

# Therapeutics

## A Handbook for Prescribing in Adults

# 2012

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# **Therapeutics**

## **A Handbook for Prescribing in Adults**

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## Feedback

Feedback, both good and bad is welcomed by the editorial group and will be used to inform decisions about future editions.

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# Introduction

Welcome to the fifth edition of 'Therapeutics: A Handbook for Prescribing in Adults'. This publication is intended to meet the needs of a clinical workforce increasingly moving between sites within NHS Greater Glasgow and Clyde. Acute service redesign and the move to directorate teams (rather than site-based) has resulted in a need to harmonise and unify clinical and prescribing guidance across all acute sites. This handbook is one of a number of developments to address this issue.

The purpose of the Handbook is to promote evidence-based prescribing which is safe, effective and cost-effective. It provides a starting point for the immediate management of many common medical conditions and situations for junior doctors (and perhaps senior doctors in areas out with their main area of expertise). It is recognised, of course, that these guidelines will not be suitable for every situation and they are not intended to be a substitute for specialist expertise and clinical judgment.

The NHSGGC Guidelines for several therapeutic areas, which form the basis of much of the guidance in the Handbook, are still in the process of being updated. Where that is known to be the case, the guidance in the Handbook will include a statement reflecting the possibility of change. However, all users of the Handbook should be aware that the most up to date source of NHSGGC Guidelines will be found within the NHSGGC Clinical Guidelines Electronic Resource Directory, on StaffNet.

This fifth edition has been extensively revised taking into account feedback the Editorial Group received following the publication of the fourth edition in August 2011. In addition to ensuring the guidance in this handbook is current, several guidelines have been extensively revised and re-written to ensure clarity and conciseness. A list of the major changes can be found on page 2.

Feedback, both good and bad is welcomed to help inform and further improve future editions.

# Summary of Major changes in Therapeutics: A Handbook for Prescribing in Adults 2012

There have been a large number changes in this edition of the handbook, however outlined below are some of the significant changes:

- Major revision of Acute Kidney Injury guideline which defines the different stages, outlines immediate management and the referral criteria.
- Treatment of Venous Thromboembolism includes information on rivaroxaban and in Reversal of Anticoagulant Therapy guideline there is brief guidance on the reversal of newer agents.
- Persistent Atrial Fibrillation guideline includes a new flowchart on management, indications for using newer anticoagulant agents and brief mention of non-urgent anticoagulation. The ACS flowchart has some amendments.
- Major revision of Blood Gas Analysis guideline and significant changes in the Pleural Effusion and Pneumothorax guidelines.
- Acutely Disturbed Guideline now includes guidance on the management of delirium.
- Some changes and additions to the infections section.
- The DKA guideline still focuses on management in the first 4 hours of admission, however there is brief additional supporting guidance included from 4 hours to discharge. There are also changes in the Hypoglycaemia guideline.
- Appendix 1: NRT – there is a change in Formulary choice of NRT
- Appendix 2: Preparation of IV additives gives guidance on how to access the new single system resource used across NHSGGC.

## **New guidelines included:**

- Parkinson's disease in acute care
- Hypernatraemia guideline
- Management of oncological emergencies which include:
  - Malignant Ascites
  - Malignant Spinal Cord Compression
  - Raised Intracranial Pressure in Cancer Patients
  - Superior Vena Cava Obstruction
  - Stridor
  - Tumour Lysis Syndrome

# Good prescribing practice – General advice

**On admission** – *as soon as possible (max within 24 hours)*, obtain complete and accurate medication history using a minimum of two of the following information sources:

- Patient / carer – generally most appropriate information source.
- Patients Own Medication (PODs) – check these with the patient, as often it is family members / ambulance crew who bring in the medication and it may not be complete or current. When checking PODs ensure that the patient details and dose on the label are correct. Also check the dates of supply.
- Emergency Care Summary – check whether the summary has been recently updated and also that the medicines have been issued to the patient recently.
- GP referral letter, medication print-out or verbal communication with GP surgery (ensure dates of supply are recent and also consider acute medication).
- Clinical Portal to access clinic letters – caution as the letters often do not contain the most recent medication changes.

Resolve any discrepancies between the information sources and document the following in the patient's medical notes:

- Sources used.
- Drug name, dose and frequency.
- The 'plan' for each medicine i.e. to be continued, stopped, withheld or amended.
- Allergies / sensitivities to medicines and the reaction(s). Also document on kardex.

On the drug kardex, prescribe all continuing medicines; indicate if 'new medicine', 'new dose' or commenced 'before admission'; fill in the medicines reconciliation box and patient details e.g. weight.

## **During admission – consider the following before prescribing**

- Route of administration – generally the oral route should be used whenever possible.
- Is the drug necessary? Are you prescribing for a side effect of another drug?
- Check patient's medication history for previous adverse drug reactions or side effects related to this drug or a related drug. Also check for drug allergies / sensitivities.
- Check for any factors that may influence the patient's drug handling ability e.g. renal or hepatic impairment, interacting drugs, weight, etc.
- Check for any contraindications / cautions e.g. prescribing ciprofloxacin in an epileptic patient.
- Consider the formulary status of the drug.
- Swallowing difficulties / Nil by mouth
- Compliance issues

## **When prescribing, to minimise any medication incidents:**

- Prescribe at sensible and convenient times for the patient.
- **Write legibly** and do not abbreviate drug names e.g. prescribe 'alteplase' instead of 'rt-Pa' and 'dihydrocodeine' instead of 'DF118'.
- Use generic names **except** in situations where bioequivalence of different formulations of the same drug cannot be assured e.g. controlled release preparations of theophylline or lithium.

These exceptions to generic prescribing are rare but for these formulations using a different brand can result in ineffective therapy or toxicity.

- Write 'micrograms' and 'nanograms' in full e.g. levothyroxine 100 micrograms; alfacalcidol 250 nanograms.
- ***Write 'units' in full. Never write 'U' as it can be mistaken for '0' e.g. 10U of insulin could be read as 100 of insulin.***
- If a decimal point is unavoidable then prescribe the dose carefully e.g. prescribe '0.3 mg' rather than '.3 mg' and '2 mg' rather than '2.0 mg'
- Do not use vague descriptions, such as 'as directed' or 'as before'.
- Do not prescribe multiple routes of administration for a drug e.g. oral / IV paracetamol.
- For drugs prescribed weekly e.g. methotrexate or alendronate, strike out 6 days of the week when the dose must not be administered.
- Ensure drugs prescribed on a separate prescription chart e.g. warfarin and insulin are also prescribed on the kardex.
- If prescribing a drug for use 'as required', specify the indication, dose interval and maximum dose, e.g. paracetamol, oral 1 g every 4 - 6 hours as required for pain up to a maximum of 4 g daily.
- Prescribe liquids as 'mg' not 'ml' as different strengths of liquids may be available (see also page 7 for CD liquids). Also include the strength of the liquid formulation.
- Sign and date all prescriptions – if a prescription chart is re-written then the date against each drug entry should be the date the medicine was originally prescribed, not the date the prescription was re-written.
- Use the simplest regimen with the minimum number of drugs and doses. If compliance is poor, combination products or sustained release formulations may be useful. However, they are not encouraged as a first choice because fixed dosing may not be flexible enough to optimise the dose. Some sustained release preparations, e.g. isosorbide mononitrate SR and doxazosin XL are more expensive and are not recommended for routine use.
- Monitor the patient for potential adverse drug reactions.
- Continually review the need for each drug. Patients receiving IV antibiotics should be reviewed daily, with a view to switching to oral therapy when clinically appropriate (see IV to oral switch policy on page 206)

**The following are good practice points when prescribing:**

- Endorse the kardex with the reason for stopping a drug
- Write a review date for individual drugs on the kardex, where appropriate.
- Communicate medication changes and relevant information, e.g. side effects, to the patient.

**On discharge**

The discharge prescription is often the first communication the GP will receive regarding a patient's hospital admission. Therefore:

- *Review all medicines before discharge*, including any withheld during admission.
- Refer to the medicines kardex and medication history recorded on admission to confirm any medicines which have been started, changed or stopped during admission. Record these changes on the discharge prescription and include a brief explanation of why medicines have been stopped.
- Ensure patient is aware of all medication changes.

- Record details of any medication allergies / sensitivities.
- Fill in the medicines reconciliation box on the medicines kardex.
- Discharge prescriptions should be written in adequate time to allow dispensing of the medicines, taking in to account the patient's planned date and time of discharge (ideally 24 hours in advance). Include all medication in the discharge prescription, even if supply is not required. Annotate the prescription with 'Patient's own drugs' if patient has their own supply in hospital which can be used on discharge. If medicines are at home and cannot be assessed for suitability to be reused, the person annotating 'Patient's own drugs' is accepting that the patient has supplied reliable and accurate information about the medicine they have at home. If there is any doubt as to the validity or accuracy of this information, request a fresh supply of all medicines on the prescription and advise the patient to return all the medicines they have at home to their local community pharmacy.
- If the patient receives medicines in a compliance aid device, clearly annotate this on the discharge prescription.
- Provide the GP and the patient (where possible) with a copy of the discharge prescription.

## **Compliance aids**

Compliance aids are used widely but not always appropriately. Some patients with compliance problems do not benefit from such devices and some drugs are not suitable for inclusion in a compliance aid. There are often other, more effective, solutions. If considering a new compliance aid for a patient, please discuss this with your clinical pharmacist or contact your local pharmacy department at the earliest opportunity (before writing the prescription). The implications for primary care are far reaching and it is essential to ensure that a community pharmacy can continue this service.

Assessing a patient for such an aid may be better done after discharge to their home environment.

## **Clinical incidents / medication incident reporting**

- A clinical incident is an incident that may involve a medicine and causes harm or potentially could cause harm to a patient. Many are preventable.
- All staff (medical, nursing and pharmacy) must ensure that incidents involving medicines are reported, even near misses. This is an important part of our Quality Assurance System and a necessary component of patient care. Please refer to the NHSGGC Incident Management Policy and Policy on the Management of Significant Clinical Incidents on StaffNet.
- Reporting forms - Datix, a web-based reporting system, is now live in all services across Acute sites. No password is required to report.
- Data for all clinical incidents involving medicines are entered into a database and reviewed.

### **The following are examples of medication incidents:**

- A dose of medicine not administered or is omitted or incorrectly prescribed on the kardex e.g. wrong dose.
- The wrong dose of a medicine is given or the wrong medicine is given.
- A medicine is given at the wrong rate or frequency.
- Medication is given in the wrong concentration or in the wrong fluid.
- The wrong medicine or strength of medicine is dispensed on discharge.
- A dispensed medicine is wrongly labelled.
- Any of the above with radiological contrast media.

# Controlled Drug Prescribing

The legislation of Controlled Drugs (CDs) in the UK has recently been changed to improve patient and staff safety in relation to CDs. It is essential that a complete audit trail for CDs, from their procurement by pharmacy to administration / supply to patients or their return to pharmacy and/or destruction, is maintained.

## CD prescription requirements

On the discharge prescription the prescriber must ensure the following:

- Prescribe the CD on a separate discharge prescription form
- The CD must also be ordered in the Ward / Department CD order book by an authorised signatory. (Check with nursing staff for local procedure).
- On the discharge prescription *the following details must be handwritten (N.B. addressograph adhesive labels not allowed)*:
  - The patient's name, unit or CHI number and address.
  - The **name, strength of the drug** and **form** (tablets, mixture, vial, patch, etc.).
  - The **total quantity** of dose units (i.e. number of tablets, unit dose vials, injections, patches or volume (ml) of liquids) **in words and figures**.
  - The dose / time to be taken by the patient.
  - The date of the prescription.
  - The prescriber's signature.

For example:

Name:		Mr A. Patient										
Address:		1 Roadside Ave District Glasgow										
D.O.B.		01/01/20		CHI no: DDMMYY12345								
Medicine	Form	Dose	Times of administration									
			am 6	am 8	am 10	md 12	pm 2	pm 4	pm 6	pm 8	pm 10	Other times
MST	Tabts	50 mg		✓						✓		
Please supply 14 (fourteen) 30 mg tablets and 28 (twenty-eight) 10 mg tablets of MST												
DRs NAME (in capitals): THE DOCTOR												
Signature: <i>The Doctor</i> Date: 01/08/2011												

*Continues on next page*



## Other examples

- Sevredol 10 mg tablets: take one every four hours if required for breakthrough pain. Please supply 28 (twenty-eight) 10 mg tablets.
- Fentanyl 25 microgram/hour patch: apply one patch every 72 hours. Please supply 3 (three) 25 microgram patches.
- Morphine 50 mg subcutaneously via a syringe driver over 24 hours. Supply 10 (ten) morphine 10 mg/ml amp and 5 (five) morphine 30 mg/ml amp.

Prescribers must clearly state on the prescription the quantity to be supplied of **each different formulation**.

*The following strengths of CDs are available:*

MST® (Morphine <b>MR</b> ) tablets	5 mg, 10 mg, 15 mg, 30 mg, 60 mg, 100 mg, 200 mg
MST® (Morphine <b>MR</b> ) sachets	20 mg, 30 mg, 60 mg, 100 mg, 200 mg
Sevredol® (Morphine) tablets	10 mg, 20 mg, 50 mg
Morphine injection	10 mg/ml, 15 mg/ml, 30 mg/ml
OxyContin® (Oxycodone <b>MR</b> ) tablets	5 mg, 10 mg, 20 mg, 40 mg
OxyNorm® (Oxycodone) capsules	5 mg, 10 mg, 20 mg
Oxycodone liquid	5 mg/5ml
Fentanyl patches	12, 25, 50, 75, 100 micrograms
Diamorphine injection	5 mg, 10 mg, 30 mg, 100 mg, 500 mg

For further advice contact pharmacy (see Appendix 6 for details).

## CD prescribing - important notes

Take care with prescribing and ensure:

- Similar sounding drugs and standard versus modified release (MR) products are written clearly to avoid misinterpretation. Common errors occur due to confusion between:
  - Oramorph® liquid and OxyNorm® liquid
  - Morphine tablets and Morphine MR tablets
  - OxyContin® and OxyNorm®
  - Prescribe MR products by brand.
- Dose prescribed is clear:
  - E.g. 'Methadone 40 ml daily' does not indicate the dose to be given.
    - On the kardex prescribe:  
'Methadone 40 mg daily'
    - On discharge prescription write as:  
'Methadone oral solution 1 mg/ml, 40 ml daily'

DATIX reports show a number of incidents where millilitres and milligrams have been confused in liquid preparations. For Oramorph® 10 mg/5 ml this can result in patients receiving double the intended dose.

# NHSGGC Formulary

NHS Greater Glasgow and Clyde aim to promote high-quality, cost-effective prescribing in all areas of care. This Therapeutics Handbook is one such tool for prescribers to help ensure that they are consistently giving patients evidence-based treatment.

Good prescribing dictates that the choice of therapy should be made on the basis of sound clinical evidence of efficacy, safety and also takes into consideration patient acceptability and cost-effectiveness.

The Greater Glasgow and Clyde Formulary takes the above into account when considering a medicine for inclusion and therefore prescribing from the Formulary is consistent with good clinical practice.

All medicines referred to in this handbook are included in the NHSGGC Formulary.

## Structure of the Formulary

The NHSGGC Formulary contains two main sections, the Preferred List and the Total Formulary.

The Preferred List is composed of approximately 350 medicines which represent the first-line agents for many classes of medicine and cover many common conditions and diseases. It is primarily aimed at the generalist prescriber, and those specialists prescribing outwith their specialty. For that reason, various therapeutic areas are not suitable for inclusion in the Preferred List, for example oncology medicines.

The Total Formulary comprises all other Formulary medicines and generally contains specialist medicines and second and third-line agents from classes included in the Preferred List.

## Non-Formulary prescribing and processes

The need for prescription of medicines from out with the Formulary (non-Formulary prescribing) is recognised, but it is expected that:

- Formal treatment guidelines / protocols will exclude non-Formulary drugs.
- Non-Formulary status will apply to new medicines until accepted by the Scottish Medicines Consortium (SMC) and the Area Drug and Therapeutics Committee (ADTC). Further information regarding the SMC, including all previous decisions, can be found on their website: [www.scottishmedicines.org.uk](http://www.scottishmedicines.org.uk)
- Non-Formulary prescribing will be necessary and approved in **exceptional** circumstances only for individual patients.
- If a non-Formulary prescription is proposed in the best interests of an individual patient, existing non-Formulary processes should be followed.

There are agreed non-Formulary processes in place within both the acute and primary care sectors of the health board. Within acute sites, there are three categories of non-Formulary prescribing / medicines. The processes that need to be followed for each category differ.

### Level 1 Non-Formulary Medicines

Most non-Formulary prescribing is monitored retrospectively using pharmacy system data and no action is required from the prescriber. These medicines are termed Level 1 non-Formulary medicines.

### Level 2 Non-Formulary Medicines

Whilst it is impractical for an Individual Patient Treatment Request (IPTTR) form to be completed for all non-Formulary medicines, a completed form is requested for those medicines that are not recommended for use by the SMC or warrant closer monitoring because of high volume use or large financial / service implications.

These medicines can be found on the IPTR List. An Individual Patient Treatment Request form (IPTR2), used for level 2 drugs needs to be completed by the consultant and sent to pharmacy along with the request for the medicine (whether that be a prescription or inpatient indent).

### **Level 3 Non-Formulary Medicines**

These medicines, along with level 2 medicines, can be found on the IPTR List, but because of the high financial or service implications associated with the medicine, and often because it is not recommended by the SMC, they require the more detailed IPTR3 form to be completed by the consultant and use authorised by a directorate-level IPTR panel prior to being supplied by pharmacy.

The information obtained from the non-Formulary processes are collated by the Formulary Team and are used to inform ADTC and its sub-committees and individual directorates about trends regarding non-Formulary prescribing that need addressing.

### **Where to find Formulary information**

Full details of the non-Formulary processes, including access to the forms and latest IPTR List List, along with all other Formulary information can be accessed via StaffNet / Info centre / medicines formulary / Non-Formulary Info

The Greater Glasgow and Clyde ADTC also has a website containing useful Formulary information at: [www.ggcprescribing.org.uk](http://www.ggcprescribing.org.uk)

Alternatively, the Formulary Team (see Appendix 6 for contact details), based within the Area Medicines Information Centre in Glasgow Royal Infirmary, are happy to answer any specific queries where the information is not readily available.

## Prescribing Indicators in Primary Care

To promote cost-effective prescribing in primary care, a number of prescribing indicators have been utilised. For many of these indicators to be successful, it is essential that the acute sector promotes a consistent approach.

A full list of the prescribing indicators for primary care in 2012-2013 is available in a special April 2012 edition of PostScript Primary Care, available on the GGC Prescribing website: [www.ggcprescribing.org.uk](http://www.ggcprescribing.org.uk)

Though many of the indicators for 2012-13 will require the support of the acute sector, the following indicators are those with arguably the largest impact for junior medical staff.

1. **Lansoprazole and omeprazole capsules** should account for > 94% of prescription for all oral PPIs.

*Action for acute sector:* If initiation of a PPI is required, consider omeprazole or lansoprazole capsules at the lowest effective dose ahead of other non-Formulary PPIs.

2. There should be an 80% **switch from Movicol®** (excluding paediatric) to **Laxido Orange®**

*Action for acute sector:* Where a macrogol preparation is required for constipation, Laxido Orange®, the Formulary macrogol preparation, should be prescribed. Movicol® is non-Formulary.

3. **Simvastatin, atorvastatin and pravastatin** should account for > 99% of all statins

*Action for acute sector:* The NHSGGC Cholesterol Guidance should be followed when initiating statins and the vast majority of patients should receive simvastatin 40 mg as first-line treatment.

4. **Ezetimibe** should account for < 0.5% of all prescriptions of ezetimibe and statins.

*Action for acute sector:* Refrain from initiating ezetimibe. It is not included in the GGC Formulary. Follow the NHSGGC Cholesterol Guidelines for appropriate treatment choices.

5. **Buprenorphine patches** should account for < 0.1 DDDs per 1000 weighted patients per day

*Action for acute sector:* Refrain from prescribing buprenorphine patches. They are not recommended for use by the Scottish Medicines Consortium and are non-Formulary.

6. **Lidocaine 5% plasters** should account for < 0.2 prescriptions per 1000 weighted patients per day

*Action for acute sector:* Refrain from prescribing lidocaine 5% plasters for any indication other than post-herpetic neuralgia (see GGC Formulary for full details). Other uses are non-Formulary.

7. **Finasteride** should account for > 92% of all prescribing of dutasteride and finasteride

*Action for acute sector:* Where a 5-reductase inhibitor is required to be initiated, prescribe finasteride in preference to dutasteride.

# Unlicensed Medicines

No medicine can be placed on the market without a Marketing Authorisation (formerly known as a Product Licence) granted by the Medicines and Healthcare Products Regulatory Authority (MHRA). This Marketing Authorisation signifies that the medicine concerned meets the appropriate quality standards and is safe and efficacious for its designated use. However, fully licensed products will not always meet the clinical needs of an individual patient in every situation. Therefore, the legislation provides an exemption to allow the manufacture, supply and administration of unlicensed medicines (i.e. medicines without a Marketing Authorisation) when necessary. In addition, provision is also made for licensed medicines (i.e. medicines with full Marketing Authorisation) to be prescribed for unlicensed indications, in unlicensed dosages or in unlicensed formulations i.e. “off-label”.

The following issues must be considered before prescribing an unlicensed / off-label medicine:

- Unlicensed Medicines and off-label medicines should only be prescribed if their use can be clearly justified from a clinical / pharmaceutical perspective.
- Products with the appropriate Marketing Authorisation should be used to treat patients in preference to unlicensed medicines or off-label use whenever possible. However, use of unlicensed / off-label medicines may be necessary in order to provide the optimum treatment for patients.
- The decision to prescribe unlicensed medicines may only be made by a consultant.
- Any practitioner prescribing an unlicensed medicine or a licensed medicine for an unlicensed indication must take responsibility for their actions. The prescriber carries the burden of the patient's welfare and in the event of adverse reactions may be called upon to justify the decisions that they have taken.
- Appropriate documentation must be completed by the responsible consultant before an unlicensed medicine or a high risk off-label medicine is prescribed as per NHS GGC Unlicensed Medicines (ULM) Policy. Please contact your local pharmacy department for further information on this process and to obtain the necessary paperwork.
- Suitable patient information should be provided and informed consent obtained for patients prescribed unlicensed medicines.
- Appropriate arrangements must be made for continuity of supply when a patient is required to continue to take an unlicensed medicine after their discharge from hospital (see Policy for more details).
- The full ULM policy together with some frequently asked questions can be found within the medicines policies section of the GGC Prescribing website at [www.ggcprescribing.org.uk](http://www.ggcprescribing.org.uk)

# Quick guide to using the handbook

## What sort of guidance is included and excluded?

The Editorial Group has agreed criteria to determine if guidance is suitable for inclusion in the Handbook. Generally, the guidance should relate to the therapeutic management of a condition where drug therapy or other therapeutic interventions (e.g. non-invasive ventilation) are detailed. However, guidelines which simply describe practical diagnostic procedures with no therapeutic component (e.g. lumbar puncture) are not included.

