2 94–98%

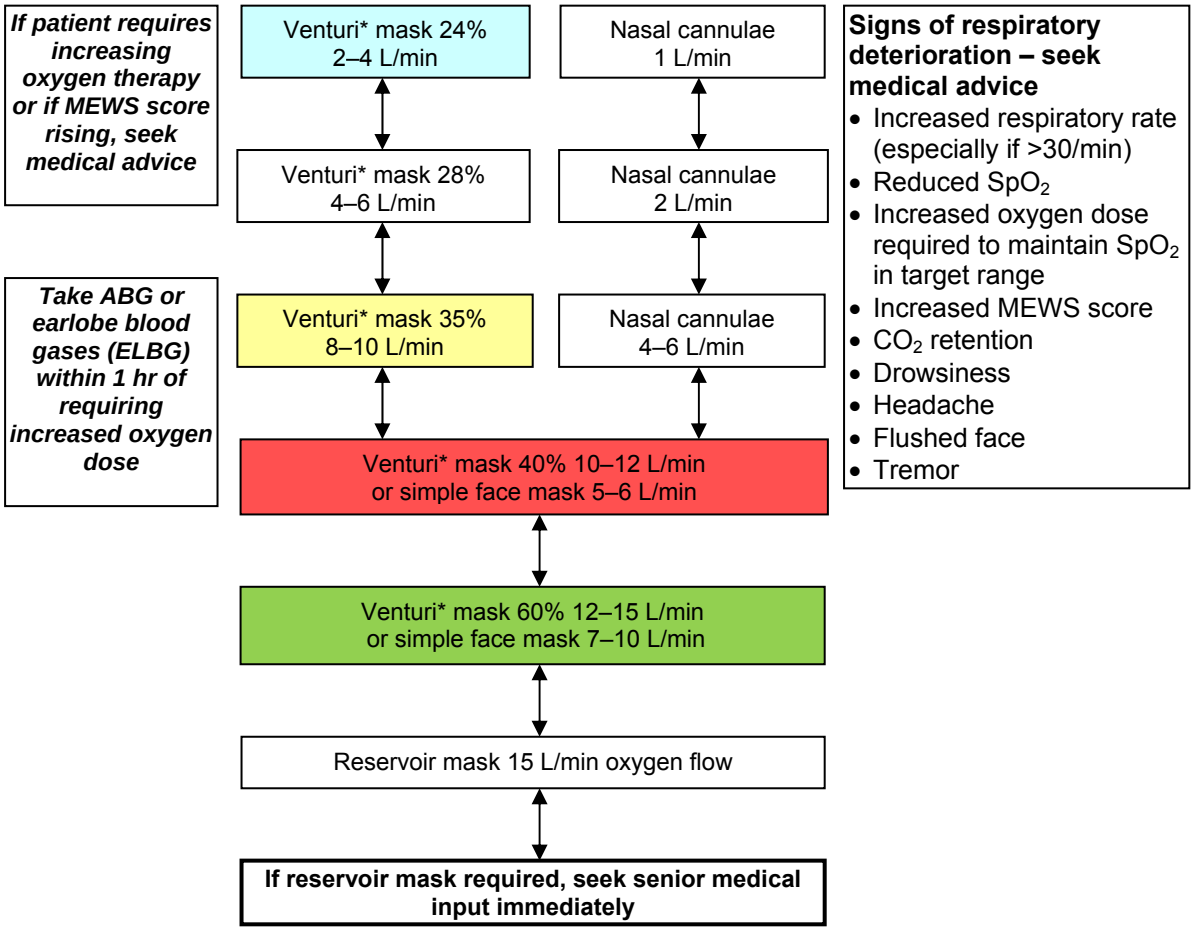
** Patients previously requiring NIV or IPPV should have a target range of 88–92%, even if the initial $PaCO_2$ is normal

Key:
ABG = arterial blood gas
COPD = chronic obstructive pulmonary disease
FiO_2 = fraction of inspired oxygen
SpO_2 = peripheral oxygen saturation measured by pulse oximetry
CCU = Critical care unit
NIV = non-invasive ventilation
$PaCO_2$ = arterial partial pressure of carbon dioxide
PaO_2 = arterial partial pressure of oxygen

OXYGEN THERAPY IN ACUTELY HYPOXAEMIC PATIENTS ● 4/4

Flowchart for oxygen administration on general ward

- Choose most suitable delivery system and flow rate
- Titrate oxygen up or down, using the least oxygen necessary to maintain target oxygen saturation
- **Flowchart** below shows available options for stepping dosage up or down. Chart does not imply any equivalence of dose between Venturi* masks and nasal cannulae
- Except in major and sudden fall in saturation, allow at least 5 min at each dose before adjusting further upwards or downwards
- Once patient has adequate and stable saturation on minimal oxygen dosage, consider discontinuation



*For Venturi masks, if respiratory rate >30 breaths/min, higher flow rate required. Colour of box matches colour of appropriate Venturi mask

Critically ill patients and those in peri-arrest situation – give maximal oxygen therapy via reservoir mask or bag-valve-mask whilst awaiting arrival of medical help.
Patients with COPD and other risk factors for hypercapnia who develop critical illness should have the same initial target saturations as other critically ill patients pending the results of blood gas measurements, after which these patients may need controlled oxygen therapy or supported ventilation if there is severe hypoxaemia and/or hypercapnia with respiratory acidosis

VANCOMYCIN ● 1/2

INDICATIONS

- Use vancomycin IV for serious MRSA infections on advice of consultant microbiologist

Do not use this guideline if CrCl <10 mL/min or patient on haemodialysis/peritoneal dialysis – seek advice from renal SpR or consultant