## Format of guidance

Each guideline gives general information on the initial management of a clinical condition. These recommendations have been agreed by relevant specialists across NHSGGC and every effort has been made to ensure that they are complete and up to date at the time of going to print. Where appropriate, users are referred to other guidelines (or full versions of guidelines) that they may wish to consult. These may be highlighted on the title page of the guideline as follows:



Scottish Intercollegiate Guideline Network (SIGN)



StaffNet

Most guidelines follow a standard template. The drug aspect has been highlighted in colour to allow users to easily navigate through the guideline.

## Active links in this publication

This handbook contains interactive content and index pages (click on the required page number in these sections) together with links to sites mentioned in the text – these are highlighted. Where SIGN or local guidelines are available, click on the icons next to the guideline title to link to these sites.

## Abbreviations

The following are the most common ones which have been used in the course of the handbook:

ABG .....	Arterial Blood Gases
AVPU .....	Alert, Voice, Pain, Unresponsive
BP .....	Blood Pressure
CrCl .....	Creatinine Clearance
CRP .....	C Reactive Protein
CXR .....	Chest X-ray
ECG .....	Electrocardiogram
ESR .....	Erythrocyte Sedimentation Rate
eGFR .....	estimated Glomerular Filtration Rate

*Continues on next page*

FBC ..... Full Blood Count  
GCS..... Glasgow Coma Scale  
Hb ..... Haemoglobin  
LFTs ..... Liver Function Tests  
LVF ..... Left Ventricular Failure  
RR ..... Respiratory Rate  
STEMI..... ST Elevation Myocardial Infarction  
U&Es ..... Urea and Electrolytes  
WCC ..... White Cell Count

Other abbreviations used have been explained in the guidelines they are used.

## **And finally**

It is important to note that the final responsibility of prescribing lies with the prescribing clinician. If there are any concerns about the appropriateness of a particular treatment, seek additional and/or alternative sources of information. In addition, some specialists units have specific guidelines and these should be followed.





# Sections

**1. Resuscitation and Anaphylaxis**

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**2. Drug overdose and Toxicity**

---

**3. Gastrointestinal System**

---

**4. Cardiovascular System**

---

**5. Respiratory System**

---

**6. Central Nervous System**

---

**7. Infections**

---

**8. Endocrine System**

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**9. Electrolyte Disturbances**

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**10. Musculoskeletal and Joint Disease**

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**11. Palliative Care**

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**12. Oncological Emergencies**

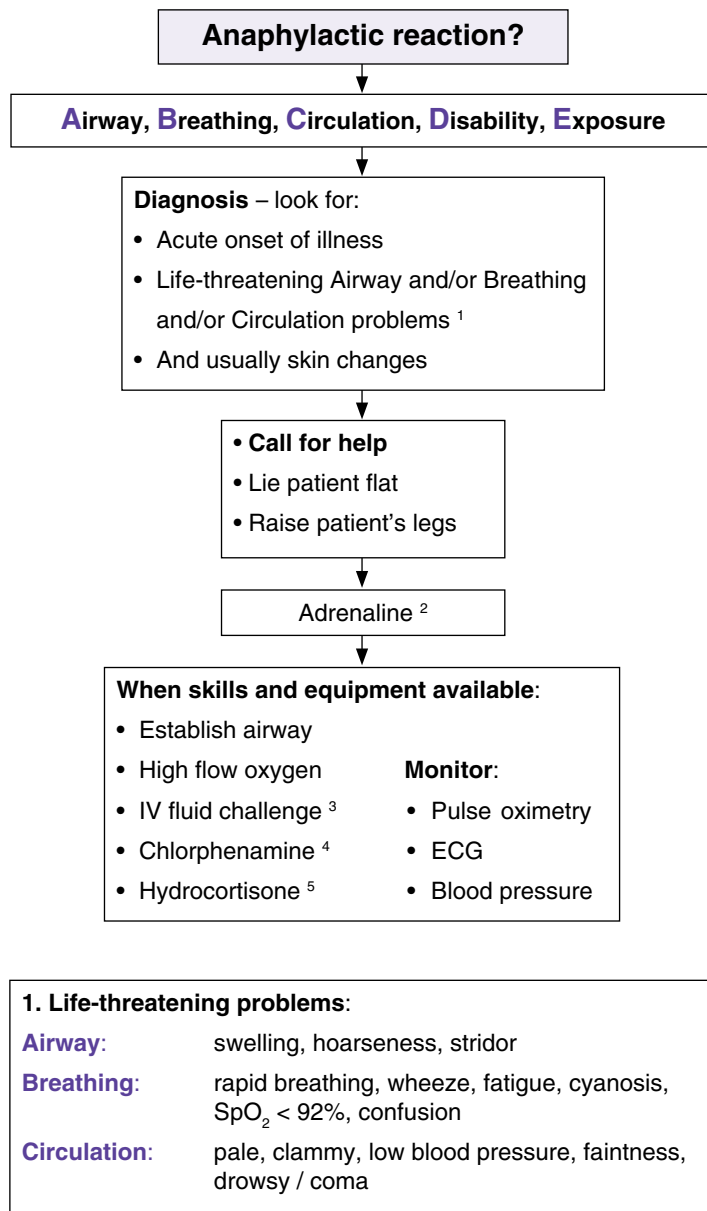
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## Section 1

# Resuscitation and Anaphylaxis

# Management of Anaphylaxis



*Continues on next page*

**2. Adrenaline (give IM unless experienced with IV adrenaline)**

IM doses of 1:1000 adrenaline (repeat after 5 min if no better)

- Adult 500 micrograms IM (0.5 ml)
- Child more than 12 years:  
500 micrograms IM (0.5 ml)
- Child 6 - 12 years:  
300 micrograms IM (0.3 ml)
- Child less than 6 years:  
150 micrograms IM (0.15 ml)

Adrenaline IV to be given *only* by experienced specialists.

**Titrate:** Adults 50 micrograms;  
Children 1 microgram/kg

**3. IV fluid challenge:**

Adult – 500 - 1000 mL

Child – crystalloid 20 mL/kg

Stop IV colloid if this might be the cause of anaphylaxis.

	4. Chlorphenamine (IM or slow IV)	5. Hydrocortisone (IM or slow IV)
Adult or child > 12 years	10 mg	200 mg
Child 6 - 12 years	5 mg	100 mg
Child 6 months - 6 years	2.5 mg	50 mg
Child < 6 months	250 micrograms/kg	25 mg

Anaphylaxis algorithm reproduced with the kind permission of the Resuscitation Council (UK)

## Other information

Anaphylaxis can be precipitated by a broad range of triggers which can include medicines, food, radio-opaque dyes and venom. On admission, known allergies must be clearly documented on the patient's kardex and in the medical notes. Any new allergies identified must be documented and communicated to the patient and the patient's GP. If a drug is the trigger then also complete a 'Yellow card' adverse drug reaction form. Forms can be found in the BNF or at [www.yccscotland.scot.nhs.uk/](http://www.yccscotland.scot.nhs.uk/)

The above algorithm has been taken from the guideline on Emergency Treatment of Anaphylactic reactions: Guidelines for healthcare providers, January 2008 ([www.resus.org.uk/pages/reaction.pdf](http://www.resus.org.uk/pages/reaction.pdf)).



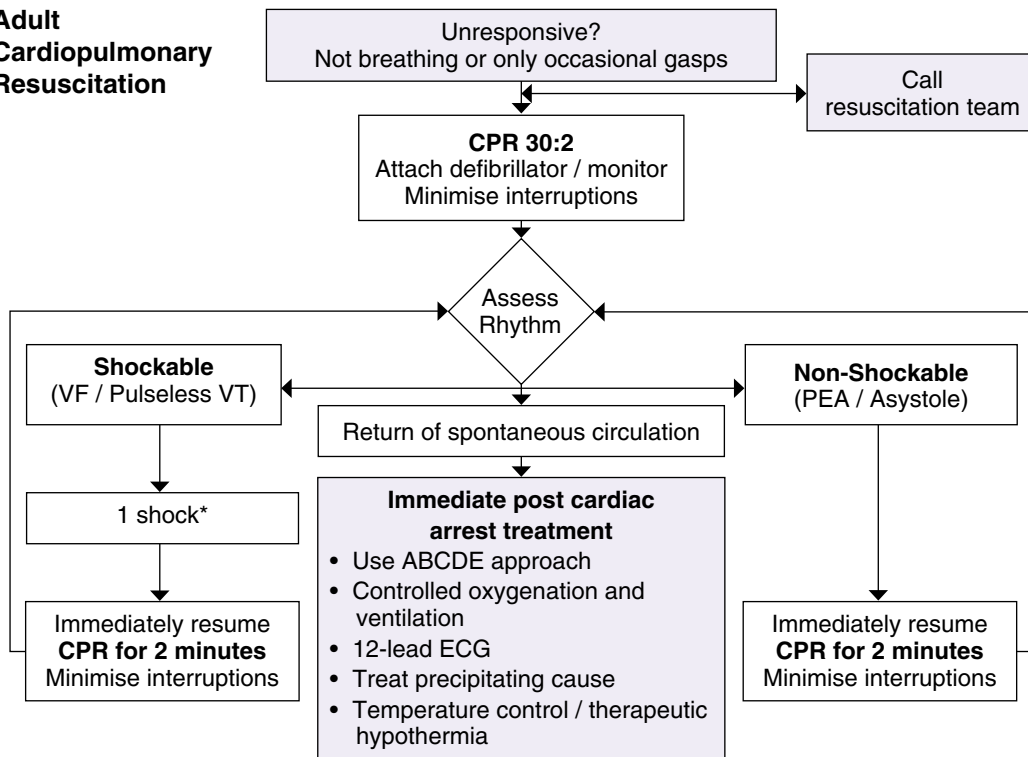
# Cardiopulmonary Resuscitation

**Note:** Under no circumstances should the emergency team enter MRI (Magnetic Resonance Imaging) areas.

Refer to the document “Cardiac Arrests or Serious Medical Emergencies Occurring in MRI Areas” available by contacting Resuscitation Officer or on StaffNet:

StaffNet / Acute / Emergency Care and Medical Services / Resuscitation / Downloads.

## Adult Cardiopulmonary Resuscitation



### During CPR

- Ensure high-quality CPR: rate, depth, recoil
- Plan actions before interrupting CPR
- Give oxygen
- Consider advanced airway and capnography
- Continuous chest compressions when advanced airway in place
- Vascular access (intravenous, intraosseous)
- Give adrenaline every 3 - 5 minutes
- Correct reversible causes

### Reversible Causes

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

\*Select 150 - 200 J biphasic for first shock and 150 - 360 J biphasic for subsequent shocks if required.

*Reproduced with the kind permission of the Resuscitation Council (UK)*

# Peri-arrest Arrhythmias

## General advice

Assessment and treatment of all arrhythmias should address two factors: the condition of the patient (stable versus unstable) and the nature of the arrhythmia.

## Adverse signs

The presence or absence of adverse signs or symptoms will dictate the appropriate treatment for most arrhythmias. The following adverse factors indicate that a patient is unstable because of the arrhythmia:

### **Clinical evidence of low cardiac output**

Pallor, sweating, cold, clammy extremities (increased sympathetic activity), impaired consciousness (reduced cerebral blood flow), and hypotension (e.g. systolic blood pressure < 90 mmHg).

### **Excessive tachycardia**

Very high heart rates (e.g. > 150 beats/min) reduce coronary blood flow and can cause myocardial ischaemia. Broad-complex tachycardias are tolerated by the heart less well than narrow-complex tachycardias.

### **Excessive bradycardia**

This is defined as a heart rate of < 40 beats/min, but rates of < 60 beats/min may not be tolerated by patients with poor cardiac reserve.

### **Heart failure**

Pulmonary oedema indicates failure of the left ventricle, and raised jugular venous pressure and hepatic engorgement indicate failure of the right ventricle.

### **Chest pain**

The presence of chest pain implies that the arrhythmia, particularly a tachyarrhythmia, is causing myocardial ischaemia.

## Treatment options

Having determined the rhythm and presence or absence of adverse signs, there are broadly three options for immediate treatment:

- Anti-arrhythmic (and other) drugs
- Attempted electrical cardioversion
- Cardiac pacing.

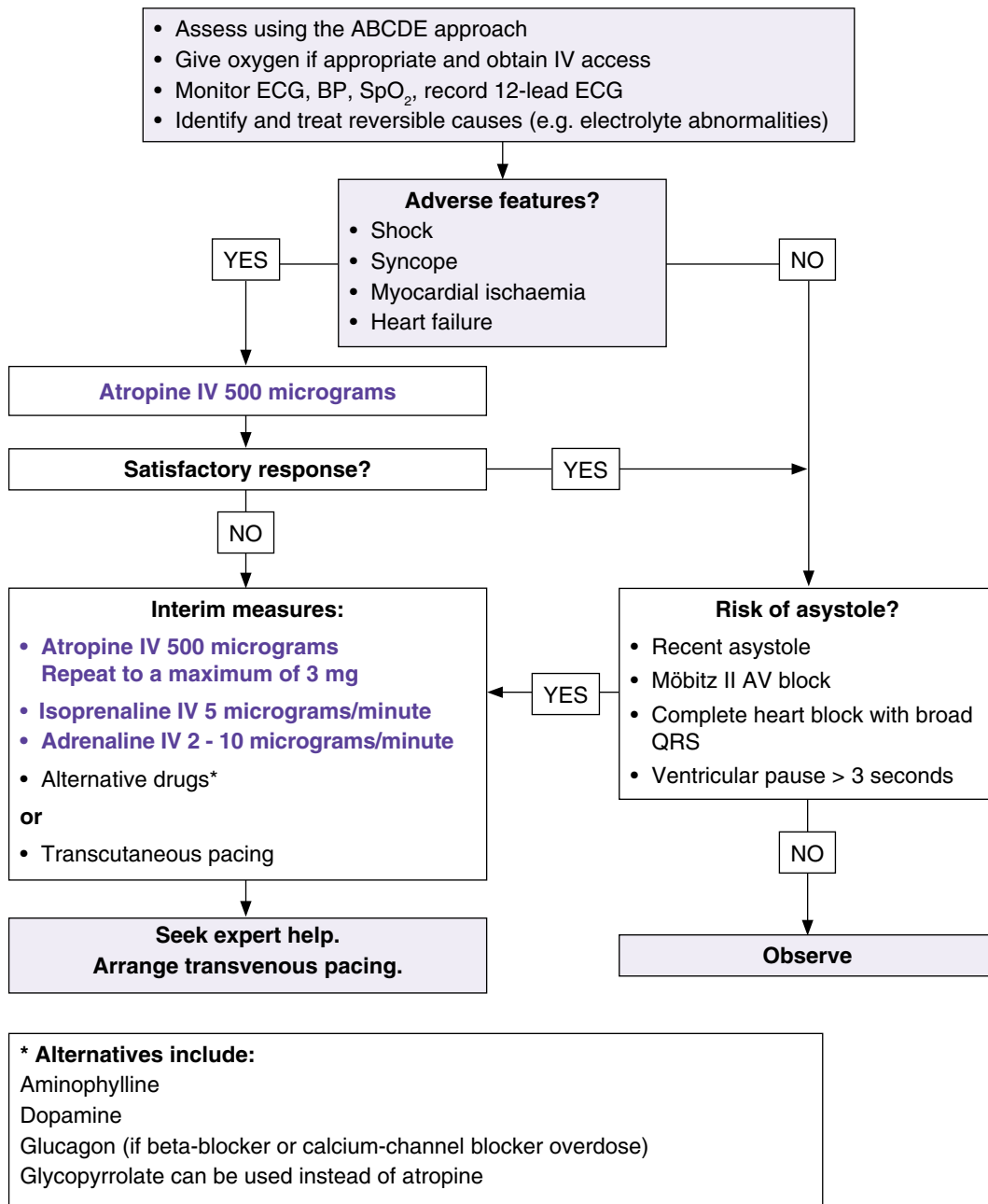
Anti-arrhythmic drugs act more slowly and less reliably than electrical cardioversion in converting a tachycardia to sinus rhythm. Thus, drugs tend to be reserved for stable patients without adverse signs, and electrical cardioversion is usually the preferred treatment for the unstable patient displaying adverse signs.

Once an arrhythmia has been treated successfully, repeat the 12-lead ECG to enable detection of any underlying abnormalities that may require long-term therapy.

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# Bradycardia – treatment algorithm

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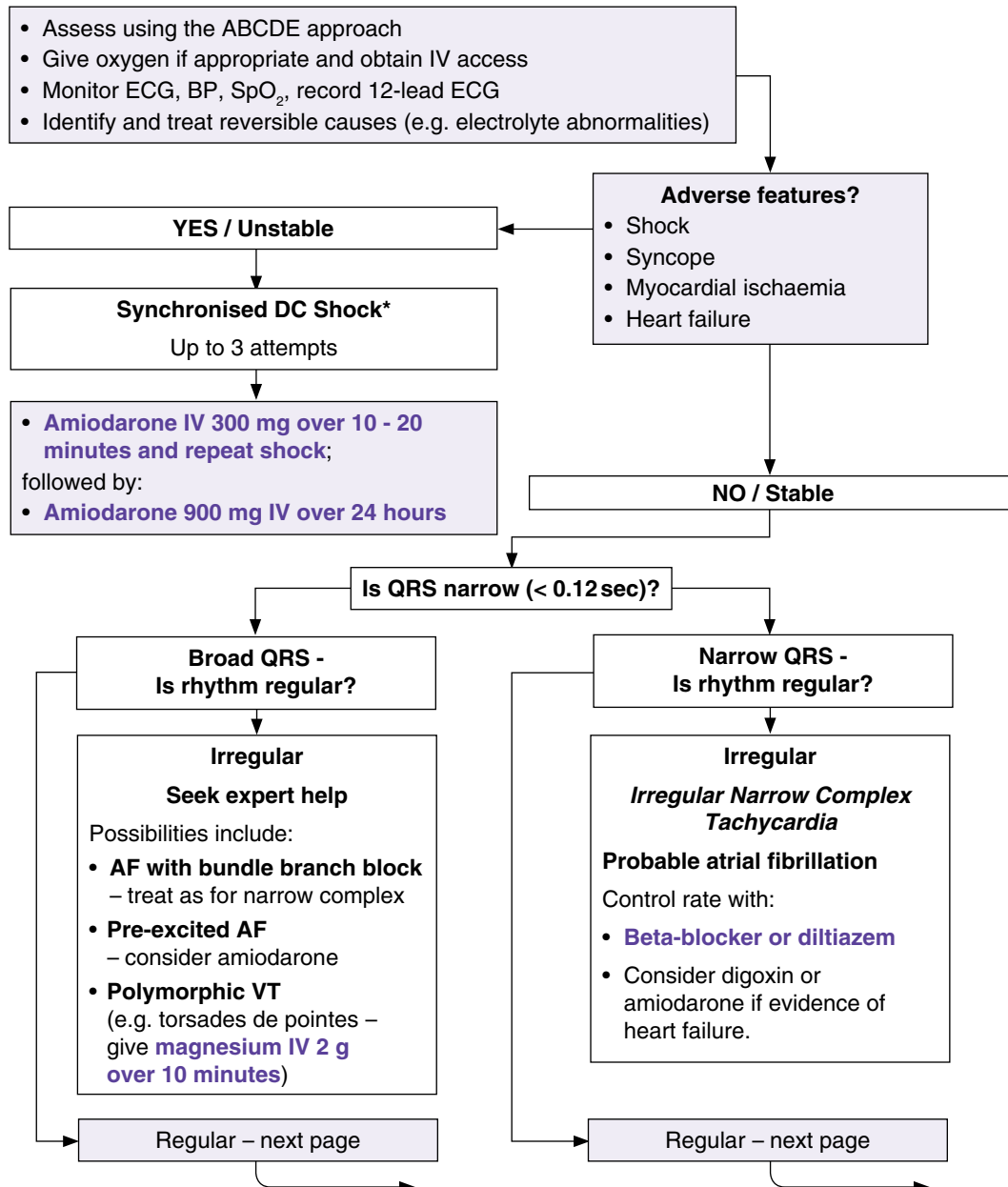




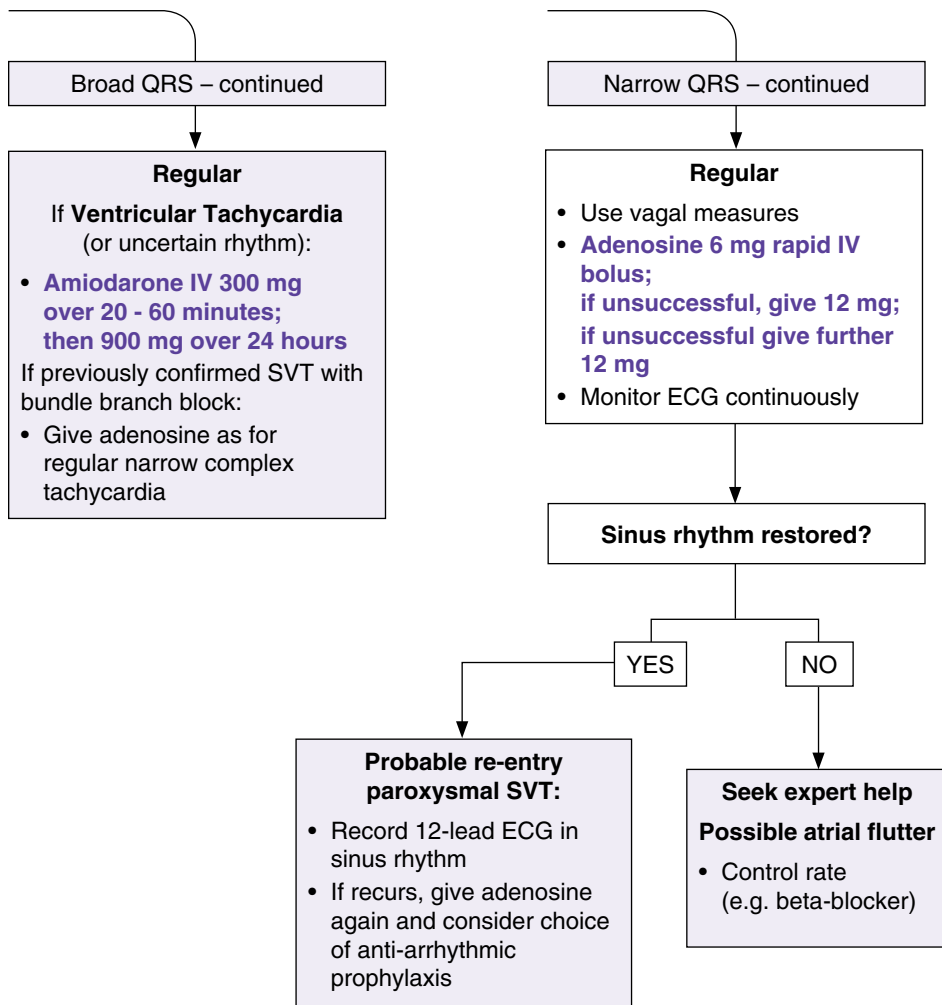
# Tachycardia – treatment algorithm (with pulse)



Reproduced with the kind permission of the Resuscitation Council (UK) [www.resus.org.uk](http://www.resus.org.uk)



\*Attempted electrical cardioversion is always undertaken under sedation or general anaesthesia.



# Guidelines on Blood Transfusion

This guideline promotes best practice regarding blood use. Further information on blood transfusion, including details regarding sampling, administration, blood products and management of reactions is available on StaffNet by searching 'Blood Transfusion Information'.

## Indications for transfusion

### Acute blood loss

An acute blood loss of greater than 20% of blood volume (about 1000 ml blood) will often need a transfusion. Do not delay ordering blood in situations where blood loss is acute and rapid.

If blood loss is very rapid, follow the site specific protocol for dealing with major haemorrhage (also see page 27).

### For surgical patients

#### Consider transfusion if:

- Post-operative Hb falls below 80 g/L (8 g/dL).
- Pre-operative Hb is less than 90 g/L (9 g/dL) and the surgery is associated with the probability of significant blood loss, but see point below.
- Pre-operative anaemia **must** be investigated, as medical management may be more appropriate than transfusion.
- Seek to maintain Hb above 80 g/L (8 g/dL) (consideration of above 100 g/L [10 g/dL] in patients with significant comorbidity e.g. age over 70, ischaemic heart disease, valvular heart disease and peripheral vascular disease).

### Anaemia in active myocardial infarction

#### (Hb below 100 g/L [10 g/dL]):

Transfusion to an Hb of 100 g/L (10 g/dL) is desirable but to overshoot to 110 g/L (11 g/dL) may be excessive. Evaluate effect of each unit as it is given.

### Anaemia in other patients

Some anaemias will respond to treatment of deficiency e.g. iron, B12, folate. Always consider cause before transfusing.

#### Hb below 80 g/L (8 g/dL):

Consider transfusion, but evaluate after each unit.

#### Hb between 80 g/L and 100 g/L (8 - 10 g/dL) and normovolaemic patients:

Consider transfusion only if they have symptomatic anaemia or significant comorbidity.

#### Symptoms and signs of anaemia include:

- Shortness of breath for no other reason
- Angina
- Syncope
- ST depression on ECG
- Tachycardia for no other reason

Transfusion to an Hb above 100 g/L (10 g/dL) is rarely indicated and the reason must be documented.

**Important note**

- Think before transfusion. Blood is a biological product and sometimes is in short supply. Transfusions come with the potential for known and unknown risks.
- Reassess after each unit is given. Do you need to give more?
- Stop if symptoms / signs shown above resolve.
- Stop if you have reached an adequate Hb i.e. above 80 g/L (8 g/dL) in symptomless patients (100 g/L [10 g/dL] in acute MI).

# Management of Major Haemorrhage

(See site specific information on page 29)

## Introduction

The therapeutic goal in the management of massive haemorrhage is maintenance of tissue perfusion and oxygenation by restoration of blood volume and haemoglobin (see site specific information on page 29).

## Definition of major haemorrhage

Definition of acute massive haemorrhage varies. It can be defined as a 50% blood loss within 3 hours or a rate > 150 ml/minute.

The normal human blood volume in an adult is 65 - 70 ml/kg; therefore a 70 kg male has a blood volume of approximately 5000 ml – a 50% loss is approximately 2500 ml.

---

### 1. Assess: Is this major haemorrhage? (See definition above)

---

### 2. Restore circulating volume

- Wide bore peripheral cannula
  - Adequate volume of crystalloid or colloid, warmed if possible
  - Give oxygen and start monitoring
  - Aim for BP at appropriate level
- 

### 3. Summon Help (See site specific information on page 29 - 31)

- Seek senior staff assistance:
- Surgical?
  - Anaesthetics?
  - ITU?
  - Obstetric?
  - Emergency medicine?
- 

### 4. Stop bleeding

Consider early surgical, obstetric or interventional radiology involvement.

---

### 5. Send blood samples

- 6 unit crossmatch
  - FBC and clotting screen including fibrinogen
  - Biochemistry including calcium
  - Ensure correct labelling of samples
  - Consider requirement for ABGs
- 

### 6. Give blood products as appropriate (see next page)

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*Continues on next page*

## Blood products

Blood product	Important information
Red cells	<ul style="list-style-type: none"> <li>Aim Hb &gt; 80 g/L (8 g/dL)</li> <li>O neg from Blood Bank or satellite fridges (see next page for details)</li> <li>Group specific 25 minutes</li> <li>Full crossmatch 60 minutes</li> </ul>
Clotting factors	<ul style="list-style-type: none"> <li>FFP: aim for PT and APTT &lt; 1.5 x control and/or</li> <li>Cryoprecipitate: aim fibrinogen &gt; 1 g/L</li> </ul>
Platelets	<ul style="list-style-type: none"> <li>Aim &gt; 75 x 10<sup>9</sup>/L, &gt; 100 x 10<sup>9</sup>/L if multiple or CNS trauma</li> <li>Stocks held at Gartnavel so take &gt; 1 hour to arrive</li> </ul>

### In Massive Transfusion remember:

Allow *at least*:

- 20 minutes for thawing of plasma products
- 25 minutes for group specific red cells
- Up to 60 minutes for full crossmatch
- Transport time

### Other information

- If O neg used please inform Haematology / Blood transfusion lab as soon as possible to ensure replacement of units.
- Avoid wastage of blood products – return blood immediately to the Blood Transfusion lab if not being used.
- Packed red cells should not be lying out of fridge for more than 30 minutes.
- Once situation resolved inform lab staff and porters to allow them to stand down.
- Once cycle completed review clinical situation.
- Tranexamic acid – This has recently been shown to safely reduce the risk of death in bleeding trauma patients (CRASH 2 Trial). Dose is:

**Tranexamic acid IV 1 g over 10 minutes, then infusion of 1 g over 8 hours**

*Continues on next page*

# Hospital Specific Information on Massive Haemorrhage Management

Royal Alexandra Hospital			
Phone numbers	Blood storage (O Neg Blood)	Key personnel	Coagulation factors
Phone switchboard 2222 and state "Major Haemorrhage" and location.	Theatre Fridge, Maternity Fridge (4 units).	On-call Haematology BMS via 2222 call.  Porter on voice pager via 2222 call.	Issued after discussion with on-call Haematology BMS or Haematology medical staff.
Inverclyde Royal Hospital			
Phone numbers	Blood storage (O Neg Blood)	Key personnel	Coagulation factors
Phone Blood Transfusion Laboratory, extension 64323.	Transfusion Laboratory, Haematology Department, Level C.  Out-of-hours satellite fridge opposite Transfusion Office (2 units), Theatre fridge (2 Units).	On-call Haematology BMS via switchboard.	Issued after discussion with on-call Haematology BMS or Haematology medical staff.
Vale of Leven Hospital			
Phone numbers	Blood storage (O Neg Blood)	Key personnel	Coagulation factors
Phone Blood Transfusion Laboratory extension 27502.	On-call Haematology BMS via switchboard, Transfusion Laboratory.  Out-of-hours satellite fridge in medical assessment unit (2 units).	On-call Haematology BMS via switchboard.	Issued after discussion with on-call Haematology BMS via switchboard or Haematology medical staff.
Stobhill ACH			
Phone numbers	Blood storage (O Neg Blood)	Key personnel	Coagulation factors
No Blood Bank on site. Call switchboard 2222 and state "Major Haemorrhage Stobhill ACH" and location, including local extension number. Call Blood Bank 24666 / 25047	ACH Laboratory satellite fridge - 6 units.	On-call Haematology BMS via switchboard.  Call switchboard and request an emergency taxi to take any samples to GRI Blood Bank.	Issued after discussion with Haematology medical staff, guided by clotting results.
Table continues on next page			

Table continued from previous page			
<b>Southern General Hospital</b>			
Phone numbers	Blood storage (O Neg Blood)	Key personnel	Coagulation factors
Call 2222 and state "Major Haemorrhage" and location.	Blood Bank 61597. General theatres (4 units). INS theatre (2 units). Labour suite (2 units). Main blood bank (2 units).	On-call Haematology BMS page 7602.	Blood Bank will automatically thaw 4 units of FFP. Further units issued once clotting screen received in lab and discussion with medical staff.
<b>Victoria Infirmary</b>			
Phone numbers	Blood storage (O Neg Blood)	Key personnel	Coagulation factors
Call Blood Bank Lab daytime 65650 or 65644 and state "Major Haemorrhage" and location.  Out of hours page 6645.	Blood transfusion lab Main theatre – Level E (2 units). ACH fridge (2 units).	On-call Haematology BMS page 6645.	Blood Bank will automatically thaw 4 units of FFP. Further units issued once clotting screen received in lab and discussion with medical staff.
<b>Western Infirmary</b>			
Phone numbers	Blood storage (O Neg Blood)	Key personnel	Coagulation factors
Call switchboard - 2222 and state "Major Haemorrhage" and location.	WIG Level 5 fridge (3 units). WIG Level 2 Theatre (6 units). WIG Blood Bank.	Blood Bank, Porters, Anaesthetist are informed by switchboard.	Blood Bank will automatically thaw 4 units of FFP once blood group known.
<b>Gartnavel General Hospital</b>			
Phone numbers	Blood storage (O Neg Blood)	Key personnel	Coagulation factors
Call switchboard - 2222 and state "Major Haemorrhage" and location.	GGH Theatre (3 units). GGH Porter Fridge (4 units irradiated).	Blood Bank, Porters, Anaesthetist informed by switchboard.	Blood Bank will automatically thaw 4 units of FFP.
Table continues on next page			



Table continued from previous page			
Glasgow Royal Infirmary			
Phone numbers	Blood storage (O Neg Blood)	Key personnel	Coagulation factors
<p>Call Switchboard 2222 and state "Major Haemorrhage" and location.</p> <p>Call Blood Bank 24666 / 25047.</p>	<p>Blood Bank - MacEwen Building.</p> <p>A&amp;E Fridge - Jubilee Building.</p> <p>Satellite theatre fridge - Queen Elizabeth Building.</p> <p>Labour Ward Fridge - Princess Royal Maternity.</p>	<p>Blood Bank 24666 / 25047.</p> <p>Out-of-hours and weekends extension 24305 (Porters office in A&amp;E).</p>	<p>The first issue of FFP and platelets can be made without haematologist involvement. Subsequent requests must be authorised by the duty haematologist.</p>



# Management of Acute Kidney Injury (AKI)

## Introduction

The definition of AKI is abrupt and sustained decline in glomerular filtration rate leading to accumulation of urea and other chemicals. It is classed in to 3 stages (see table 1). Risk factors of developing AKI are listed in boxes 1 and 2.

**Table 1 – Stages of AKI**

AKI stage	Definition
I	Cr >150 - 200% from baseline <b>or</b> Acute increase of Cr >25 micromol/L/48 hours <b>or</b> UO < 0.5 ml/kg/hour for > 6 hours
II	Cr > 200 – 300% from baseline <b>or</b> UO < 0.5 ml/kg/hour > 12 hours
III	Cr > 300% from baseline <b>or</b> Cr > 350 micromol/L <b>or</b> UO < 0.3 ml/kg/hour for 24 hours or anuric for 12 hours <b>or</b> requires renal replacement therapy, irrespective of Cr

### Box 1 – AKI risk factors

#### Clinical history

- Kidney disease
- Heart failure
- Ischaemic heart disease
- Malignancy
- Liver disease
- Urological intervention

#### During a hospital admission

- Surgery
- IV contrast
- > 20 mmHg decrease in BP
- Urinary obstruction
- Hypovolaemia
- Malnourished

### Box 2 – AKI avoidable risk factors

#### Nephrotoxins

- Angiotensin-converting enzyme inhibitors / Angiotensin-II receptor antagonists
- Non-steroidal anti-inflammatory drugs
- Antivirals / antifungals
- Vancomycin / Gentamicin
- Chemotherapy / contrast

#### Contrast Administration

If patient is at risk:

- Use low ionic low-osmolar contrast
- Fluids 1 ml/kg/hour fluid 6 - 12 hours pre- **and** post study

## Assessment / Monitoring

### AKI stage I

- Obtain clinical history. Check for risk factors (see box 1 on previous page), any pointers towards aetiology and review medication (see examples in box 2).
- Clinical examination:
  - Check patient's obs,
  - Fluid status (assess peripheral perfusion, JVP (central venous pressure, CVP), oedema, 3<sup>rd</sup> spacing) and urine output (UO).
- Investigations:
  - U&Es, urinalysis, MSSU, CXR, ECG.
  - **Consider** renal ultrasound (US), sepsis screen

### AKI stage II

As for Stage I but renal US within 24 hours and sepsis screen.

### AKI stage III

- As for stage II. Look for multi-organ failure and chase renal US report.
- Mandatory blood tests are: U&Es and  $\text{HCO}_3^-$ , CRP, creatine kinase, LFTs,  $\text{Ca}^{2+}$ , FBC, coagulation factors.
- **Consider:** amylase level, urine PCR if proteinuria, autoantibody screen if haematuria or proteinuria, microscopy if haematuria, myeloma screen, abdominal US.

**AKI complications** include: sepsis, acidosis, hyperkalaemia, multi-organ failure, oedema, respiratory failure, encephalopathy, serositis, haemorrhage.

## Management

### AKI stage I

- Stop nephrotoxins (see box 2 on previous page)
- Optimise fluid status.
  - Correct hypovolaemia, hydrate, optimise haemodynamics, keep accurate fluid balance chart.
  - Fluid challenge unless there is evidence of fluid overload.  
Aim for a mean arterial pressure > 65 or SBP > 100 mmHg.
  - **Consider:** vasoactive agents if hypotensive and not volume depleted.
  - Assess response and repeat U&Es. Aim for UO of 0.5 ml/kg/hour.
- Treat infection if present (see Infection Management Guidelines pages 210 - 250).
- Manage any contributing risk factors.
- **Consider:** inserting urinary catheter, seeking senior review, assessing CVP, reviewing medication and adjusting doses.
- Relieve obstruction if present with mandatory decompression, also request urgent urology review and/or discussion with interventional radiologist.

*Continues on next page*

*Management – AKI stage I continued*

- If evidence of rhabdomyolysis then:
  - Aim for UO > 100 ml/hour
  - Alternate Sodium chloride 0.9% IV with Sodium bicarbonate 1.26% IV
  - Keep urine pH > 6.5
  - Request surgical review if indicated

**AKI stage II**

- Manage as per Stage I and also:
  - Seek senior review
  - Insert urine catheter and check urine volumes hourly.
- **Consider:**
  - CVP / cardiac monitoring, 12 hourly bloods and level 2 care.
  - Refer to the Renal team if likely to need renal replacement therapy or if no clinical improvement in 24 - 48 hours.

**AKI stage III**

- As per Stage II and also:
  - Refer to the Renal team and transfer to level 2 care.
  - Do cardiac monitoring
- **Consider:**
  - CVP line insertion and 12 hourly bloods
  - Refer to ITU if patient is in respiratory failure or there is multi-organ involvement.

**Referral Criteria to Renal Unit**

- Urgent inpatient referral if:
  - High suspicion of rapidly progressive glomerulonephritis
  - Indication for dialysis (refractory increase  $K^+$  > 6.5 mmol/L, or urea > 30 with (or without) Cr > 500 micromol/L, tumour lysis syndrome, refractory volume overload, refractory acidosis pH  $\leq$  7.1, complications of uraemia, severe poisoning, severe hypothermia).
  - Stage III AKI
  - Stage II AKI and unresponsive to treatment after 24 – 48 hours
  - Renal transplant patient
  - Dialysis patient prior to admission

Page oncall renal page 4603.

- Non-urgent inpatient referral if:
  - Stage II AKI
  - Nephrotic syndrome
  - Positive ANCA or ANA and proteinuria with or without haematuria
  - Malignant hypertension

Telephone renal secretary on 0141 211 2658 or fax 0141 211 2322, response within 1 working day.

## Section 2

# Drug Overdose and Toxicity

# General Management of Overdoses and Toxicity

---

Most overdoses come to no harm. For all overdoses (even common ones) it is good practice to refer to TOXBASE [www.toxbase.org](http://www.toxbase.org) (password required). Print out a copy of the advice to put in the patient's notes and follow the advice. If patient is unwell or you are not sure, discuss with a senior and contact the National Poisons Information Service (NPIS) on 0844 892 0111.

# Treatment of Paracetamol Overdose

This guideline is aimed at providing general guidance on the management of oral paracetamol overdose. For more detailed information, including the management of IV paracetamol overdose, consult TOXBASE [www.toxbase.org](http://www.toxbase.org) (password required) or contact the National Poisons Information Service [NPIS] on 0844 892 0111.

## Introduction

In overdose the potential risk of a patient having significant liver damage is directly proportional to the amount of paracetamol ingested. It is often difficult to quantify due to an, often, unreliable history from patient. ***Even smaller amounts of paracetamol can lead to hepatocellular damage in patients with contributing risk factors such as:***

- Long-term treatment with drugs which induce liver enzymes e.g. carbamazepine, rifampicin, phenytoin, phenobarbital, primidone, St John's Wort.
- Regular consumption of more than the recommended amount of alcohol.
- Glutathione depletion e.g. eating disorder, cystic fibrosis, HIV positive or has cachexia.

***(See "high risk" treatment line on graph (page 39) for patients with these risk factors.)***

## Treatment options

- Acetylcysteine (N-acetylcysteine, Parvolex®, NAC) IV is the treatment of choice. It can prevent paracetamol-induced hepatotoxicity if given during the first 8 hours of overdose. It may also be effective up to and possibly beyond 24 hours (particularly for high-risk patients). If acetylcysteine cannot be given or is inappropriate for the patient then consider and discuss with NPIS about giving oral methionine, provided the overdose has taken place within 10 - 12 hours and the patient is not vomiting.
- Hypokalaemia may occur – refer to page 288 for guidance on management.

---

### < 4 hours after paracetamol ingestion

- Consider activated charcoal administration if:
  1. The dose ingested is suspected to be > 150 mg/kg (75 mg/kg if risk factors present) or 12 g (whichever is smaller)
  - and
  2. It is within 1 hour since overdose.
- For obese patients (> 110 kg) the toxic dose in mg/kg should be calculated using 110 kg, rather than their actual weight.
- Note that paracetamol levels taken at this time cannot be interpreted. ***Wait until 4 hours from ingestion then measure level.***
- If the paracetamol level is above the treatment line (or the high risk treatment line if appropriate) on the graph (page 39) then treat with: **acetylcysteine infusion. Total dose of 300 mg/kg over 20 hours – see dosing table page 40.**

*Continues on next page*

## Treatment of paracetamol overdose continued

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### 4 - 8 hours after ingestion

- Request urgent plasma paracetamol analysis. Await result before deciding whether treatment is required (***provided result can be obtained and acted upon within 8 hours of ingestion***).
  - If the paracetamol level is above the treatment line (or the high risk treatment line if appropriate) on the graph (page 39) then treat with **acetylcysteine infusion. (Total dose of 300 mg/kg over 20 hours – dosing table page 40.)**
- 

### 8 - 24 hours after ingestion

- If the dose ingested is suspected to be > 150 mg/kg (75 mg/kg if risk factors present) or 12 g (whichever is smaller) ***do not wait for result - commence treatment with acetylcysteine (dosing table page 40).***
  - For obese patients (> 110 kg) the toxic dose in mg/kg should be calculated using 110 kg, rather than their actual weight.
- 

### > 24 hours after ingestion

- A plasma concentration measured at this time is likely to be below the limit of detection, even after a substantial overdose.
  - For management refer to TOXBASE [www.toxbase.org](http://www.toxbase.org) (password required) or contact NPIS on 0844 892 0111.
- 

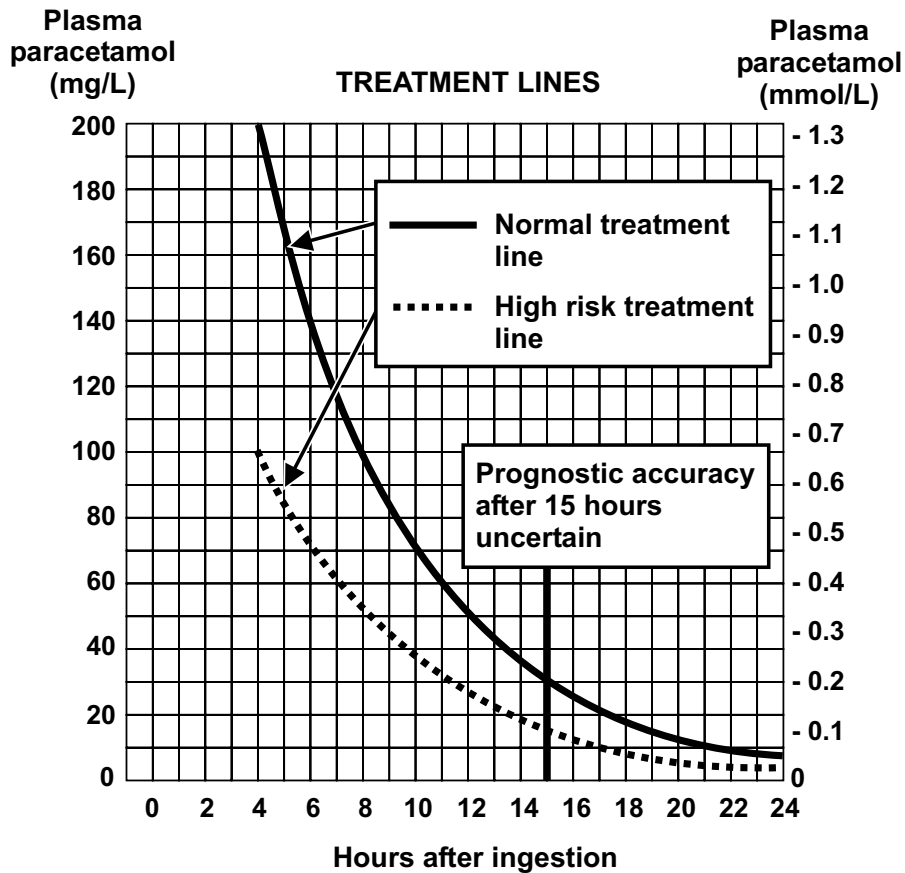
### Staggered overdoses

- Paracetamol plasma levels are not helpful in this situation. Consider giving acetylcysteine and if required seek further advice from NPIS (telephone 0844 892 0111).

**Paracetamol overdose treatment graph – see next page**



**Paracetamol overdose treatment graph:** Patient should receive treatment if level is above the normal treatment line. If patient has contributing risk factors then treat if level is above the high risk treatment line. The prognostic accuracy after 15 hours is uncertain but a plasma-paracetamol concentration above the relevant treatment line should be regarded as carrying a risk of serious liver damage.