DOSAGE

- As vancomycin has a narrow therapeutic index, accurate dosing is imperative to prevent toxicity
- Use **Vancomycin calculator** on Trust intranet>Clinical section> Clinical guidelines> Antimicrobial guidelines>Vancomycin calculator
- After completing calculation on the calculator, print off the result (if possible) and insert into patient notes. **If calculator not available** use **Steps 1–3** below
- **Give single loading dose followed by maintenance doses**

STEP 1 – WEIGH PATIENT

- If unfit to be weighed, estimate weight

STEP 2 – LOADING DOSE

- **Use ACTUAL or estimated body weight –** not ideal body weight (IBW)
- Use **Table 1** to select loading dose and volume and duration of infusion
- Loading dose is independent of patient's renal function
- Prescribe on once only antimicrobial section of prescription chart

Table 1

Actual/estimated body weight	Dose	Volume of sodium chloride 0.9% or glucose 5%	Duration of infusion
<40 kg	750 mg	250 mL	1.5 hr
40–59 kg	1 g	250 mL	2 hr
60–89 kg	1.5 g	500 mL	3 hr
≥90 kg	2 g	500 mL	4 hr

STEP 3 – MAINTENANCE DOSING

- Calculate renal function using equations below. **DO NOT** use eGFR
- If patient's creatinine <60 µmol/L use 60 µmol/L as a minimum value to avoid falsely producing high creatinine clearance
- **Female: CrCl =** $\frac{1.04 \times (140 - \text{age}) \times \text{weight*}\ (\text{kg})}{\text{serum creatinine}\ (\mu\text{mol/L})}$
- **Male: CrCl =** $\frac{1.23 \times (140 - \text{age}) \times \text{weight*}\ (\text{kg})}{\text{serum creatinine}\ (\mu\text{mol/L})}$

*weight – use IDEAL body weight (IBW) *unless* patient appears underweight **–** See **Ideal body weight** guideline

- If patient appears underweight and is fit to be weighed, use **actual body weight**
- If patient appears underweight AND is unfit to be weighed, **estimate body weight**
- Based on calculated CrCl, select maintenance dose from **Table 2**
- Maintenance dose should NOT be higher than loading dose

Give first maintenance dose 12, 24 or 48 hr after start of loading dose according to dose interval in Table 2

Table 2

CrCl (mL/min)	Dose	Volume of sodium chloride 0.9% or glucose 5%	Duration of infusion	Dose interval (time since loading dose and time between maintenance doses)	Timing of samples
<10	See advice above				
10–19	500 mg	100 mL	1 hr	48 hr	Trough concentration immediately before both 1st and 2nd maintenance doses
20–29	500 mg	100 mL	1 hr	24 hr	
30–39	750 mg	250 mL	1.5 hr	24 hr	
40–54	500 mg	100 mL	1 hr	12 hr	Trough concentration immediately before 3rd or 4th maintenance dose – whichever falls before morning dose
55–74	750 mg	250 mL	1.5 hr	12 hr	
75–89	1 g	250 mL	2 hr	12 hr	
90–110	1.25 g	250 mL	2.5 hr	12 hr	
>110	1.5 g	500 mL	3 hr	12 hr	

STEP 4 – MONITORING VANCOMYCIN CONCENTRATION

Target trough concentration: 10–15 mg/L
In some serious infections the target trough concentration may be up to 20 mg/L but this is on advice only from microbiology or infectious diseases consultant

- **Microbiology laboratory will assay vancomycin samples every day 0900–1500 hr. Samples received after 1500 hr will be processed the following morning. Results available on CIS/iPortal/ICE**
- See **Table 2** for timing of samples
- Therapeutic drug monitoring is recommended to ensure adequate serum concentration
- Results are meaningless unless dose and sample time are recorded accurately
- Monitor creatinine daily
- Do not wait for result before giving dose due immediately after taking sample, unless patient has severe renal impairment (CrCl <10 mL/min) or poor urine output (<0.5 mL/kg/hr)
- **Document on prescription chart:**
- time each infusion started
- time sample taken
- **Record on blood sample request form: (or on OrderComs)**
- dose of vancomycin
- date and start time of infusion last administered to patient
- dose regimen

STEP 5 – CONCENTRATION INTERPRETATION AND ADJUSTMENT OF DOSES

- See **Table 3**
- Always check dosage history and sampling time are appropriate before interpreting result
- If necessary, request assistance in interpreting result from pharmacy
- If renal function impaired but stable, check trough concentration on alternate days
- If renal function is changing rapidly (deteriorating **or** improving), check trough concentration daily to prevent over- or under-treatment
- If dose has to be changed, take further samples for trough concentration before appropriate dose (see **Table 2**)

Table 3

Vancomycin concentration	Suggested dose change
<10 mg/L	Increase dose by approximately 50%; round doses to nearest 250 mg. If this increased dose exceeds 1.5 g 12-hrly, seek **immediate** advice from microbiology
10–15 mg/L	Maintain present dose, check renal function daily and if stable re-check trough concentration twice weekly
>15 mg/L	Stop until <15 mg/L and seek advice. Check levels daily unless advised otherwise

For further advice, contact ward pharmacist, antimicrobial pharmacist (via call centre or bleep), or Medicines information. Out-of-hours contact on-call pharmacist or microbiologist via call centre

EMERGENCY MEDICINE GUIDELINES 2018–19

These guidelines are advisory, not mandatory. Every effort has been made to ensure accuracy. The authors cannot accept any responsibility for adverse outcomes.

Suggestions for improvement and additional guidelines would be most welcome by Bedside Clinical Guidelines Partnership, please contact via e-mail: bedsideclinicalguidelines@uhns.nhs.uk