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**N.B.** Paracetamol levels are reported in mg/L units

**Table 1 – Acetylcysteine IV dosing and administration**

Acetylcysteine	Infusion1	Infusion 2	Infusion 3	Infusion 4
Dose	150 mg/kg over 15 minutes	50 mg/kg over 4 hours	50 mg/kg over 8 hours	50 mg/kg over 8 hours
Preparation	Remove 50 ml from 250 ml glucose 5% then add the required volume	Add the required volume to 500 ml glucose 5%	Add the required volume to 500 ml glucose 5%	Add the required volume to 500 ml glucose 5%
Weight (kg)	Volume (ml)	Volume (ml)	Volume (ml)	Volume (ml)
40	30.0	10.0	10.0	10.0
50	37.5	12.5	12.5	12.5
60	45.0	15.0	15.0	15.0
70	52.5	17.5	17.5	17.5
80	60.0	20.0	20.0	20.0
90	67.5	22.5	22.5	22.5
100	75.0	25.0	25.0	25.0
Other	0.75 x wt	0.25 x wt	0.25 x wt	0.25 x wt
Infusion rate	999 ml/hr for 15 mins	125 ml/hr for 4 hours	62.5 ml/hr for 8 hours	62.5 ml/hr for 8 hours

**Important notes**

1. **Obese patients (> 110 kg)** – the dose should be calculated using a weight of 110 kg rather than the patient's actual weight.
2. Hypersensitivity reactions do occur. True anaphylaxis is rare. Stop the infusion and re-start at a slower rate (50 mg/kg over 8 hours). Occasionally where necessary give antihistamine and consider the use of corticosteroids.
3. Acetylcysteine has been associated with mild elevation of INR. If INR is elevated (< 1.3) but transaminase is normal then no further treatment or monitoring is required. If both INR and transaminase are elevated then repeat infusion 3 in table above over 16 hours and refer to TOXBASE / discuss with NPIS.

# Reversal of Opioid-induced Respiratory Depression

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This guideline relates to the reversal of accidental opioid-induced respiratory depression, rather than intentional overdose. For management of narcotic overdose, contact the National Poisons Information Service (telephone 0844 892 0011) or consult TOXBASE – [www.toxbase.org](http://www.toxbase.org) (password required).

## Management

Reduced conscious level is usually used to predict patients at risk of severe respiratory depression. If the patient is unrousable:

1. Give oxygen therapy (see pages 126 and 129).
2. Give naloxone. Balance the risk of withholding naloxone against a possible transient worsening of pain if given. If necessary, contact a senior colleague for advice.

### Naloxone IV bolus:

**Naloxone IV 100 - 200 micrograms, then increments of 100 micrograms every 2 minutes as required according to response.**

Observe patient carefully for recurrence of CNS and respiratory depression. The plasma half-life of naloxone is shorter than that of all opioid analgesics – *therefore repeated doses of naloxone may be required.*

### Naloxone IV infusion:

(N.B. Administration guidance from TOXBASE)

Naloxone infusion may be useful where repeated doses are required. An infusion of 60% of the initial dose per hour is a useful starting point.

**Dilution:** Make up a solution of naloxone 10 mg/50 ml as follows:

- Draw up 10 mg of naloxone from 25 ampoules, each containing 400 micrograms/ml (total volume: 25 ml).
- Dilute the 10 mg concentrate with 25 ml of glucose 5% to give a final volume 50 ml and a concentration of 200 micrograms/ml.
- Infuse solution using an IV pump, adjust dose to clinical response. Infusions are not a substitute for frequent review of the patient's clinical state.

**Dose example:** If the total repeated doses required to maintain patient with satisfactory ventilation for at least 15 minutes add up to 4 mg then the infusion rate would be 60% of this dose which is 2.4 mg (12 ml)/hour.

3. Observe patients for at least 6 hours after the last dose of naloxone. Monitor BP, pulse, respiratory rate, oxygen saturation and conscious level at least every 15 minutes initially.
4. If no response to naloxone, do not delay establishing a clear airway, adequate ventilation and oxygenation
5. If pulmonary oedema is a complication, then assisted ventilation with positive end-expiratory pressure may be necessary.

# Lithium toxicity

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Normal range 0.4 - 1 mmol/L. Plasma lithium level > 1.5 mmol/L may be fatal and requires urgent medical treatment. In overdose, there may be a delay of symptoms (> 12 hours).

## Common features

- Early features of toxicity are non-specific e.g. apathy, restlessness and can be followed by: confusion, vomiting, diarrhoea, loss of appetite, slurred speech, abnormal drowsiness or sluggishness, severe tremor or twitching, muscle weakness, blurred vision, ringing in ears, dizziness, loss of balance, clumsiness.
- Severe toxicity: convulsions, coma, renal failure, hypotension, dehydration, electrolyte imbalances and death.

## Common causes of toxicity

- Dehydration, renal dysfunction, infection, interacting medication e.g. diuretics, non-steroidal anti-inflammatories (see BNF for more details).

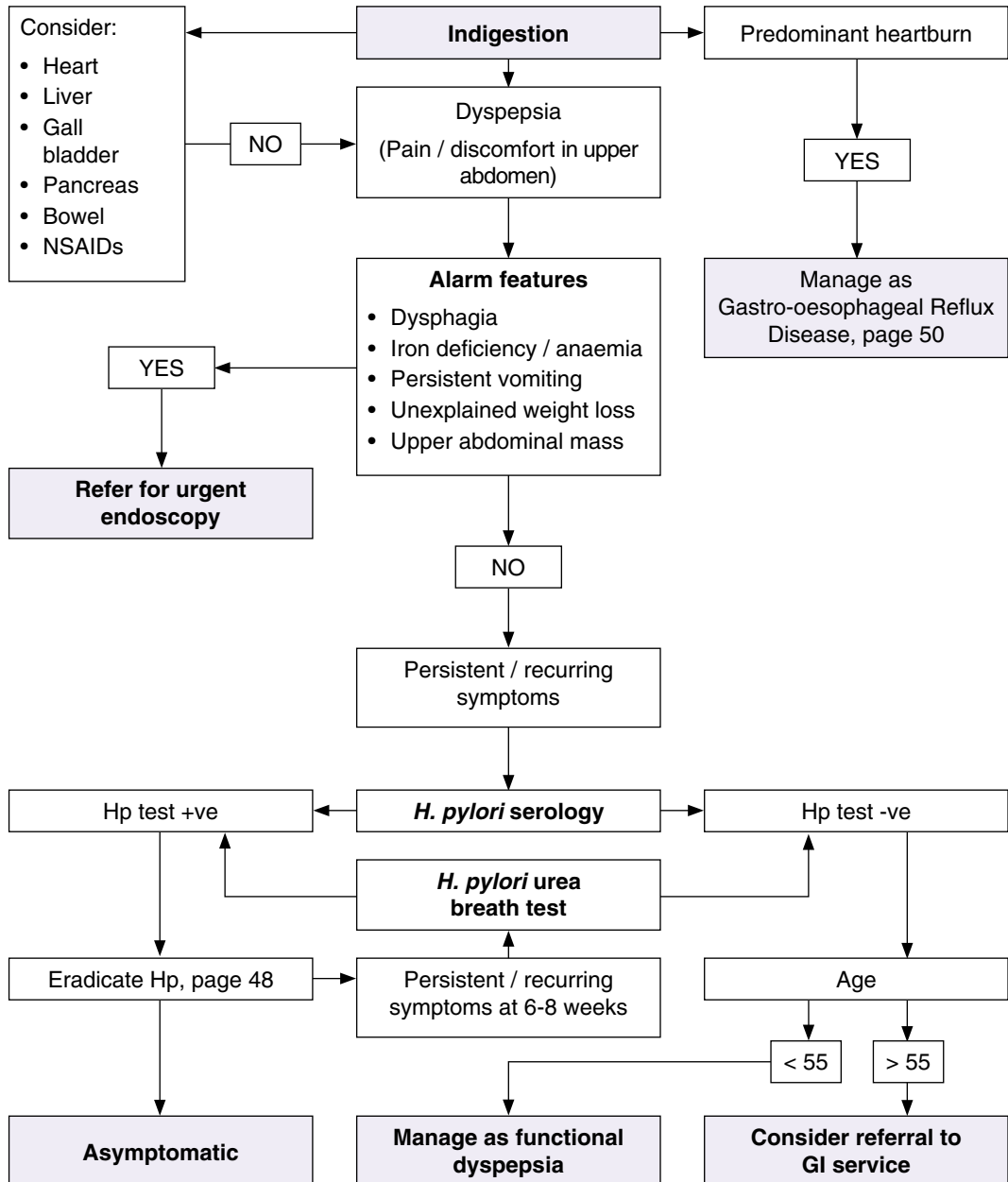
## Management of toxicity

- If there are concerns that the patient could be lithium toxic, then seek advice from senior medical staff, withhold lithium and obtain lithium level. Check urea and electrolytes and thyroid function tests. Closely monitor fluid balance.

See Appendix 3 for information on therapeutic monitoring of lithium.

## Section 3

# Gastrointestinal System



# Management of Constipation

## Introduction

This guideline applies to patients who are initiated on laxatives during their hospital stay or to patients who are not responding to their current laxative therapy.

**N.B.:** Laxatives are **contraindicated** in patients with intestinal obstruction. If suspected refer to specialist surgical team.

## Assessment / monitoring

Identify possible causes:

- Underlying disease e.g. hypothyroidism, hypercalcaemia.
- Mechanical obstruction e.g. rectal tumour.
- Immobility / dehydration e.g. stroke / diabetes mellitus.
- Drugs e.g.
  - Opiates (including co-codamol and dihydrocodeine);
  - Anticholinergics (tricyclic antidepressants, oxybutynin);
  - Verapamil;
  - Aluminium containing antacids;
  - Iron and calcium containing preparations.

### Check

- Serum U&Es
- Creatinine
- Calcium
- Thyroxine (T4)
- Glucose

## General management

### Rectal examination:

- Hard faeces – (prescribe a faecal softener e.g. lactulose – see table on following pages).
- Soft faeces – (prescribe a stimulant laxative e.g. senna – see table on following pages).
- Impaction – (for enema e.g. sodium citrate micro-enema or phosphate enema – see table on following pages).
- Empty rectum – (suspect obstruction and obtain plain abdominal x-ray).

### Educate patient

- Increase dietary fibre (bran, fruit, vegetables).
- Increase mobility.
- Ensure adequate fluid intake (especially if on bulk forming laxative e.g. ispaghula husk, or high fibre diet).

## Drug therapy / treatment options

**Acute constipation.** (Constipation of recent onset due to a period of illness or immobility, drug therapy, changes in diet or fluid intake. Laxatives should only be given for short-term use.)

Laxative	Dose	Notes
Senna tabs	2 - 4 tablets at night	Liquid preparation also available: 10 ml senna liquid = 2 senna tablets.
<i>Or</i>		
Glycerol suppositories	4 g PR daily	Moisten suppositories with water for ease of insertion.

**Chronic constipation** (Requires long-term management.)

Laxative	Dose	Notes
Ispaghula husk (Fybogel®)	1 sachet twice daily	Ensure adequate fluid intake. If ineffective after several days add senna 2 - 4 tablets at night (short-term only).
<i>Or</i>		
Lactulose	15 ml twice daily regularly	If above option is not effective / appropriate.
+/- senna	2 tablets at night	
<i>Or</i>		
Macrogol Oral Powder (Laxido Orange®)	1 - 3 sachets daily	If above options are not effective/ appropriate. Ensure adequate fluid intake.
+/- senna tabs	2 tablets at night	

**Opioid-induced constipation**

Laxative	Dose	Notes
Senna tabs	2 - 4 tablets at night	
<i>and either</i>		
Lactulose	15 ml twice daily regularly	
<i>Or</i>		
Sodium Docusate	100 - 500 mg daily	
<i>Or</i>		
Co-danthramer capsules	1 - 2 at night	<b>For terminally ill patients only.</b> Titrate dose upwards as necessary.
Co-danthramer liquid	5 - 10 ml at night	
Table continues on next page		



Table continued from previous page		
<b>Rectal impaction*</b>		
Laxative	Dose	Notes
Bisacodyl suppository AND Glycerol suppository	1 of each	
Sodium citrate microenema	1 at night	
<i>If no result, followed by:</i>		
Phosphate enema	1 in the morning	Do not use more than twice a day.
Arachis oil retention enema	1	Avoid if nut allergy.
<i>If no result, followed 6 - 8 hours later by either:</i>		
Sodium citrate microenema	1	
<i>Or</i>		
Phosphate enema	1	
Macrogol Oral Powder (Laxido Orange®)	8 sachets daily for up to 3 days**	For use in resistant cases of impaction. Ensure adequate fluid intake.

\* In some cases of rectal impaction, manual evacuation may be required. Seek advice from senior medical staff.

\*\* May not be possible to use this dose in the frail elderly.

*Note: Patients unable to swallow, but with a nasogastric or RIG/PEG tube in situ can have certain laxative preparations administered via the tube. Contact clinical pharmacists for details.*

## Management of Diarrhoea

Oral rehydration salts e.g. Dioralyte®	1 - 2 sachets after every loose motion. Each sachet is reconstituted with 200 ml of water.
Loperamide	4 mg initially followed by 2 mg after each loose stool, up to a maximum of 16 mg daily.

**Note:** *If Clostridium difficile is suspected, see Infections section. In such cases loperamide is **not** appropriate.*



# Management of *Helicobacter pylori*

*Helicobacter pylori* (*H. pylori*) is a bacterium colonising the gastric mucosa and may be the causative agent in a number of gastrointestinal pathologies.

## Eradication - which patients?

- All patients with proven duodenal ulcers.
- Patients with gastric ulcer.
- Patients with *H. pylori* and a strong family history of gastric cancer.
- Patients with epigastric pain in the absence of an ulcer.

## Assessment / monitoring

Initial testing for *H. pylori* may be done by laboratory-based serology, urea breath test and stool antigen test. Re-testing should always be done using urea breath test.

### Drug therapy

One week therapy with a proton pump inhibitor (PPI) and two antibiotics is recommended:

**First line –**

**Omeprazole oral 20 mg twice daily (or lansoprazole oral 30 mg twice daily)**

**and**

**Clarithromycin oral 500 mg twice daily**

**and**

**Amoxicillin\* oral 1 g twice daily.**

*\*In penicillin allergy use tetracycline oral 500 mg twice daily.*

**Second line –**

Substitute:

**Clarithromycin for metronidazole oral 400 mg twice daily.**

- Patients should be counselled on the importance of compliance before starting treatment and in those patients taking metronidazole on the avoidance of alcohol because of the risk of a disulfiram-like reaction.
- After 1 week's treatment all medication can be stopped, except where ulcers have bled or perforated, when a PPI will be continued.
- A breath test should be carried out 28 days after completion of treatment to check that eradication has been successful if the patient is still symptomatic.

**N.B.** Healing of gastric ulcers must be confirmed by endoscopy after 6 - 8 weeks.

## Introduction

If *H.pylori* infection demonstrated, treat with eradication therapy, as outlined on page 48.

### Drug therapy

#### Proton pump inhibitors

**Omeprazole oral 40 mg once daily for 4 - 8 weeks or**

**Lansoprazole oral 30 mg once daily for 4 - 8 weeks**

*If the ulcer is associated with NSAID:*

- Discontinue the NSAID.
- Repeat endoscopy 2 - 4 weeks after completion of therapy to confirm healing and to check for *H.pylori*. If latter is positive, eradicate infection.
- If the NSAID needs to be continued or restarted, use in combination with a PPI e.g. :

**omeprazole oral 20 mg once daily or**

**lansoprazole oral 30 mg once daily**

irrespective of *H. pylori* status.

#### IV proton pump inhibitors

- If the patient is unable to take oral therapy give:  
**omeprazole 40 mg by IV bolus injection**
- If patient has had endoscopic haemostasis for a bleeding ulcer give:  
**omeprazole infusion, initial 80 mg dose** (give 40 mg in 100 ml sodium chloride 0.9% infused over 20 - 30 mins and then **repeat**.)

***followed by:***

**continuous infusion of 8 mg/hour for 72 hours** (make up 40 mg in 100 ml sodium chloride 0.9%, infuse at 20 ml (8 mg) per hour over 5 hours for a total of 72 hours, a total of 15 infusion bags have to be prepared.)

***followed by maintenance dose:***

**omeprazole oral 20 mg each day for 8 weeks**

**N.B.** Continuous infusion of omeprazole is an unlicensed use. Bags should only be prepared immediately before use as no stability data beyond this time period.

# Management of Gastro-oesophageal Reflux Disease (GORD)

## General management

- Lifestyle changes will include:
  - weight reduction
  - reduce alcohol
  - stop smoking
  - avoid stooping
  - raise head of bed
  - avoid foods that lower LOS (lower oesophageal sphincter) pressure (e.g. caffeine, chocolate, and onions).
- Review concurrent drug therapy:
  - Avoid NSAID (non-steroidal anti-inflammatory drugs) and consider alternatives if possible for drugs likely to lower LOS pressure (e.g. any drugs with anticholinergic side effects, SSRIs, calcium-channel blockers)

## Treatment options

### Mild symptoms

**Co-magaldrox (Mucogel®) oral 10 - 20 ml after meals and at bedtime, or when required**

**or**

**Peptac® oral 10 - 20 ml after meals and at night.**

**N.B.** Avoid in cardiac failure, renal disease and hepatic disease.

### Persisting symptoms

**Omeprazole oral treatment dose 40 mg once daily for 4 - 8 weeks, then maintenance dose 20 mg once daily or**

**Lansoprazole oral treatment dose 30 mg once daily for 4 - 8 weeks, then maintenance dose 15 mg once daily.**

### Long-term maintenance

- Aim for lowest dose proton pump inhibitor (PPI) needed to control symptoms.
- Encourage 'on demand' PPI treatment especially for endoscopy-negative reflux disease.

### Ongoing symptoms

- Try higher dose PPI and seek specialist advice.

# Management of Upper Gastrointestinal (GI) Haemorrhage



## Introduction

- 80% of upper GI bleeding will stop spontaneously.
- Age, co-morbidity and signs of significant blood loss (e.g. shock and melaena) increase risk.
- Liver disease and variceal bleeding have much higher mortality rates (see separate guidelines on pages 56, 60 and 62).

## Assessment

- Assess pulse and BP (including postural blood pressure if not hypotensive).
- Check for evidence of significant blood loss (including rectal examination for melaena - if melaena is present it implies that there has been significant blood loss).
- Check FBC, U&Es and LFTs.
- Check coagulation if suspected liver disease or on anticoagulation.
- Assess co-morbidity.
- Check medication – NSAIDs (non-steroidal anti-inflammatory drugs), aspirin, anticoagulants.
- Scoring systems can be used to assess risk in these patients and local protocols for individual hospitals exist, dependent on resources and endoscopy services. The Rockall score is the most commonly used endoscopy-based risk score and the Glasgow Batchford Score (GBS) is the best early (pre-endoscopic) risk score. However, if a patient is haemodynamically unstable with ongoing bleeding, they should be discussed with the on-call surgical team / endoscopist. Other patients should be endoscoped on the next available list.
- Out-patient management – If the patient's parameters and clinical status fulfil **all** criteria of table 1 (GBS = 0), then patient can be discharged and managed in out-patient setting (see Table 1 below).

**Table 1 – Criteria for out-patient management (GBS = 0)**

Parameter	Value
Urea	< 6.5 mmol/L
Hb	> 130 g/L (men) > 120 g/L (women)
Systolic BP	≥ 110 mmHg
Pulse	<100 bpm
<b>Clinical Status</b>	
Absence of melaena, syncope, cardiac failure or hepatic disease	

GBS - Adapted with permission from The Lancet, 356 (Iss 9238), pages 1318 – 1321, 2000.

*Continues on next page*

## General management

All patients:

- Group and save or cross-match as clinically indicated
- Stop NSAIDs, aspirin and anticoagulants
- Consider reversing anticoagulation (depends on severity of bleeding and indication for anticoagulation, see page 84)
- Repeat Hb as clinically indicated

Patients with haemodynamic compromise and/or significant comorbidities have higher mortality, particularly if elderly. In these patients:

- Crossmatch 4 units
- IV access x 2
- Consider HDU
- Resuscitate aggressively. Use blood volume expanders or sodium chloride 0.9% to keep pulse < 100 bpm, systolic BP > 100 mmHg, Hb > 100 g/L and urine output > 30 ml/hour.
- If resuscitation difficult consider CVP monitoring.

Contact senior support to decide on timing of urgent endoscopy.

## Endoscopy

- Fast for 3 hours
- Consent
- Venflon in situ
- Ensure case notes and observation charts go with patient.

## Post endoscopy

### If no abnormality found and no drop in haemoglobin:

There is a low risk of re-bleeding. Consider patient for early discharge.

### If peptic ulcer disease is found:

- Stop NSAIDs or aspirin and advise patients against them, unless they are essential, in which case, co-prescribe a proton pump inhibitor (PPI):

### Lansoprazole oral 30 mg each day or Omeprazole oral 20 mg each day

- Check *Helicobacter pylori* (*H. pylori*) serology:
  - If positive for *H. pylori* – see eradication regimen page 48.
  - If negative for *H. pylori* and not on NSAIDs – maintain on lifelong PPI (see above for choice and dose).
    - If re-bleeding occurs (fresh melaena or haematemesis associated with a drop in Hb of 20 g/L) - seek senior help, including surgical review.
    - If varices, refer to separate guideline, page 60.
    - Give specific treatment for other pathologies as indicated.
    - Discuss with gastroenterologist as required.

*Continues on next page*

### *Post endoscopy continued*

- c. If stigmata for high risk of re-bleeding (e.g. active bleeding at endoscopy or visible vessel) then the endoscopist may recommend:

**Omeprazole IV infusion (Hong Kong Protocol) – page 49 for dose and administration details.** This is an unlicensed use and so should only be prescribed at the request of a consultant.

These patients should remain in hospital for 96 hours to monitor for re-bleeding. After infusion initiate PPI oral therapy (see previous page for choice and dose).

## **On discharge**

- Arrange <sup>13</sup>C Urea Breath Test in 8 weeks if *H. pylori* eradication therapy given.
- Continue PPI for 6 weeks and then change to H<sub>2</sub> antagonist prior to breath test.
- Repeat OGD (Oesophagogastroduodenoscopy) in 8 weeks if gastric ulcer found.

# Management of Severe Exacerbation of Inflammatory Bowel Disease

## Assessment / monitoring

### On admission

- Stool culture and *Clostridium difficile* toxin.
- Stool chart (kept by nursing staff).
- BP / pulse / temperature – frequency depends on initial findings.
- Bloods – FBC; CRP or ESR; U&Es; LFTs; blood cultures.
- X-ray – plain film of abdomen.
- If features suggesting severe disease present, seek immediate senior review.
- Unprepared sigmoidoscopy in new patient.

## General management and treatment options

- Avoid anti-diarrhoeal agents
- Give **IV fluids**
- Give **hydrocortisone sodium succinate IV infusion 100 mg every 6 hours**  
**N.B.** Some sites may be auditing an alternative choice of IV steroid. Check with local GI unit before prescribing.
- Give low residue diet / oral fluids
- Give high calorie supplements
- If Hb < 90 g/L – transfuse
- High risk of venous thromboembolism – give thromboprophylaxis (unless contraindicated):  
**enoxaparin SC 40 mg once daily (20 mg once daily if eGFR < 30 ml/minute /1.73m<sup>2</sup> as these patients are at risk of DVT.**
- Involve gastroenterologist / gastrointestinal surgeon.

### Note: Caution with:

- |   |   |   |
|---|---|---|
| <ul style="list-style-type: none"> <li>• Narcotics</li> <li>• Antispasmodics</li> <li>• Hypokalaemia</li> <li>• Barium enema</li> </ul> | ] | Patient with abdominal pain must be seen and assessed before prescribing analgesia. |
|---|---|---|

Discuss with radiologist / gastroenterologist.

Continues on next page



## General management and treatment options continued

### Ongoing management

- Monitor Hb, WCC, U&Es, CRP daily
- Daily abdominal film (where indicated)
- Light diet
- A CRP > 45 or the stool frequency > 8 at day 3 are bad prognostic signs and senior review and/or surgical review should be undertaken immediately.

### Drug treatment after 5 - 7 days

- Change IV hydrocortisone to:  
**prednisolone oral 40 mg each day. Reduce no faster than by 5 mg every 5 - 7 days. Normally there is gradual reduction over a 4 - 8 week period if CRP and stool frequency falling.**
- **Add mesalazine oral (Pentasa® Granules MR 2 - 4 g per day in 2 divided doses or Asacol® MR 2.4 - 4.8 g daily in 2 divided doses or Mezavant® XL 2.4 g once daily preparation).**
- Rectal preparations may be useful in proctitis, left sided disease and Crohn's disease of the rectum and anus. Seek specialist advice.

## Discharge

Normally discharged when:

- Non-toxic
- Stool frequency decreased, consistency increased and macroscopic blood decreased
- Lab parameters stable
- Follow-up OPD appointment made

# Management of Decompensated Liver Disease

## Assessment / monitoring

- Bloods for FBC, coagulation screen, U&Es, LFTs, glucose
- Signs of chronic liver disease
- Arrange ultrasound scan of abdomen
- Assess for alcohol withdrawal
- Dietary assessment
- Liver screen including AFP (alpha fetoprotein) if not previously performed
- **In encephalopathy** (signs = mental slowness, confusion, drowsiness, liver flap):  
Assess for the following precipitants and treat as appropriate:
  - Sepsis
  - Culture blood and urine
  - Tap ascites if present for WCC count, protein content and culture (see below)
  - Arrange chest x-ray
  - Bleeding
  - Renal failure, electrolyte abnormalities
  - Constipation
  - Medication (e.g. sedatives or over-diuresis)
- **In renal impairment:**
  - Assess for potentially reversible factors – dehydration, diuretics, sepsis, intrinsic renal disease.
  - Renal tract US to exclude obstruction. Urine dipstick – if hepatorenal should be nothing abnormal detected. If blood and protein consider renal causes.
  - Assess for hydration.
- **If ascites is present:**
  - Consider other causes of ascites (e.g. malignancy, Budd-Chiari syndrome or cardiac failure).
  - Perform diagnostic ascitic tap. Aspirate 50 ml of fluid (normally straw coloured) and send for:
    - Microbiology – WCC and culture in blood culture bottle (anaerobic and aerobic)
    - Biochemistry – total protein and albumin
    - Cytology

*Continues on next page*

- Serum-ascites albumin gradient (SAAG) can differentiate ascites resulting from portal hypertension and from other causes. It is more useful than the protein based exudate / transudate concept. Calculate SAAG by:

$$\text{SAAG} = (\text{serum albumin}) - (\text{ascites albumin})$$

Obtain both values on the same day. If SAAG > 11 g/L then ascites very likely the result of portal hypertension (97% accuracy).

- Table 1 lists the major differential diagnoses based on the SAAG.

**Table 1 – Differential diagnoses of ascites based on serum-ascites albumin gradient**

SAAG ≥ 11 g/L	SAAG < 11 g/L
Cirrhosis	Diffuse peritoneal metastases
Alcoholic hepatitis	Tuberculous peritonitis
Cardiac ascites	Pancreatic ascites
Massive liver metastases	Nephrotic syndrome

## General management and drug therapy

### Diet

- Aim for high protein, high calorie diet.
- Reduce protein slowly if encephalopathic.
- Restrict dietary salt if ascites is present.
- Give:

**Vitamin K (phytomenadione) 10 mg slow IV injection over 3 - 5 minutes.**

**Note:** *This will not correct clotting unless there is a deficiency (can occur in obstructive liver disease or prolonged malnutrition) but will ensure patient's level is replete.*

- Consider **DVT prophylaxis** (see page 66).
- **If history of alcohol abuse is suspected:**

**Pabrinex® (contains thiamine)** – see vitamin prophylaxis flowchart page 174.

**Continues on next page**



## General management and drug therapy continued

### Management of encephalopathy

- Assess for precipitating factors (see under 'Assessment and monitoring' section) and treat as appropriate. If sepsis suspected, treat with antibiotics. Remember typical signs of sepsis may be masked. Use broad-spectrum antibiotics (see page 210).
- Stop sedatives
- Give **lactulose oral 20 ml three times daily (titrate dose to give three soft motions per day)**.

### Management of ascites

- If ascitic WCC  $> 500 /\text{mm}^3$  or neutrophil count  $> 250 /\text{mm}^3$ , treat as for spontaneous bacterial peritonitis (SBP) (see below).
- Low salt diet
- Diuretics – initially use:

**Spironolactone oral 100 - 400 mg each day**

Seek senior advice if renal impairment or high potassium. Titrate dose / consider adding furosemide according to weight and renal function. Aim for weight reduction of no more than 1 kg per day.

- If ascites is causing respiratory compromise or is not responding to above measures consider large volume paracentesis.
- Treat Spontaneous Bacterial Peritonitis (SBP) once diagnosis confirmed with:

**Suitable antimicrobial (see Infections section page 234)**

**Salt poor albumin (100 ml of 20 %) IV infusion 1.5 g/kg on day one then 1 g/kg on day 3**

- Prophylaxis of SBP in:
  - patients with one episode proven SBP, either previously or currently (once current episode treated)
  - patients with total ascitic protein  $< 10 \text{ g/L}$

Prescribe: **norfloxacin oral 400 mg once daily for prophylaxis.**

**Continues on next page**

## General management and drug therapy continued

### Management of renal impairment

- Catheterise (strict input / output chart)
- Stop diuretics
- Assess hydration status. If clinically dehydrated:

**Sodium chloride 0.9% IV infusion (1 - 1.5 litres is reasonable)**

If evidence of ascites and peripheral oedema:

**Salt poor albumin 20% IV, 2 x 100 ml each day** and consider:

**Terlipressin IV – initially 0.5 mg 6 hourly. Titrate dose over 72 hours in discussion with the local gastroenterology team.**

Terlipressin is contraindicated in ischaemic heart disease / peripheral vascular disease and arrhythmias.

If no improvement in urine output after above measures seek senior review and consider central venous pressure monitoring.

Jaundiced patients who suffer from alcoholic liver disease should be discussed with the local gastroenterology team regarding eligibility for inclusion in the STOPAH (Steroids or Pentoxifylline for Alcoholic Hepatitis) trial.

## Aminoglycoside in decompensated liver disease

Gentamicin should be avoided in patients with decompensated liver disease (jaundice, ascites, encephalopathy, variceal bleeding or hepatorenal syndrome). See infection management section or contact microbiology / infections diseases unit for advice.

## Other information

### For further monitoring

- Daily FBC, U&Es until improving
- Coagulation screen and LFTs 2 - 3 times per week
- Daily weight
- Monitor daily for encephalopathy

### Pre-discharge

- Aim to stabilise weight, mental state and diuretics dose prior to discharge
- Counsel about alcohol. Liaise with alcohol support services
- Arrange clinic review

## Assessment

- Check pulse and BP (including postural drop if not hypotensive).
- Assess for stigmata of chronic liver disease.
- Check FBC, coagulation, U&Es and LFTs.
- Cross-match 6 units of blood.

## Management

The following management plan should be instituted in all patients with suspected variceal haemorrhage on the basis of having evidence of chronic liver disease and evidence of a significant gastrointestinal bleed **prior to** the diagnosis of variceal bleed being confirmed.

- If patient is shocked (pulse > 100 bpm, systolic BP < 100 mmHg and evidence of bleeding) should have a urinary catheter inserted and consideration of CVP line insertion.
- Consider admission to HDU.
- Correct any clotting and platelet abnormality (discuss with haematology).
- Resuscitate with blood or colloid aiming to maintain Hb > 80 g/L, pulse < 100 bpm, systolic BP > 90 - 100 mmHg, CVP of 8 - 10 cm and urine output greater than 30 ml/hour. Resuscitation and transfusion requirements also depend on patient's age and co-morbidities.
- Start appropriate drug therapy (see 'Drug therapy' section of this guideline).
- If ascites is present perform an ascitic tap.
- Seek help from seniors:
  - If stable should be listed for urgent endoscopy.
  - If unstable, liaise with on-call endoscopist. A Sengstaken tube should only be inserted in exceptional circumstances by an experienced member of staff. Anaesthetic support to protect the airway followed by transfer to ITU may be necessary.

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## Drug therapy

- Unless contraindication (cardiovascular disease) start:

**Terlipressin 2 mg by IV bolus followed by 1 - 2 mg every 4 to 6 hours until bleeding is controlled, for up to 48 hours.**

**Octreotide** can be used if terlipressin contraindicated, but this use is unlicensed and therefore should be discussed with seniors first.

- Start antibiotics – use broad spectrum antibiotic cover:

**Co-amoxiclav IV 1.2 g every 8 hours (or clarithromycin IV 500 mg every 12 hours if penicillin allergy).** If antibiotic therapy not otherwise required, continue for 7 days (when appropriate observe IV to oral switch).

## Management once stable

- Enter into a variceal eradication programme – discuss with gastroenterologist.
- Start **propranolol oral 40 mg twice daily if no contraindication and titrate up to 160 mg once daily sustained release preparation if tolerated.**
- Give advice on alcohol intake if appropriate – abstinence alone can reduce the portal pressure.

# Management of Acute Liver Failure

**Definition of Acute Liver Failure:** Encephalopathy developing in a person with acute hepatic dysfunction within 8 weeks of the onset of jaundice.

## Introduction

- Most acute admissions for liver failure occur in patients with pre-existing liver disease.
- Acute liver failure strictly refers to those patients without such a history, and is much rarer.
- The guidelines, Acute Liver Failure and Management of Decompensated Liver Disease, are intended to help with both the acute case and with the deterioration of chronic cases.

## Aetiology

The causes of acute liver failure in the UK are, in order of incidence:

- Paracetamol overdose (70%)
- Viral Hepatitis (8.4%)
- Idiosyncratic drug reaction (5.1%)
- Budd-Chiari (2.1%)
- Autoimmune (2%)
- Ischaemic (2%)
- Miscellaneous (10.4%)

(Reference: Edinburgh Royal Infirmary 2009)

## Clinical features

- Encephalopathy
- Jaundice: may be minimal in early stages
- Hepatic foetor
- Liver size: normal or small. Large liver suggests chronicity
- Metabolic acidosis and renal failure may be early and marked in paracetamol overdose
- Coagulopathy
- Hypoglycaemia
- Infection
- Circulatory collapse

## Assessment / monitoring

- **Immediate:** FBC, coagulation screen, blood glucose, U&Es, paracetamol levels, blood and urine cultures.
- **Urgent (within 24 hours):** LFTs, hepatitis serology (IgM anti-HAV, HBsAg, IgM anti-HBc and anti-HCV).
- Chest x-ray, ultra sound (US) of liver and pancreas.

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**Consider:**

- Serum copper and caeruloplasmin, 24 hour urinary copper, Kayser Fleischer rings to be assessed by Ophthalmologist for Wilson's disease.
- Doppler US of hepatic vein if Budd-Chiari suspected.
- EEG if doubt about the aetiology of cerebral dysfunction.

**General management and treatment options**

Seek senior help early. ITU admission will be required for all grades of encephalopathy in the acute patient. Your consultant should be aware of the patient on the day of admission so that early discussions can take place with relatives and the Liver Transplant Unit if needed.

**General**

- Monitor urine output hourly, blood glucose every 2 hours.
- Do not sedate.
- Avoid arterial puncture (except in paracetamol overdose where hypoxia is a criterion for transfer to the liver unit).

**Encephalopathy**

- If Grade II or worse on presentation, and cerebral oedema is suspected, nurse 20 - 30° head elevated and give:

**Mannitol IV 20% , 0.5 g/kg over 30 - 60 minutes and repeat 4 hourly if necessary.**

**Hypoglycaemia**

- **Glucose IV 10% at a rate of 100 ml/hour. Increase to 20% or 50% if hypoglycaemia is profound.**
- Continuous infusion of glucose may cause hyponatraemia which may itself be a contraindication to liver transplantation. Therefore the recommendation is to give concurrent:

**Sodium chloride IV 0.9% plus**

**Potassium chloride IV 40 mmol/L if hypokalaemic.**

**Coagulopathy**

- **Do not** give blood products (i.e. fresh frozen plasma, factor concentrates) unless bleeding is a problem.
- Vitamin K (phytomenadione) does not correct clotting defect but give:

**Phytomenadione 10 mg slow IV bolus over 3 - 5 minutes to ensure patient is replete.**

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**General management and treatment options continued****If bleeding occurs**

- Discuss with haematologist.
- Take blood for FDPs or D-Dimers to exclude DIC (disseminated intravascular coagulation).
- Give fresh frozen plasma.
- Consider platelets 6 units if platelets  $< 20 \times 10^9/L$ .

**Sepsis**

- Culture blood and urine at baseline and every 24 hours.

**Renal Failure**

- If  $K^+ > 6 \text{ mmol/L}$ ,  $HCO_3^- < 15 \text{ mmol/L}$  or creatinine  $> 400 \text{ micromol/L}$ , the patient will need renal support. Discuss with renal unit regarding modality.

**Indication for discussion with the Scottish Liver Transplant Unit in Acute Liver Failure**

Rather than waiting until the strict criteria for transplantation are met, patients with severe acute liver failure should be discussed with the Scottish Liver Transplant Unit (see Appendix 6 for contact details) at an early stage. This should occur if:

- Prothrombin time  $> 30$  seconds or INR  $> 2.5$
- $pH < 7.3$  or  $H^+ > 50 \text{ nmol/L}$
- Hypoglycaemia
- Encephalopathy
- Creatinine  $> 200 \text{ micromol/L}$

**Indications for transplant**

The following outlines current indications for transplantation but by the time the patient fulfils the criteria he/she should already be in a liver unit.

**Paracetamol overdose:**

- $pH < 7.3$

Or **all** of the following:

- Prothrombin time  $> 100$  seconds
- Creatinine  $> 300 \text{ micromol/L}$
- Grade III encephalopathy

**All other causes**

- Prothrombin time  $> 100$  seconds

Or 3/5 of the following:

- Aetiology: non A non B hepatitis or drug reaction
- Age  $< 11$  or  $> 40$  years
- $> 7$  days between onset of jaundice and encephalopathy
- Prothrombin time  $> 50$  seconds
- Bilirubin  $> 300 \text{ micromol/L}$

## Section 4

# Cardiovascular System

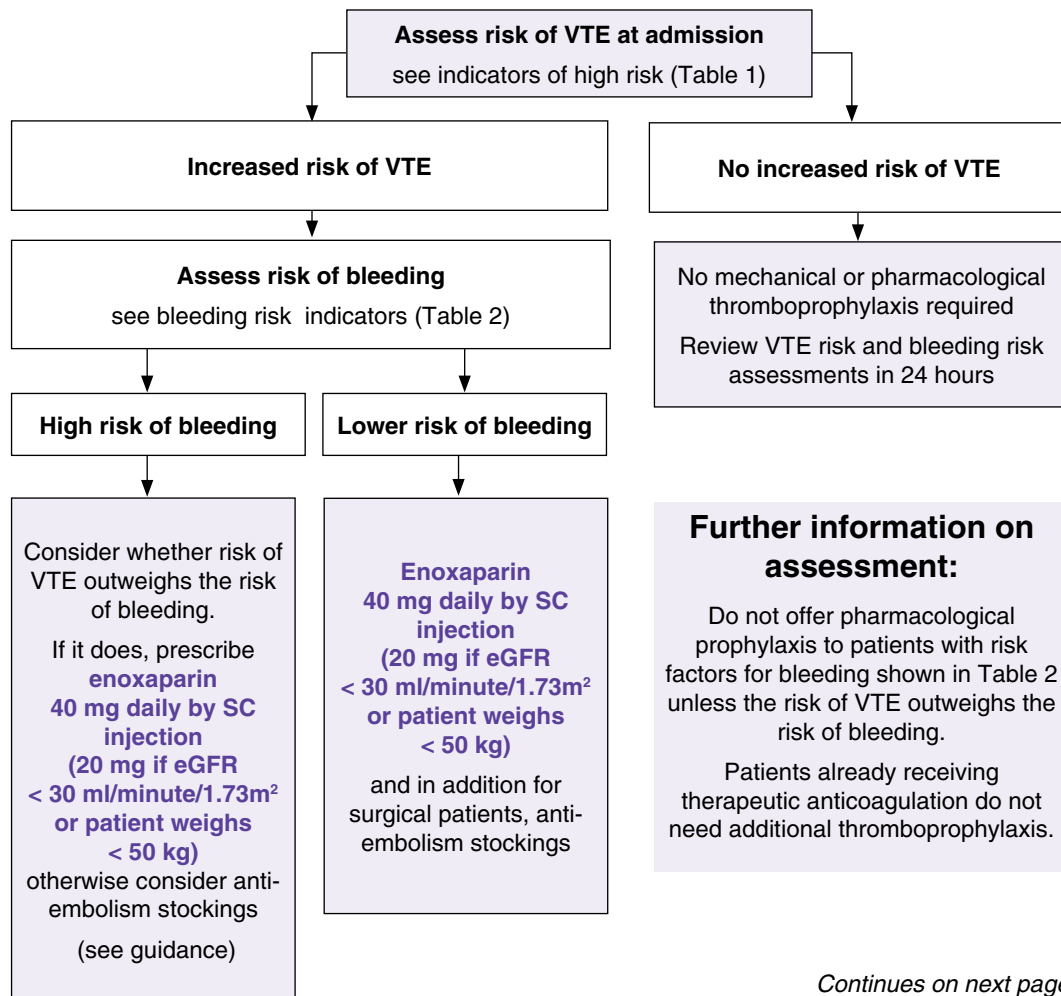
# Thromboprophylaxis for Medical and Surgical Patients

## Assessment of VTE and bleeding risk

All patients must have their risk of venous thromboembolism (VTE) assessed at admission using the appropriate risk assessment tool and then regularly during their stay in hospital. A record of these assessments must be made and documented in the thromboprophylaxis section of the kardex.

Assess the patient at admission using the following algorithm and indicators as guidance and reassess risk of bleeding and VTE within 24 hours of admission and regularly thereafter.

Different specialty specific algorithms apply for orthopaedics, ENT and obstetrics.



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**Table 1 – Indicators of patients at increased risk of VTE**

Regard medical patients as being at increased risk of VTE if they are expected to have ongoing ( $\geq 2$  days) reduced mobility relative to their normal state **and** have one or more of the risk factors below. Regard surgical patients as being at increased risk of VTE if they have one or more of the following risk factors:

- Acute surgical admission with inflammatory or intra-abdominal condition
- Dehydration
- Critical care admission
- Surgical procedure with total anaesthetic/ surgical time  $> 90$  min, or  $> 60$  min if surgery on lower limb
- Age  $> 60$  yrs
- Obesity (BMI  $> 30$  kg/m<sup>2</sup>)
- Active cancer
- Thrombophilia
- Personal history or 1st degree relative with a history of VTE
- Hip fracture
- Current significant medical condition e.g.
  - Serious infection
  - Heart failure
  - Respiratory disease
  - Inflammatory disease
- Pregnancy or  $\leq 6$  weeks post partum (**seek specialist advice**)
- Hormone replacement therapy, tamoxifen
- Oestrogen containing contraceptive pill
- Varicose veins with phlebitis

This list is not comprehensive and there will be patients with other specific conditions which are sufficiently pro-thrombotic that merit thromboprophylaxis.

**Table 2 – Indicators of patients at high risk of bleeding**

Regard patient at risk of bleeding if they have any of the following risk factors:

- Surgery expected within next 12 hours
- Surgery within past 48 hours and/or risk of clinically important bleeding
- Active bleeding or risk of bleeding including
  - new-onset stroke
  - platelet count  $< 75 \times 10^9/L$
  - acute liver failure
- Concurrent use of therapeutic anticoagulant
- Acute bacterial endocarditis
- Any spinal intervention (prophylactic enoxaparin dose is contraindicated for 12 hours before spinal and epidural anaesthetics and lumbar puncture. Enoxaparin contraindicated for 4 hours after spinal and epidural anaesthetics and removal of epidural catheter)
- Persistent uncontrolled hypertension (BP  $\geq 230/120$  mmHg)
- Untreated inherited bleeding disorder (e.g. haemophilia or von Willebrands)
- Neurosurgery, spinal, posterior eye or thyroid surgery

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## General management and treatment options

Surgical patients who merit pharmacological thromboprophylaxis should receive:

- **Enoxaparin SC 40 mg daily (at 6 pm) and anti-embolic stockings**

Medical patients who merit pharmacological thromboprophylaxis should receive:

- **Enoxaparin SC 40 mg daily (at 6pm) only.**

**N.B. Reduce the dose of enoxaparin to 20 mg SC once daily if eGFR < 30 ml/minute/1.73m<sup>2</sup>. It may be appropriate to reduce dose to 20 mg in patients of low weight (< 50 kg).**

Extremely heavy patients (> 120 kg), with normal renal function, may merit higher doses of enoxaparin (see StaffNet / Info Centre / Policies, Procedures and Guideline Documents / NHSGGC Clinical Guideline Electronic Resource Directory).

Enoxaparin should only be prescribed after assessing the risks of VTE and balancing against the risks of bleeding.

Contraindications should be considered carefully (e.g. Heparin induced Thrombocytopaenia (HIT), acute bacterial endocarditis, recent stroke, etc).

### Timing of enoxaparin administration

For medical in-patients enoxaparin should be prescribed at 6 pm. For surgical in-patients with a significant reduction in mobility enoxaparin should be prescribed at 6 pm the night before surgery. Otherwise it should be started after surgery at the later of: 4 hours post-operatively or 6 pm. Then at 6 pm on subsequent days.

For patients admitted on the day of surgery who require enoxaparin thromboprophylaxis:

- Anti-embolic stockings at admission
- Enoxaparin started after surgery at the later of: 4 hours post-operatively or 6 pm. Then at 6 pm on subsequent days.

### Precautions with epidural and spinal anaesthetic techniques

Epidural and spinal anaesthetic techniques should not be carried out within 12 hours of a prophylactic dose of enoxaparin. Likewise epidural catheters should not be removed within 12 hours of a prophylactic dose of enoxaparin. Wait > 4 hours after any of these procedures before giving next dose of enoxaparin. In most cases administration of enoxaparin at 6 pm will avoid any difficulties here.

### Monitoring platelet count

All patients prescribed heparin, including LMWH, should have a baseline platelet count assessed. Heparin induced thrombocytopenia (HIT) is most commonly seen in post-operative patients receiving unfractionated heparin (UFH). Post-operative patients receiving UFH and post cardio-pulmonary bypass (CPB) patients receiving UFH or LMWH should have platelet count monitoring every 2-3 days from days 4 to 14 or until heparin is stopped. If the platelet count falls to < 100 x10<sup>9</sup>/L, or if there is a smaller but significant drop (30 - 50%) from baseline, stop the heparin and seek specialist advice. Medical and obstetric patients receiving UFH or LMWH, and post-operative patients (excluding post-CPB patients) receiving LMWH, have a low risk of HIT and do not require routine platelet count monitoring for this purpose. Further advice on Diagnosis and Treatment of HIT can be found in StaffNet / Info Centre / Policies, Procedures and Guideline Documents / NHSGGC Clinical Guideline Electronic Resource Directory.

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## Anti-embolism stockings (AES)

- Sigel profile compliant AES should be used.
- Calf length AES may be used where thigh length AES are unsuitable.
- AES may be replaced with intermittent pneumatic compression devices (IPC) whilst in hospital.
- AES must be removed for 30 minutes in each 24 hour period.
- Reassess daily for any changes to skin or changes to patient's condition such as oedema, and re-measure if any changes noted.
- Medical practitioners must prescribe the use of AES within the medication kardex.

*Incorrect fitting of AES can be detrimental to the patient causing skin damage.* Observation and continual assessment is required.

Do not offer AES to patients who have:	Cautions
Peripheral arterial disease	Ensure the correct size is provided
Peripheral neuropathy of legs	Re-measuring and refitting may be required
Leg / foot ulcers	Ensure good capillary refill after fitting
Fragile 'tissue paper' skin	Show patients how to use AES
Major limb deformity	Ensure patients discharged with AES are able to remove and replace them (or have assistance)
Cellulitis or massive oedema	Do not fold down the tops of AES

## Duration of thromboprophylaxis

- AES – continue until patient discharged and returned to pre-admission level of mobility.
- Enoxaparin – usually stopped at discharge, or earlier if patient no longer at high thrombotic risk when re-assessed.
- Extended anticoagulant thromboprophylaxis is indicated in specific patients (e.g. known high risk thrombophilia, but not on long-term warfarin) or situations (e.g. post THR).

## General recommendations

- Facilitate early mobilisation as soon as possible.
- Do not allow patients to become dehydrated.

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- Advise patients to consider stop taking oestrogen-containing oral contraceptives or hormone replacement therapy before elective surgery.
- Pre-existing established anti-platelet therapy:
  - Assess risks and benefits of stopping before surgery.  
See NHSGGC Secondary Prevention of Coronary Heart Disease – Antiplatelet Guideline, page 99 and secondary antiplatelet guidance following stroke, page 122.
  - Do not regard low dose antiplatelet therapy as adequate prophylaxis for VTE.
  - Consider offering additional VTE prophylaxis to patients taking antiplatelet agents assessed to be at increased risk of VTE ( Table 1), taking into account the increased risk of bleeding.
- Pre-existing established warfarin therapy
  - See NHSGGC Management of Patients on Anticoagulant Therapy in the Perioperative Period guideline (page 87).
  - Do not offer enoxaparin to those on full anticoagulant therapy.
- If regional anaesthesia is used, pharmacological prophylaxis must be timed to minimise the risks of epidural haematoma.



# Treatment of Venous Thromboembolism

For suspected VTE in pregnant patients, refer to separate guideline on page 79.

## Introduction

Fifty percent of Deep Vein Thrombosis (DVT) and Pulmonary Embolism (PE) arise spontaneously, without any obvious triggering event; there are many risk factors which are particularly common in hospitalised patients.

Early recognition and treatment of an acute venous thromboembolism (VTE) is essential to reduce the risk of early fatal PE. It is estimated that deaths from hospital acquired PE far exceed those from hospital acquired infection.

## Diagnosis of acute VTE

**Signs and symptoms which may accompany an acute DVT or PE include:**

- Calf warmth, tenderness, swelling, pitting oedema, erythema
- Chest pain (often pleuritic), cyanosis, breathlessness, haemoptysis, collapse
- Tachycardia / hypotension, raised JVP, hypoxia, tachypnoea

In all suspected cases positive radiological confirmation will be required. However, for those presenting from the community it may be possible to rule out such a diagnosis by use of pre-test clinical probability scoring schemes in conjunction with measurement of fibrin D-dimer levels, which are almost invariably increased in cases of acute VTE (see decision algorithms pages 72 - 73).

**If DVT or PE is not excluded by the above, or the patient is already hospitalised then:**

- Check baseline coagulation screen, FBC, U&Es and LFTs.
- Unless contraindicated, commence anticoagulant therapy with low molecular weight heparin (LMWH) – see page 74, Drug therapy / treatment options section.
- Arrange objective radiological imaging (e.g. compression ultrasound leg or CTPA chest or V/Q lung scan).

## Diagnosis and early management of suspected massive PE

Brief guidance is given below. Full guidance on the diagnosis and early management of a suspected massive PE can be found in the Clinical Guideline Electronic Resource Directory on StaffNet.

## Definition of massive PE

PE associated with a systolic blood pressure < 90 mmHg or a drop in systolic blood pressure of  $\geq 40$  mmHg from baseline for a period >15 minutes (not otherwise explained by hypovolaemia, sepsis or new arrhythmia)

## Initial management:

- Seek immediate senior advice as patient may need transfer to CCU / ICU / HDU / Resus
- Heparinise with IV unfractionated heparin bolus (5,000 units) then IV infusion (18 units/kg/hour adjusted to maintain APTT ratio of 1.8 - 2.8) - see page 76.

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*Initial management of massive PE continued*

- O<sub>2</sub>
- IV fluids and inotropic support
- If pregnant, inform on-call obstetric team immediately for consideration of early delivery
- Consider thrombolytic therapy

**Diagnostic algorithm for out-patients with suspected DVT**

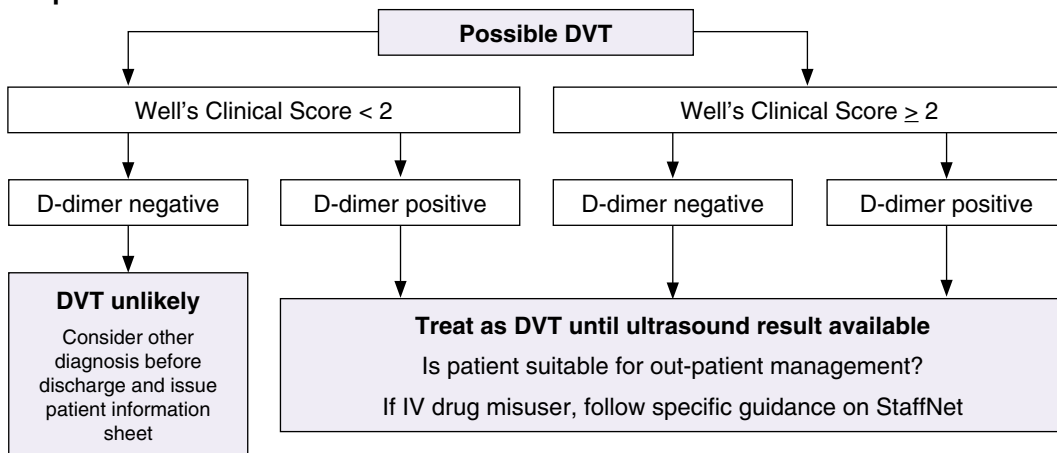
Patients with chronic heart failure, chronic renal failure, body weight < 70 kg or suspected bilateral DVT may not be suitable for out-patient investigation and management of suspected VTE.

**Table 1 – Wells Clinical Score**

Active cancer (treatment ongoing, within previous 6 months or palliative)	1
Paralysis, paresis or recent plaster immobilisation of lower extremities	1
Recently bedridden for $\geq 3$ days or major surgery within 12 weeks	1
Localised tenderness along distribution of deep venous system	1
Entire leg swollen	1
Calf swollen by $\geq 3$ cm compared to asymptomatic leg (10 cm below tibial tuberosity)	1
Pitting oedema (greater in symptomatic leg)	1
Collateral superficial veins (non-varicose)	1
Previously documented DVT	1
Alternative diagnosis as likely or greater than that of DVT	-2
<b>TOTAL:</b>	

*Score < 2: DVT unlikely    Score  $\geq 2$ : DVT possible*

Table 1 adapted with the kind permission of the lead author.

**Wells Clinical score should be utilised in all NHSGGC hospitals when DVT is suspected**

Out-patients who have a negative ultrasound should be considered for a repeat scan at 5 -7 days if there is no likely alternative diagnosis for their leg symptoms.

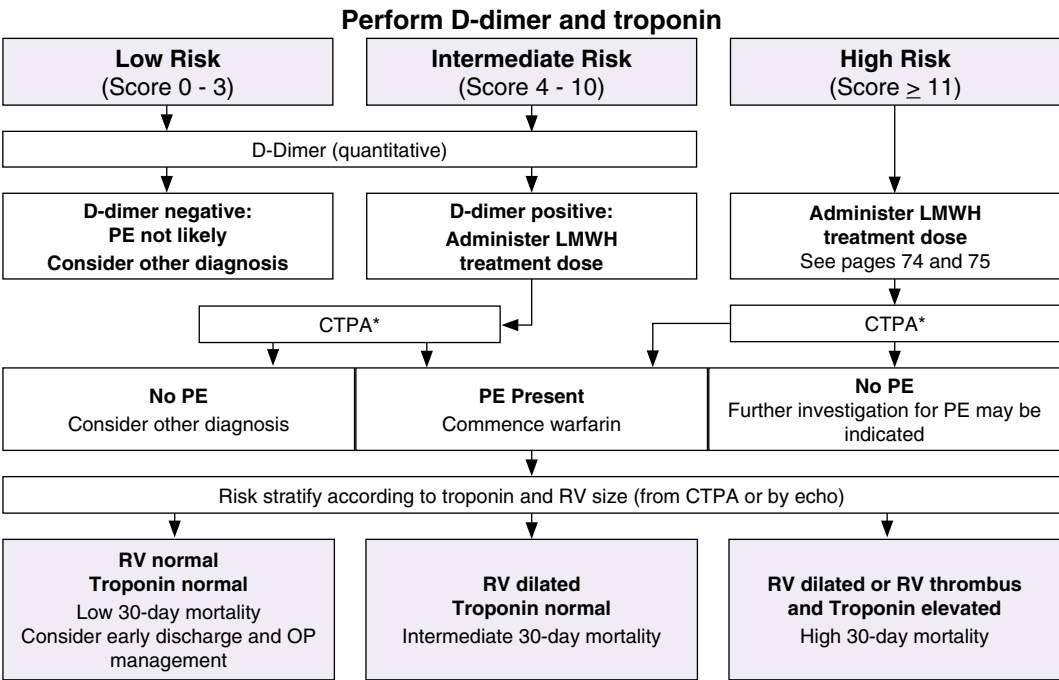
# Diagnostic algorithm for out-patients with suspected PE

- Assess predictive risk score using following scoring tool
- Identify risk of PE and follow guidance in flow-chart
- If patient is haemodynamically unstable consider massive PE and refer to guidance on page 71 and the full guideline on StaffNet.

Table 2 – Modified Geneva Predictive Risk Score

Age > 65 years	1
Previous DVT / PE	3
Recent surgery or recent lower limb fracture ( $\leq$ 1 month)	2
Malignant disease (active or cured $\leq$ 1 year)	2
Unilateral lower limb pain	3
Haemoptysis	2
Heart rate 74 - 94 bpm	3
Heart rate $\geq$ 95 bpm	5
Pain on deep venous palpitation of leg and unilateral oedema	4
TOTAL:	

Table 2 adapted from Annals of Internal Medicine. 2006; 144 (3); 165 - 171 with permission.



\*If CTPA is not readily available and patient is clinically stable with normal CXR and no underlying lung disease, then V/Q scan may be an alternative diagnostic option.

Full guidance is available in the Clinical Guideline Electronic Resource Directory on StaffNet.

## General Management

Aim to provide therapeutic anticoagulant therapy for 3 - 6 months (or indefinitely for some patients with life-threatening or recurrent thrombosis), normally using LMWH initially followed by oral warfarin (with an overlap of at least 5 days). Oral rivaroxaban, for 3 - 6 months, may be a suitable alternative for some patients with acute DVT, see page 78.

### Special cases where management may differ include:

#### Pregnant patients

- Both diagnostic and management strategies differ (see page 79).

#### Patients with active cancer

- These patients may be managed with LMWH only, due to high risk of bleeding and risk of early recurrent thrombosis. Seek advice and discuss with patient and their cancer team. Full guidance is available in the Clinical Guideline Electronic Resource Directory on StaffNet.

#### IV Drug Misusers

- Given their chaotic lifestyles and habits, these patients may be considered at high risk of bleeding complications from therapeutic anticoagulant therapy, particularly warfarin therapy which demands careful compliance with monitoring and avoidance of interacting drugs (including alcohol).
- For these patients an individualised risk / benefit assessment is required, and there are three possible approaches to outpatient management of DVT in these patients:
  1. No anticoagulant therapy
  2. LMWH for 6 weeks
  3. Warfarin treatment for 3 - 6 months

An algorithm to inform the decision as to which treatment option is the most suitable and with details of treatment for related conditions (e.g. cellulitis) is available in the Clinical Guideline Electronic Resource Directory on StaffNet.

## Drug therapy / treatment options

### Subcutaneous LMWH (see pages 79 - 81 for dosing in pregnant patients)

Dalteparin is the LMWH of choice across NHSGGC for treatment of VTE unless the patient is pregnant or has specific contraindications to dalteparin (although some patients with acute DVT may be considered for oral rivaroxaban).

#### Continue with dalteparin until:

- The diagnosis is disproved **or**
- The diagnosis is confirmed and either rivaroxaban is commenced or dalteparin has been over-lapped with warfarin for at least 4 - 6 days and the INR has been  $\geq 2$  for two consecutive days.
- Dalteparin does not require laboratory monitoring (APTT is inappropriate, though if significant renal impairment or exceptionally low or high BMI, consider assessing anti-factor Xa activity after 2 - 3 consecutive doses of dalteparin, at 4 hours post dose (when target would be 0.5 - 1 units/ml)).

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## Drug therapy / treatment options continued

### Dalteparin

Dose is 200 units/kg subcutaneously once daily. 18,000 units is the maximum recommended daily dose.

**Table 3 – Dalteparin dosing**

Actual weight (kg)	Dalteparin daily dose (units) using pre-filled syringes	Dalteparin Syringe Colour
34 - 45	7,500	Green
46 - 56	10,000	Red
57 - 68	12,500	Orange
69 - 82	15,000	Purple
≥ 83	18,000	White

#### NOTES

- Guidance on heparin dose adjustment for patients with significant renal impairment or weighing > 120 kg are available in the Clinical Guideline Electronic Resource Directory on StaffNet.
- If there is concern about efficacy in patients weighing > 95 kg, anti-factor Xa activity should be checked 4 hours after a dose (see BNF).
- Lower doses of dalteparin should be considered in patients with significant liver and/or renal failure (CrCl < 30 ml/minute).

### Unfractionated Heparin (Sodium Heparin)

- Used in treatment of DVT / PE if rapid anticoagulation is deemed appropriate (e.g. massive PE) or patients thought to be at particularly high bleeding risk (e.g. recent surgery/trauma)
- There are different concentrations of unfractionated heparin currently available - only the 1000 units/ml preparation should be used at all times
- **LOADING DOSE:** 5,000 units by IV bolus over 5 minutes - use one 5 ml vial of 1000 units/ml (total concentration 5000 units/5 ml)
- **MAINTENANCE INFUSION:** 18 units/kg/hour (usually ~ 1,200 units (1.2 ml) per hour for a 70 kg patient). If patient is at high risk of bleeding, start at 1000 units/hour. Use one 20 ml vial of 1000 units/ml (total concentration 20,000 units/20 ml). Replace the syringe at least every 24 hours, until treatment is discontinued.
- **Monitoring** – Check APTT ratio after 6 hours and 4 hours after any change in infusion rate, then daily.
- Adjust infusion rate according to APTT ratio (see table on next page).

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**Drug therapy / treatment options continued****Table 4 – Unfractionated heparin dose adjustment**

APTT ratio	Sodium Heparin Infusion Rate Change
> 4.0	Stop for 60 minutes and recheck APTT ratio, before recommencing at a rate reduced by 300 - 500 units/hour
3.5 - 4.0	Stop for 60 minutes and reduce heparin by 200 units/hour
2.9 - 3.4	Stop for 30 minutes and reduce heparin by 100 units/hour
1.8 - 2.8	No change
1.2 - 1.7	Increase heparin by 200 units/hour
< 1.2	Increase heparin by 400 units/hour and consider further bolus of 5,000 units heparin

**NOTES**

- Rarely should patients require infusion rates > 1.6 - 2 ml/hour. If target APTT ratio of 1.8 - 2.8 is not being achieved with a dose of 1.6 ml/hour, then monitor anti-factor Xa level (target 0.35 - 0.7 units/ml).
- If unfractionated heparin is continued for > 5 days (even as an intravenous line flush), platelet count should be monitored for evidence of developing Heparin Induced Thrombocytopenia (HIT) on **alternate days** up until day 14.

**Warfarin**

- Used as follow-on from LMWH in intermediate and long-term treatment of DVT and PE (except in pregnant patients and some IVDU and cancer patients).
- Induction treatment with warfarin should always follow a validated induction dosing algorithm suitable to the patient, and be accompanied by INR testing on the specified days.
- The following algorithm (age-adjusted Fennerty regimen) is suitable for most inpatients who require to quickly achieve a therapeutic INR of 2 - 3. Daily INR testing is required with this algorithm.
- The use of alternative 'slower' induction regimens (with less intense monitoring) should be considered in outpatients and the elderly (see StaffNet for acceptable alternative induction regimens).
- Warfarin should be administered orally, once daily at 6 pm.

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## Warfarin flexible induction regimen (Age-adjusted Fennerty)

**N.B.** The table below gives dosing advice for the first 4 days of warfarin initiation only. It is not appropriate for dosing from day 5 onwards which should be undertaken manually using clinical judgement.

### On initiation:

- Perform baseline INR (unless part of initial coagulation screen), and repeat INR daily on the first 4 days.
- When the INR result is towards the upper end of a range in the INR column, it is recommended that a warfarin dose is chosen towards the lower end of the suggested range in the age-appropriate dose column; and vice versa when INR result is towards the lower end of an INR range.
- Beyond day 4 dosage adjustment may still be required, especially between days 5 and 14 when INR may need to be assessed every 2 - 3 days until stable and patient has been transferred to an appropriate outpatient INR monitoring service (see page 82).
- More careful dosing and monitoring may be required in elderly patients or where there is co-administration with drugs known to increase or decrease INR (consult BNF or seek advice from clinical pharmacists).

**Table 5 – Warfarin age-adjusted induction regimen**

Day	INR	Dose for age (mg)			
		≤ 50 yr	51 - 65 yr	66 - 80 yr	> 80 yr
1	< 1.4	10	9	7.5	6
2	< 1.6	10	9	7.5	6
	≥ 1.6	0.5	0.5	0.5	0.5
3	< 1.8	10	9	7.5	6
	1.8 - 2.5	4 - 5	3.5 - 4.5	3 - 4	2.5 - 3
	2.6 - 3.0	2.5 - 3.5	2.5 - 3.5	2 - 2.5	1.5 - 2
	3.1 - 3.5	1 - 2	1 - 2	0.5 - 1.5	0.5 - 1.5
	3.6 - 4.0	0.5	0.5	0.5	0.5
	> 4	0	0	0	0
4	< 1.6	10 - 15	9 - 13	7.5 - 11	6 - 9
	1.6 - 1.9	6 - 8	5.5 - 7	4.5 - 6	3.5 - 5
	2.0 - 2.6	4.5 - 5.5	4 - 5	3.5 - 4.5	2.5 - 3.5
	2.7 - 3.5	3.5 - 4	3 - 3.5	2.5 - 3	2 - 2.5
	3.6 - 4.0	3	2.5	2	1.5
	4.1 - 4.5	Omit today's dose and on day 5 give the following dose (if INR < 4.1):			
		1 - 2	0.5 - 1.5	0.5 - 1.5	0.5 - 1
	> 4.5	Withhold warfarin until INR back between 2.0 - 3.0 (then restart on 0.5 - 1mg)			

Adapted from Aust NZ J Med 1999; 29: 731-736 with permission

### Decrease dose by 33% if the patient has one or more of the following risk factors:

- Severe congestive cardiac failure (EF < 30% and/or biventricular failure)
- Severe COPD (oxygen or steroid dependent or dyspnoea at rest)
- Concurrent treatment with amiodarone

## Rivaroxaban

Rivaroxaban is an oral direct factor Xa inhibitor which has been shown to be as effective as LMWH followed by warfarin in the treatment of acute DVT. It is not currently licensed for the treatment of acute PE and there is limited experience of treating DVT patients for longer than 12 months. No monitoring of the anticoagulant effect of rivaroxaban is required, and although it has a short half-life, rivaroxaban has no reversing agent.

Rivaroxaban may be regarded as a suitable alternative to LMWH followed by warfarin in patients with acute DVT for whom the intended duration of anticoagulation (at the outset) is determined to be 3 or 6 months. Where treatment duration is planned to be indefinite, then warfarin remains the preferred treatment of choice.

### Patients with acute DVT deemed suitable for rivaroxaban therapy:

- Should be treated with LMWH (dalteparin) until the diagnosis has been objectively confirmed.
- Start rivaroxaban 22 - 24 hours after the last dose of dalteparin.
- Give **rivaroxaban oral 15mg twice daily for the first three weeks and then 20 mg once daily for the remaining duration of treatment (i.e. 3 or 6 months).**

In renal impairment (CrCl 15 – 49 ml/minute) **reduce rivaroxaban dose to 15 mg twice daily for the first 3 weeks then 15 mg daily for the remaining duration of treatment.**

### Exclusion for rivaroxaban treatment include:

- Creatinine clearance <15 ml/minute
- Liver disease associated with cirrhosis or coagulopathy
- Pregnancy or breast feeding
- Concurrent therapy with azoles (except fluconazole), protease inhibitors or strong CYP3A4 inducers (e.g. rifampicin, phenytoin)
- Patients perceived to be at high bleeding risk who would not be suitable for any therapeutic anticoagulant therapy.

### Patients being discharged on rivaroxaban:

- The initial 21 days of treatment (15mg twice daily) should be provided from hospital pharmacy.
- Patients on rivaroxaban do not require referral to an anticoagulant clinic.
- The GP copy of the patient discharge medications should be accompanied with clear written information for the GP regarding the ongoing time-restricted prescription of this medication and its important contraindications.
- Any patient commenced on rivaroxaban should be issued with a Rivaroxaban Patient Alert card and offered counselling about this anticoagulant medication.



# Management of Venous Thromboembolism in Pregnancy

The full guideline on 'The Management of Acute Thromboembolic Disease in Pregnancy' is available via StaffNet / Acute / Women and Children's Services / Obstetrics / GGC obstetric guidelines.

## Introduction

Venous thromboembolism (VTE) is a major cause of maternal death in the United Kingdom. Clinical assessment and diagnosis of women presenting with suspected VTE in pregnancy is unreliable and clinical suspicion must always be confirmed by appropriate objective testing. The signs and symptoms of VTE include: leg pain and swelling (usually unilateral), lower abdominal pain, low grade pyrexia, dyspnoea, chest pain, haemoptysis and collapse.

In prophylaxis of VTE in pregnancy enoxaparin or tinzaparin is used. **Before** initiating prophylactic therapy, seek specialist advice to discuss doses and monitoring during pregnancy.

### Prevention of VTE in pregnancy

- Assessment of risk factors for VTE is usually made at booking, throughout pregnancy and in the postnatal period (see full guideline on StaffNet for details on risk factors).
- Thrombophilia screen at booking should be considered in women with either:
  - a family history of both VTE and thrombophilia **or**
  - a family history of VTE in a 1st degree relative which was unprovoked or provoked by a minor risk factor (e.g. hormone-related [including pregnancy], minor trauma or long distance travel).
- Women with a personal history of VTE which was unprovoked or provoked by a minor risk factor (as above) should be tested for antithrombin deficiency only, as this is the only inherited thrombophilia which, if present, could alter management during pregnancy – see Thrombophilia Testing Guideline on StaffNet.
- Women with **several risk factors for VTE** may require antithrombotic therapy antenatally and/or postnatally: anti-embolism stockings, low molecular weight heparin (LMWH) or unfractionated heparin.

## Assessment / monitoring

- Send for FBC, U&Es, coagulation screen, LFTs.
- After checking patient's bloods and whilst awaiting results of diagnostic tests (as outlined on the next page) commence anticoagulation therapy (see Drug therapy / treatment options section of this guideline).

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## Diagnosis of VTE in pregnancy

- If Deep Vein Thrombosis (DVT) is suspected:
  - Compression Duplex ultrasound is the primary diagnostic test. If ultrasound confirms DVT diagnosis then continue anticoagulating.
  - If ultrasound is negative but a high level of clinical suspicion remains, the patient should remain anticoagulated and ultrasound repeated in one week or an alternative diagnostic test employed. If repeat testing is negative, anticoagulant treatment should be discontinued.
  - When iliac vein thrombosis is suspected, (back pain and swelling of the entire limb) magnetic resonance venograph or conventional contrast venography may be considered.
- If Pulmonary Embolism (PE) is suspected:
  - Perform chest x-ray. This may provide a reason for the chest symptoms. An electrocardiograph is rarely helpful and pulse oximetry is often more useful and safer than arterial blood gases.
  - If the chest x-ray is normal, PE is still suspected and there are symptoms and/or signs of DVT then leg Doppler scans should be performed. If these show a DVT, anticoagulant treatment should be continued and further radiological investigations are not required.
  - If the chest x-ray is normal, PE is still suspected and there are **no** symptoms and/or signs of DVT, then a ventilation / perfusion scan (V/Q scan) or CT-pulmonary angiography (CTPA) should be performed. V/Q scanning is first line investigation for suspected PE in all maternity units within NHSGGC. If the patient has an abnormal chest x-ray or is unstable, a CTPA is the investigation of choice.
- If a V/Q scan or CTPA is required, the woman should be counselled with regard to the risk of radiation exposure both to her and her unborn baby.
- Testing for D-dimer and performing a thrombophilia screen in the acute situation, should not be performed.

## General management

Following DVT, fitted European Grade II graduated elastic compression stockings (23 - 32 mmHg) should be worn on the affected leg for up to 2 years.

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## Drug therapy / treatment options

### Treatment of VTE in pregnancy

1. Start treatment with a LMWH:

**N.B.** There is more experience of enoxaparin being used in pregnancy.

#### (i) Initial dose of enoxaparin is determined as follows:

Early pregnancy weight	Initial dose of enoxaparin
< 50 kg	40 mg twice daily
50 - 69 kg	60 mg twice daily
70 - 89 kg	80 mg twice daily
> 90 kg	100 mg twice daily

#### (ii) Initial dose of tinzaparin: 175 units/kg once daily. Use early pregnancy weight.

2. Monitor LMWH therapy

Routine measurement of peak anti-factor Xa activity for patients on LMWH for treatment of acute VTE in pregnancy or post-partum is not recommended but can be requested if:

- Obstetric patient is at extremes of body weight (< 50 kg and  $\geq$  90 kg).
- Obstetric patient has other complicating factors which puts her at high risk (e.g. renal impairment, recurrent VTE).

3. Platelets

- For obstetric patients receiving LMWH only, platelet count monitoring is not required.
- If unfractionated heparin is employed, **or** if the obstetric patient is receiving LMWH after first receiving unfractionated heparin, **or** if she has received unfractionated heparin in the past 100 days, the platelet count should ideally be monitored every 2 - 3 days from day 4 to day 14, or until heparin is stopped, whichever occurs first.

4. Continue full dose LMWH throughout pregnancy.

5. Labour, caesarean section, and regional anaesthesia.

Inform the on-call obstetric team of this patient and see the full guideline on StaffNet for details.

6. High risk of haemorrhage.

Discuss patient with specialists and also refer to the full guideline on StaffNet.

7. Postnatal anticoagulation

Anticoagulant therapy should be continued for the duration of the pregnancy and for at least 6 weeks postnatally and until **at least** 3 months of treatment has been given in total. Refer to full guideline on StaffNet for information regarding postnatal treatment choice.

Patients developing VTE in pregnancy should be referred to the haematology clinic or obstetric medical/haematology clinic for follow up investigations (including thrombophilia testing, if appropriate, once heparin treatment has been discontinued) and anti-factor Xa activity if appropriate.



# Referral of Patients to Anticoagulant Clinic

Patients being discharged from hospital on warfarin will usually be in an unstable phase of anticoagulation. It is therefore essential that the transition of anticoagulant monitoring from hospital care to the community or outpatient clinic is well organised and clearly documented for the patient and clinical staff involved.

## Anticoagulant service providers

Within NHSGGC all community INR monitoring services are provided by the Glasgow and Clyde Anticoagulation Service (GCAS), rather than individual GPs (who should not be asked to undertake routine INR monitoring). See Appendix 6 for GCAS contact details.

The GCAS Anticoagulant Monitoring and Clinic referral form contains all necessary information and other contact details – see StaffNet.

For patients resident outwith NHSGGC, please contact patient's GP to identify the most appropriate anticoagulant service for the patient.

## Prior to discharge

Key recommendations are as follows:

- Ensure an anticoagulant clinic appointment is made for the patient (usually for 3 - 7 days following discharge, unless patient is stably anticoagulated when their appointment should be no longer than 2 weeks post discharge).
- Ensure transport is booked and confirmed for this appointment, if required.
- Issue patient with a yellow anticoagulant booklet and ensure it is fully completed. It must contain the patient's details and include the 3 most recent INR results and resulting warfarin doses (including dose at discharge) so as to allow safe dosing at their first anticoagulant clinic visit.
- Record the date, time and venue for the patient's next anticoagulant clinic appointment in the yellow booklet.
- Fax a fully completed copy of the Glasgow and Clyde Anticoagulant Service (GCAS) Anticoagulant Monitoring and Clinic Referral form which includes recent INR results and resulting warfarin doses to the GCAS team - fax numbers are included at the bottom of the form. A copy of this form should then be handed to the patient to take to their first anticoagulant clinic appointment.
- Counsel the patient on their anticoagulant therapy (indication for treatment, interacting factors and bleeding risks), ensure they know how to take their anticoagulant medications and arrange a suitable supply of them.

If a patient is unable to attend an anticoagulation clinic on discharge this should be discussed further with the relevant anticoagulant service provider. Within Glasgow and Clyde this will usually be the Lead Nurse for the Glasgow and Clyde Anticoagulant Service (GCAS), and not the GP (see Anticoagulant Monitoring and Clinic Referral form for contact details).

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## Patients recently commenced on warfarin (new patients)

Such patients should be referred to their local anticoagulant service provider (this will usually be the GCAS service) using the Anticoagulant Monitoring and Clinic Referral form. Patients living out with NHSGGC should be referred to their GP. Complete the referral form fully and include the following details:

- Full patient and GP details and contact information.
- Details of referring consultant and location.
- Indication for warfarin, target INR and intended duration of treatment.
- Recent INR results and resulting warfarin doses.
- Details of all other medication.
- Specific details of any antiplatelet agents to be continued along with warfarin.
- Details of other diagnoses or risk factors relevant to anticoagulant therapy.

## Patients to be commenced on warfarin as an outpatient

Patients requiring elective initiation of warfarin (e.g. asymptomatic atrial fibrillation) can be referred to their local hospital Anticoagulant Clinic for this to be commenced as an outpatient.

The same referral information (as above) is required. It is recommended that such patients do not start anticoagulant therapy in advance of their first anticoagulant clinic appointment.

## Return patients

Patients who were receiving warfarin prior to their current admission are often discharged in a less stable anticoagulant state and sometimes on a different warfarin dose. These patients will have an existing anticoagulant clinic appointment, however it may be appropriate to bring this forward. Therefore, prior to discharge, ward staff should ensure such patients have a suitable appointment with their usual anticoagulant clinic. Details of this modified appointment along with three most recent inpatient INR results and corresponding warfarin doses from their inpatient stay should be recorded in their yellow booklet.



# Reversal of Anticoagulant Therapy

## Introduction

Reversal of anticoagulant therapy may be necessary when a patient is found to be over-anticoagulated, develops bleeding problems or requires an invasive procedure. The general principles are similar in each situation and all cases require an individualised risk:benefit assessment. Management of surgery in patients receiving warfarin is covered in detail on page 87.

Patients with major or life-threatening bleeding, irrespective of their indication for anticoagulation (even patients with prosthetic metal heart valves) will usually require complete reversal of their anticoagulant therapy, at least temporarily.

Patients with minor bleeding, or over-anticoagulated without bleeding, will usually require temporary cessation of anticoagulant therapy (+/- small doses of reversing agents) to achieve a low-therapeutic level of anticoagulation.

## General management and drug therapy

### Heparin overdose

#### Intravenous unfractionated heparin

- Stop heparin.

Heparin has a short elimination half-life of 30 - 90 minutes, although may be longer in renal failure.

- Protamine sulphate.

This drug is **only required in severe bleeding cases** where there is likely to be a large amount of circulating heparin.

Protamine sulphate (1mg) neutralises 100 units of heparin.

**Administer protamine up to a maximum of 50 mg in a single dose as slow IV infusion over 10 minutes (anaphylaxis has been reported, see page 18 for Management of Anaphylaxis).**

This drug should be avoided in patients with allergies to fish or fish products.

#### Subcutaneous low molecular weight heparin (LMWH)

- Stop LMWH.

Most LMWHs have an elimination half-life of around 2 - 4 hours following subcutaneous injection, although this can be prolonged in renal failure.

- Protamine sulphate.

The anticoagulant effects of LMWH are not completely reversed by protamine sulphate, but this drug should be considered if patients are suffering significant haemorrhage following recent (< 12 hours) administration of a therapeutic dose of LMWH.

**Protamine doses are the same as for reversal of unfractionated heparin (1 mg of protamine per 1 mg of enoxaparin or 100 units of dalteparin or tinzaparin), but may need repeated as further LMWH is released from its subcutaneous depot.**

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## General management and drug therapy continued

### Oral warfarin reversal

#### Life-threatening haemorrhage (e.g. intracranial, GI)

All patients, including those with prosthetic heart valves, should have their anticoagulation completely reversed in the presence of life-threatening haemorrhage or trauma.

- Stop warfarin
- Give Phytomenadione (Vitamin K<sub>1</sub>) 5 mg IV (in 100 ml glucose 5% over 15 - 30 minutes).
- Give prothrombin complex concentrate (Beriplex®)
  - Dose according to table below. Maximum dose is 5000 units (200 ml).
  - Reconstitute 500 unit vial of Beriplex® to 20 ml using the sterile water and the reconstitution device supplied.
  - Infuse immediately at an infusion rate not exceeding 8 ml/minute.
  - Contraindicated in patients with allergy to heparin, citrate or with suspected heparin induced thrombocytopenia, and use with extreme caution in patients with disseminated intravascular coagulation (DIC) or recent (< 1 month) venous thromboembolism, myocardial infarction or thrombotic stroke.

**Table 1 – Beriplex® dose adjustment according to INR**

INR	Approximate Dose
2 - 3.9	1 ml/kg = 25 International units/Kg
4 - 6	1.4 ml/kg = 35 International units/Kg
> 6	2 ml/kg = 50 International units/Kg

Recheck coagulation status after 20 - 30 minutes and at 4 - 6 hours and 24 hours (or earlier if clinically indicated). Further doses of Phytomenadione (Vitamin K<sub>1</sub>) may be required in cases of extreme overdose.

#### Less severe haemorrhage (e.g. haematuria, epistaxis)

- Stop warfarin for 1 - 2 days, and until INR has fallen to therapeutic levels and bleeding stopped.
- Give phytomenadione (Vitamin K<sub>1</sub>) 0.5 - 1 mg IV. Use insulin syringe to measure required volume before adding to 100 ml glucose 5% and infusing over 15 - 30 minutes.  
N.B. 0.5 mg = 0.05 ml. 1 mg = 0.1 ml.
- Re-assess regularly.

**Continues on next page**

### General management and drug therapy continued

#### Asymptomatic INR > 8 or INR 6 - 8 + bleeding risk (e.g. elderly)

- Stop warfarin, monitor INR, and restart when INR < 5.0.
- Consider giving:  
**Phytomenadione (Vitamin K<sub>1</sub>) 0.5 mg IV or 2 mg orally (use paediatric IV formulation orally).**
- Check INR next day.

#### INR 5 - 8, asymptomatic

- Stop warfarin, monitor INR and restart warfarin when INR < 5.

## Reversal of Antiplatelet Therapy

- Commonly used antiplatelet agents (including aspirin and clopidogrel) cause irreversible platelet inhibition, and therefore their effect may last up to 7 - 10 days following drug cessation.
- If a patient suffers life-threatening bleeding while being treated with combination antiplatelet agents (i.e. aspirin and clopidogrel) consideration should be given to treatment with platelet transfusion. *In vitro* evidence suggests that such dual antiplatelet therapy may be temporarily overcome by treatment with 2 - 3 adult doses of platelets.

## Reversal of new anticoagulant agents

Newer oral anticoagulant agents which are now available include:

- Dabigatran (Pradaxa®) – a direct Factor IIa (thrombin) inhibitor.
- Rivaroxaban (Xeralto®) – a direct Factor Xa inhibitor.
- Apixaban (Eliquis®) – a direct Factor Xa inhibitor.

These agents are not easily reversed, but fortunately they have relatively short half-lives (around 8 -12 hours). In renal impairment the half-life of dabigatran will be significantly prolonged, however the drug can be cleared by dialysis.

If patients receiving any of these new agents suffer major haemorrhage or require emergency surgery, then the following is recommended:

- Ascertain time of most recent dose of anticoagulant agent.
- Administer no further anticoagulant agent.
- Check coagulation screen (including PT, APTT and TCT) and renal function (U&Es).
- Discuss urgently with your local haematologist.
- Maintain cardiovascular status with fluid, red cell and blood product support as necessary (refer to Major Haemorrhage guideline, page 27).
- Consider possibility of delaying surgery until anticoagulant effect dissipated.

Further anticoagulant-specific advice can found in the StaffNet / Info Centre / Policies, Procedures and Guideline Documents / NHSGGC Clinical Guideline Electronic Resource Directory.



# Management Plan for Patients on Warfarin in the Peri-operative Period

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## Introduction

This guideline aims to balance the competing risks – thrombosis versus haemorrhage – that anticoagulated patients face in the peri-operative period. In doubtful cases it is usually safer to omit anticoagulant drugs rather than over treat but each case needs individual assessment and you should consult senior colleagues and/or seek Haematology advice readily.

## Emergency admissions

In anticoagulated patients admitted with trauma, major bleeding or for emergency surgery the risks from haemorrhage generally far outweigh the thrombotic risks (even in high thrombotic risk patients).

*Full and immediate anticoagulation reversal is required –*

1. Check INR, full coagulation screen, full blood count and cross match blood.
2. Withhold warfarin
3. Reverse anticoagulation fully and rapidly (see page 84)
  - give **vitamin K<sub>1</sub> (phytomenadione) IV 5 mg as a single dose.**
  - give **Prothrombin Complex Concentrate (e.g. Beriplex®, 25 - 50 units/kg – maximum dose 5000 units)** according to the INR level.
4. Recheck full coagulation screen and full blood count.
5. If any concerns or uncertainty, discuss with on-call haematologist.
6. Proceed to surgery as appropriate.
7. **Only when you are sure** the risk of bleeding has abated, re-anticoagulate as appropriate to the patient's thrombotic risk category using the guideline for elective admissions (see below).

## Elective admissions - risk stratification

**Invasive procedures can be classified as to their risk from bleeding.**

**Low risk of bleeding:**

1. Standard dental procedures e.g. simple extractions  $\leq$  4 teeth
2. Routine upper GI endoscopy or colonoscopy including simple biopsy (unless part of the national bowel cancer screening programme – see below)
3. Cataract extraction and lens implantation

**High risk of bleeding:**

1. Any colonoscopy performed as part of the national bowel cancer screening programme, polypectomy, endoscopic treatment of varices, or ERCP
2. Most formal surgical procedures
3. Anaesthesia involving spinal or epidural anaesthetic

*Continues on next page*

**Extremely high risk of bleeding:**

1. Neurosurgical interventions

**Patients can be classified as to their risk from thrombosis.****Low risk of thrombosis:**

1. Atrial fibrillation with normal heart valves and no previous embolism or stroke
2. Single episode of venous thromboembolism > 3 months previously
3. Sinus rhythm (SR), tissue heart valve or modern (post-1990) metal aortic valve inserted > 2 months previously

**High risk of thrombosis:**

1. Atrial fibrillation with previous stroke, embolism, heart valve disease or any type of valve replacement
2. Metal mitral valve, any 'Ball and Cage' valve, pre-1990 metal aortic valve
3. Any artificial valve and previous embolism
4. Any heart valve placed within previous 2 months
5. Arterial embolism or venous thrombosis within previous 3 months
6. Prior recurrent venous thrombosis
7. Patient requiring target INR 3 - 4
8. Prior venous thrombosis and known high risk thrombophilia

**Elective admissions - management strategy**

The general strategy for anticoagulant management is laid out in the following matrix.

**N.B.** Extremely high haemorrhagic risk procedures (e.g. neurosurgery) – consult the appropriate senior colleague and *do not apply this matrix*.

	Low risk of thrombosis	High risk of thrombosis
Low risk from bleeding	<b><i>In general continue warfarin therapy unchanged</i></b> Proviso - INR should be checked < 48 hours prior to procedure; It should not be supra-therapeutic and should be < 4	
High risk from bleeding	<b>Target INR <math>\leq</math> 1.4 for procedure</b> 1. Omit warfarin on day -5 (i.e. 5 days before surgery) – see page 89 2. Give a prophylactic dose of <b>enoxaparin 40 mg SC daily at 1800 hours on each pre-operative inpatient day</b> 3. Restart anticoagulation post-operatively – see page 89.	<b>Target INR <math>\leq</math> 1.4 for procedure</b> 1. Omit warfarin on day -5 (i.e. 5 days before surgery) – see page 89 2. Use high dose heparin bridging therapy pre-operatively – see page 89 (LMWH) or page 90 (UFH*) 3. Restart anticoagulation post-operatively – see page 89

Some patients or procedures may not be easily classified into the above categories – if so, they should be discussed with the relevant senior clinician (e.g. haematologist, cardiologist, surgeon).

\* UFH – Unfractionated heparin

## Elective admissions - stopping anticoagulation for surgery

**N.B.** Day zero is the day of the procedure, minus days are days prior to procedure, plus days are days after the procedure.

### 1. Before surgery – at pre-assessment

- i. Ideally the patient should not be first on the operation list – this allows time for a day zero INR to be obtained prior to surgery if required.
- ii. Day -7 (or earlier) measure INR.
- iii. Day -5, stop warfarin: i.e. omit 5 doses prior to theatre.
- iv. If high dose bridging therapy is appropriate follow the protocol below. Use low molecular weight heparin (LMWH) bridging as the method of choice where possible.

### 2. High dose LMWH bridging in the pre-operative period

Our aim is for patients to get this without hospital admission until day -1. Liaison between GP practice / district nurse team will usually be required. However, if a patient or carer is well motivated and safe disposal of sharps is assured then self-administration at home is possible.

- i. Stop warfarin on day -5: i.e. omit 5 doses prior to theatre.
- ii. Organise the prescription and administration of:  
**enoxaparin SC 1.5 mg/kg on the afternoon of days -3 and -2** (i.e. between 1400 hours and 1800 hours) – see notes 1, 2 and 3 on page 91.
- iii. Prescribe **enoxaparin SC 40 mg for 1800 hours** on day -1.

### 3. Before surgery - on ward

- i. Patient should attend ward by 2 pm on day -1 for repeat INR.
- ii. Obtain INR result that afternoon and if INR > 1.5 administer:  
**vitamin K<sub>1</sub> (phytomenadione) IV 1 mg (0.1 ml) as a single dose.**  
(Use an insulin syringe to draw up 0.1 ml before adding to 100 ml glucose 5% bag and administering over 15 - 30 minutes).
- iii. Recheck INR on day zero at 8 am.

## Elective admissions – restarting anticoagulation post-operatively

- *The first principle is do not prescribe any heparin or warfarin if there is evidence of active bleeding. If in doubt seek advice.*
- Ensure you have read all the accompanying notes prior to prescribing.
- Day zero is the day of the procedure, plus days are days after the procedure.

### Day 0 – All patients

- i. Give **enoxaparin SC 40mg at 1800 hours** (or 4 hours post-op, whichever is later) if no bleeding.
- ii. Consider restarting warfarin. Restarting warfarin on day zero may be safe for some, as it will take several days to take affect. Never restart warfarin with an epidural catheter in situ.

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*Elective admissions – restarting anticoagulation post-operatively continued*

### **Day + 1 and subsequent days – High thrombotic risk group**

Assess daily and consider:

- i. Continued high risk of bleeding –  
Give **enoxaparin SC 40 mg at 1800 hours**
- ii. Low risk of bleeding and no epidural in place –  
Give **enoxaparin SC 1.5 mg/kg at 1800 hours** + restart warfarin as soon as safe and practicable (i.e. adequate gut function).
- iii. Low risk of bleeding and epidural in place –  
Discuss with anaesthetist. Suggested dose:  
**enoxaparin SC 1 mg/kg once daily at 1800 hours** (or alternatively **enoxaparin SC 40 mg once daily**) + do not restart warfarin until epidural catheter removed.

### **Day + 1 and subsequent days - Low thrombotic risk group**

Assess daily and consider:

- i. Continued high risk of bleeding –  
Give **enoxaparin SC 40 mg at 1800 hours**
- ii. Low risk of bleeding day +1 and +2 –  
**enoxaparin SC 40 mg at 1800 hours** + restart warfarin as soon as safe and practicable (i.e. adequate gut function, no epidural in place).
- iii. Low risk of bleeding day +3 onwards –  
If there is no epidural in place increase dose to: **enoxaparin SC 1 mg/kg at 1800 hours**.

### **All patients:**

Continue LMWH therapy until INR has returned to  $\geq 2$ .

### **Bridging therapy with unfractionated heparin in the peri-operative period**

- *The first principle is do not prescribe any heparin or warfarin if there is evidence of active bleeding. If in doubt seek advice.*
  - Use of unfractionated heparin (UFH) may occasionally be preferable to using LMWH e.g. when the ability to ensure rapid and complete reversal of heparin is required, where significant renal impairment exists or where standard monitoring of heparin effect is necessary.
1. On pre-operative day -1 commence UFH according to the schedule detailed in treatment of venous thromboembolism (VTE) (page 76).
  2. Monitor APTT ratio and adjust UFH to achieve a result of 1.8 - 2.8.
  3. Stop IV UFH 6 hours pre-operatively.
  4. Recommence IV UFH 8 hours post-op (assuming haemostasis) at 50% of prior therapeutic dose.
- N.B.** Do not give a loading dose post-operatively.

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5. Assess APTT ratio on day +1 and **slowly** increase UFH dose to achieve a ratio of 1.8 - 2.8.
6. Restart usual dose of warfarin as soon as it is safe and GI tract function is judged adequate. Do not restart warfarin with an epidural catheter in situ.
7. On day +2, monitor APTT ratio and slowly adjust UFH to achieve a ratio of 1.8 - 2.8.
8. Stop IV UFH 6 hours prior to removal of epidural catheters.
9. Continue UFH until INR is  $\geq 2$ .

## Contraindications to heparin / high dose bridging therapy with LMWH

### Absolute contraindication –

History of heparin allergy or heparin-induced thrombocytopenia (HIT), applies to UFH and LMWH.

### Relative contraindication –

1. High bleeding risk (e.g. recent major bleed, stroke, neurosurgery, etc. in previous month)
2. Creatinine clearance  $< 30$  ml/minute [or  $\text{eGFR} < 45$  ml/minute/ $1.73\text{m}^2$ ]. Use of LMWH heparin may be possible with suitable downward dosage adjustment, otherwise consider the use of UFH. Seek expert advice.

## Surgery with spinal or epidural anaesthesia

1. Epidural or spinal anaesthesia should not be initiated or removed unless the INR is  $\leq 1.4$  and there is no appreciable heparin effect.
2. Avoid insertion or withdrawal of an epidural catheter within 12 hours of 40 mg enoxaparin or within 30 hours of a therapeutic (1 - 1.5 mg/kg) dose of LMWH.
3. Avoid heparin administration (SC or IV) for 4 hours after removal of an epidural.

## Essential Notes

1. Wherever possible the prescribed dose of enoxaparin should allow the use of a single pre-filled syringe of 40, 60, 80, 100, 120 or 150 mg. In heavy patients 2 syringes may be required.
2. Always round doses down rather than up where required i.e. the dose of enoxaparin should not exceed 1.5 mg/kg.
3. The maximum daily dose by protocol is 180 mg of enoxaparin (or 120 mg if 1 mg/kg is being applied). In heavy patients ( $>120$  kg) do not extend the dose past these values without seeking senior advice.
4. Attention should be given to renal function throughout the period of LMWH use. Doses of enoxaparin will need to be reduced if  $\text{eGFR}$  is  $< 30$  ml/minute/ $1.73\text{m}^2$ .
5. Restart warfarin with the patient's usual daily dose. *Do not use a loading dose regimen – it is safer to go safe and slow with the reintroduction of warfarin.*
6. If exposure to unfractionated heparin (UFH) exceeds 4 days, monitor platelet count every 2 - 3 days from day 4 to 14, or until heparin is stopped. Be alert for evidence of HIT.
7. Patients with relatively recent ( $< 100$  days) prior exposure to heparin can develop HIT within hours of re-exposure to the drug.



# Management of Suspected Acute Coronary Syndrome (ACS)

N.B. Some of the recommendations in this guideline are being revised. Please check: StaffNet / Info Centre / Policies, Procedures and Guideline Documents / NHSGGC Clinical Guideline Electronic Resource Centre for the most up to date information.

## Introduction

Chest pain is one of the most common presentations at A&E. There is a long list of differential diagnoses.

If the ECG is not diagnostic of ST Elevation MI (STEMI) or other acute ischaemia, then, only if the history is typical or if there is no other obvious diagnosis, proceed to troponin measurement or treatment for acute coronary syndrome.

## Assessment / monitoring

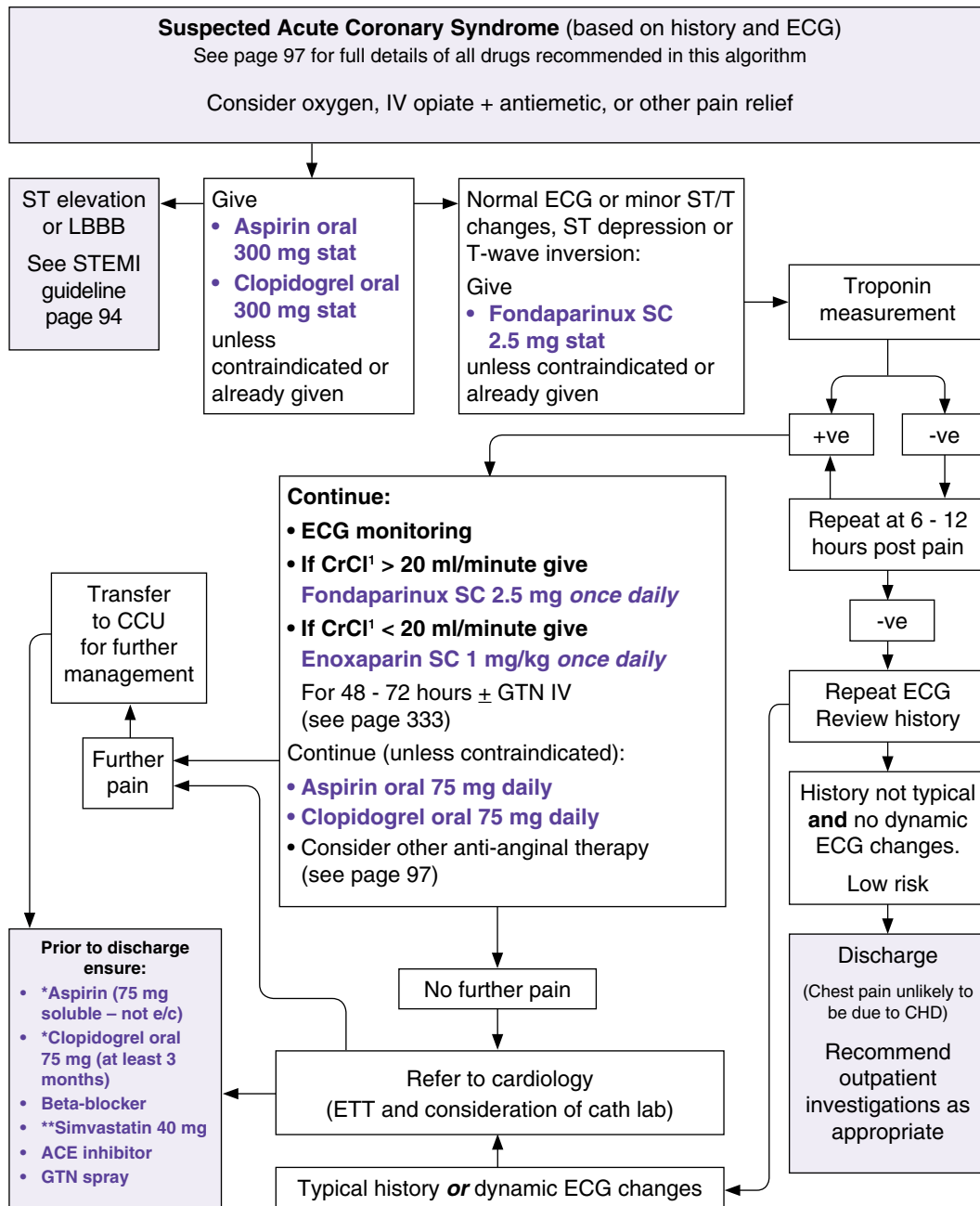
Record ECG (continuous monitoring), take a good history, measure blood pressure and perform all general assessment measures for an acute admission. Follow flow chart on the next page once ACS is established as the most likely cause of the presenting complaint.

Test for troponin **only if** acute coronary syndrome is suspected with a good history (even if no ECG changes) or there is another good clinical reason for testing. **Troponin testing should *not* be used as a catch-all test in a 'routine' battery.**

## STEMI

Thrombolysis or primary percutaneous coronary intervention (PPCI) are most effective when done as early as possible. ***Do not delay*** in making decisions about these – decisions will almost always be made in the ambulance or in A&E.

*Continues on next page*



\* Refer to antiplatelet guideline page 99.

\*\* Refer to secondary prevention of heart disease and stroke page 102.

<sup>1</sup> See equation on page 256

# Initial management of STEMI presenting to A&E

**Step 1:** Oxygen and monitor ECG.

**Step 2:** Call 999 and ask for “Emergency PCI Transfer”.

**Step 3:** Commence medical treatment (see Box 1 page 95) (**N.B.** If patient is going direct to cath lab, give clopidogrel 600 mg stat dose.)

**Step 4:** Contact Golden Jubilee National Hospital (GJNH) 0791 761 6501 and give information of patient transfer.

**Step 5:** Fax ECG to GJNH if possible (fax 0141 951 5893)

If PPCI is not possible or there are logistical reasons causing a significant delay to PPCI, it may be necessary to administer thrombolytic therapy (see Box 2 on page 95).

Some patients with multiple co-morbidities may not be candidates for PPCI or thrombolysis.

## Contraindications to thrombolysis

### Absolute:

- Haemorrhagic stroke or stroke of unknown origin at any time
- Ischaemic stroke in preceding 6 months
- Central nervous system damage / neoplasms
- Major trauma / surgery / head injury within preceding 3 weeks
- Gastrointestinal bleeding within the last month
- Known bleeding disorder
- Aortic dissection

### Relative – discuss with senior staff before withholding:

- Transient ischaemic attack in preceding 6 months
- Oral anticoagulant therapy
- Pregnancy or within 1 month post partum
- Non-compressible punctures < 24 hours
- Traumatic resuscitation
- Refractory hypertension (systolic BP > 180 mmHg).
- Advanced liver disease
- Infective endocarditis
- Active peptic ulcer
- Terminal illness

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**If patient is for PPCI go to Box 1.**

**If patient is for Thrombolysis go to Box 2.**

### Box 1

#### Procedure for patients with STEMI who are eligible for PPCI

**N.B.** The management of ACS is under review and may change. Please check StaffNet / Info Centre / Policies, Procedures and Guideline Documents / NHSGGC Clinical Guideline Electronic Resource Centre for the most up to date information.

Contact GJNH – see next page for contact details.

Prescribe and administer the following:

- **Morphine 5 - 10 mg by slow IV injection**
- **Metoclopramide IV 10 mg**
- **Soluble aspirin oral 300 mg immediately unless patient has already received a dose as per page 93 (75 mg if already taking aspirin regularly)**
- **Clopidogrel oral 600 mg (or a further 300 mg if an initial 300 mg dose has already been given) as a single 'one-off' dose**
- **Heparin IV 5000 units (unless patient has already received treatment dose of fondaparinux or enoxaparin)**

Consider prescribing the following, or if advised by the GJNH:

- **Glycoprotein IIb/IIIa inhibitor**
- **Metoprolol IV 5 - 15 mg or oral 50 - 100 mg if Killip Class 1 (withhold if heart rate < 65 bpm, systolic < 105 mmHg)**

### Box 2

#### Procedure for patients with STEMI who are for thrombolysis rather than PPCI

Prescribe and administer drugs as in **Box 1** *plus* tenecteplase, *provided contraindications to this have been ruled out (see previous page).*

#### Tenecteplase single weight adjusted bolus over 10 seconds

Weight	Weight imperial	Dose	Volume
< 60 kg	< 9 st 6 lb	30 mg	6 ml
60 - 69.9 kg	9 st 6 lb - 11 st	35 mg	7 ml
70 - 79.9 kg	11 st 1 lb - 12 st 8 lb	40 mg	8 ml
80 - 89.9 kg	12 st 9 lb - 14 st 2 lb	45 mg	9 ml
> 90 kg	> 14 st 2 lb	50 mg max dose	10 ml

**N.B. 90 minutes post thrombolysis** – if pain persists or a review of ECG shows a fall in ST elevation < 50% contact GJNH regarding rescue PCI for non-reperfusion.

Interventional Cardiology Referral Pathway – West of Scotland Regional Heart and Lung Centre		
Elective Referrals	<b>Urgent Referrals</b> Bed to Bed Transfer <i><b>Do not withhold LMWH on day of referral</b></i>	Emergency / Immediate Referrals
Referrals via Cardiologist to: bookingoffice@gjnh.scot.nhs.uk <b>or</b> dedicated FAX number: 0141 951 5893	<b>Cath Lab slot same day except in exceptional circumstances.</b> Contact Clinical Scheduler – <b>0791 761 6501</b> The same mobile number will be used 24 hours a day but will divert to cHDU out of hours.	<b>Call 999 before contacting GJNH on:            0791 761 6501</b> The same mobile number will be used 24 hours a day but will divert to cHDU out of hours. Discuss patient with Cardiology SpR on-call.  <i>Transfer patient by A&amp;E ambulance to GJNH Cath Lab / cardiology HDU as directed.</i>
The referrals will be reviewed by a cardiologist and the Cardiology Clinical Scheduler. The patient will then be placed on the elective waiting list according to proposed procedure.	Fax Medical Referral Form – Fax number: 0141 951 5893	
	Arrange transfer of patient as directed by Clinical Scheduler.	
	Ensure all available information is sent with patient.	
		Ensure all available information is sent with patient.

# Drugs for acute coronary syndrome / STEMI and secondary prevention of MI



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**Antiplatelet drugs – Refer to antiplatelet guideline on page 99.**

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## **Beta-blockers**

**Atenolol oral 25 - 50 mg twice daily**

Or if evidence of heart failure:

**Bisoprolol oral 1.25 - 10 mg daily or**

**Carvedilol oral 3.125 - 25 mg twice daily**

*Caution: Avoid beta-blockers in patients with a history of asthma or bronchospasm.*

Alternative options are:

- Cautious test dose with a short-acting beta-blocker such as metoprolol (which may be switched to an alternative beta-blocker if tolerated).
- A rate limiting calcium antagonist e.g. verapamil or diltiazem *instead of a beta-blocker*.

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**Statins – Refer to cholesterol guideline on page 102**

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## **ACE inhibitors (ACEI)**

**Ramipril oral 2.5 mg twice daily initially. Increase after 2 days to 5 mg twice daily if tolerated.**

**Lisinopril** – dose according to systolic blood pressure:

- *Systolic blood pressure over 120 mmHg – initially give lisinopril oral 5 mg, followed by a further 5 mg 24 hours later, then 10 mg after a further 24 hours. Continue with 10 mg once daily orally for 6 weeks (or continue if heart failure).*
- *Systolic blood pressure 100 - 120 mmHg – initially give lisinopril oral 2.5 mg once daily and increase to maintenance of 5 mg once daily orally.*

For ACEIs:

- Check U&Es before first prescription to exclude significant renal impairment.
- Check U&Es at one week following initiation and each up-titration to assess renal function.
- If renal function deteriorating (> 20% increase in creatinine or creatinine > 220 micromol/L), consider stopping ACEI and seek specialist advice.
- If ACEI not tolerated due to cough, substitute with an angiotensin II receptor blocker.
- **Avoid** potassium supplements / potassium sparing diuretics, if possible.

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**Calcium-channel blockers** – may be considered if indicated

**Amlodipine oral 5 - 10 mg daily.** This is the preferred calcium-channel blocker for patients on a beta-blocker

**or**

**Diltiazem oral 60 mg three times daily or 200 - 500 mg long-acting formulation once daily (e.g. Tildiem LA®).** Always prescribe diltiazem by brand name. Never prescribe a rate limiting calcium-channel blocker together with a beta-blocker unless advised by a consultant.

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**Nitrates** – may be considered if indicated

**Isosorbide mononitrate oral 10 - 40 mg twice daily (prescribe 8 am and 2 pm).**

Nitrate free period recommended (usually at night) to avoid developing tolerance.

# Secondary Prevention of Coronary Heart Disease and Stroke – Antiplatelet Guideline



The following patients should have antiplatelet therapy for life (unless they develop an indication for warfarin):

- CHD (angina, acute coronary syndrome, post-CABG)
- Thrombotic stroke or transient ischaemic attack (TIA). See separate guidance (page 118 and 122)
- Peripheral arterial disease (intermittent claudication or post-graft)

**Aspirin oral 75 mg daily (dispersible tablet)** is the agent of choice (but see separate guidance for stroke and TIA). Enteric coated aspirin does not reduce gastrointestinal (GI) symptoms. Only if aspirin is contraindicated or the side effects are intolerable (see page 101) should **clopidogrel oral 75 mg daily** be used instead.

Caution with all antiplatelets – ideally blood pressure should be under control (< 150/90 mmHg) prior to commencing any antiplatelet agent, and certainly systolic < 180 mmHg.

## Combination antiplatelet regimens

**Table 1 – Antiplatelet dual therapy regimens**

Indication	Drug regimens and duration
<b>Thrombotic stroke (also see additional note on next page)</b>	
Stable thrombotic stroke or TIA	See Secondary Prevention of Stroke and TIA guideline page 122
Carotid artery stent	Aspirin oral 75 mg daily indefinitely AND Clopidogrel oral 75 mg daily for 4 weeks.
<b>Acute Coronary Syndromes (without PCI / stent)</b>	
ST elevation MI	Aspirin oral 75 mg daily indefinitely AND Clopidogrel oral 75 mg daily for 4 weeks
Non-ST elevation MI	Aspirin oral 75 mg daily indefinitely AND Clopidogrel oral 75 mg daily for 12 weeks
<b>Coronary artery stents (also see additional note on next page)</b>	
Bare metal stent (elective)	Aspirin oral 75 mg daily indefinitely AND Clopidogrel oral 75 mg daily for 4 weeks. Some patients may receive clopidogrel 150 mg daily for the first week and/or a 3 month course of clopidogrel at the discretion of the interventional cardiologist.
Bare metal stent (unstable)	Aspirin oral 75 mg daily indefinitely AND Clopidogrel oral 150 mg daily for 1 week, then 75 mg daily for 11 weeks
Drug eluting stent	Aspirin oral 75 mg daily indefinitely AND Clopidogrel oral 150 mg daily for 1 week, then 75 mg daily for 51 weeks

*Continues on next page*

## Notes

- Coronary artery stents: Do not discontinue antiplatelet dual therapy sooner than the recommended durations in Table 1 without prior discussion with the patient's interventional cardiologist (details can be found on patient's clopidogrel card). If an invasive procedure is required, and cannot be delayed till end of clopidogrel prescription, consult patient's interventional cardiologist for individual action plan.
- If there is significant carotid stenosis following acute stroke or TIA, patient may be considered for combination aspirin and clopidogrel, at the discretion of a stroke consultant, whilst awaiting carotid surgery.

## Combination warfarin and antiplatelet agents

This combination is associated with a significantly higher major haemorrhage complication rate than either agent alone, without offering any proven benefit in reducing ischaemic or thromboembolic events (except in patients with metallic prosthetic heart valves).

### Patients on warfarin who develop an indication for an antiplatelet agent (e.g. thrombotic stroke, ACS)

**Low thrombosis risk patients** (e.g. moderate risk atrial fibrillation (AF), deep vein thrombosis (DVT) > 3 months previously) who develop an indication for dual antiplatelet therapy (e.g. AF patient requiring coronary stent) should stop warfarin or receive triple therapy for as short a time as possible. Consideration should be given to the use of a bare metal stent.

**High thrombosis risk patients** (e.g. high risk AF, recent venous thromboembolism) developing an ACS, require specialist advice and be considered for triple therapy.

### Patients on antiplatelet agents who develop an indication for warfarin therapy (e.g. AF, DVT)

In patients with stable vascular disease, on a single antiplatelet agent, this agent should be discontinued for the duration of warfarin therapy.

In patients with unstable vascular disease (e.g. recent ACS or stent) receiving dual antiplatelet therapy warfarin should be commenced cautiously with close monitoring and discontinuation of aspirin +/- clopidogrel earlier than planned should be discussed with an interventional cardiologist.

It is accepted that some high thrombotic risk patients, with low inherent bleeding risk, may merit short-term triple therapy, however each case should be considered individually with a full risk:benefit assessment.

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## Contraindications to aspirin

These are rare, but include aspirin allergy (aspirin-induced angioedema, asthma or skin rash).

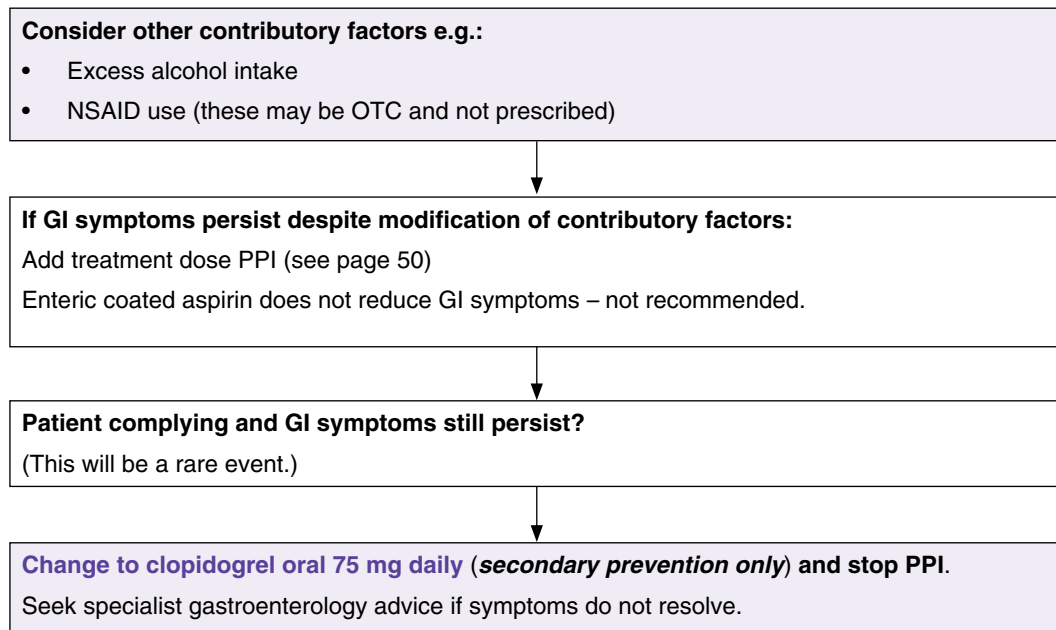
**Relative contraindications for all antiplatelet agents (only prescribe on expert advice):**

- Recent gastrointestinal (GI) bleed
- Proven active peptic ulcer disease
- Breast feeding
- Haemophilia or other bleeding disorder

## GI symptoms and use of aspirin

- In patients with a history of bleeding peptic ulcer disease the combination of aspirin + proton pump inhibitor (PPI) **is safer than** clopidogrel alone (for secondary prevention).
- In patients developing GI symptoms after starting aspirin **follow the algorithm below.**

### Patients developing GI symptoms after starting aspirin

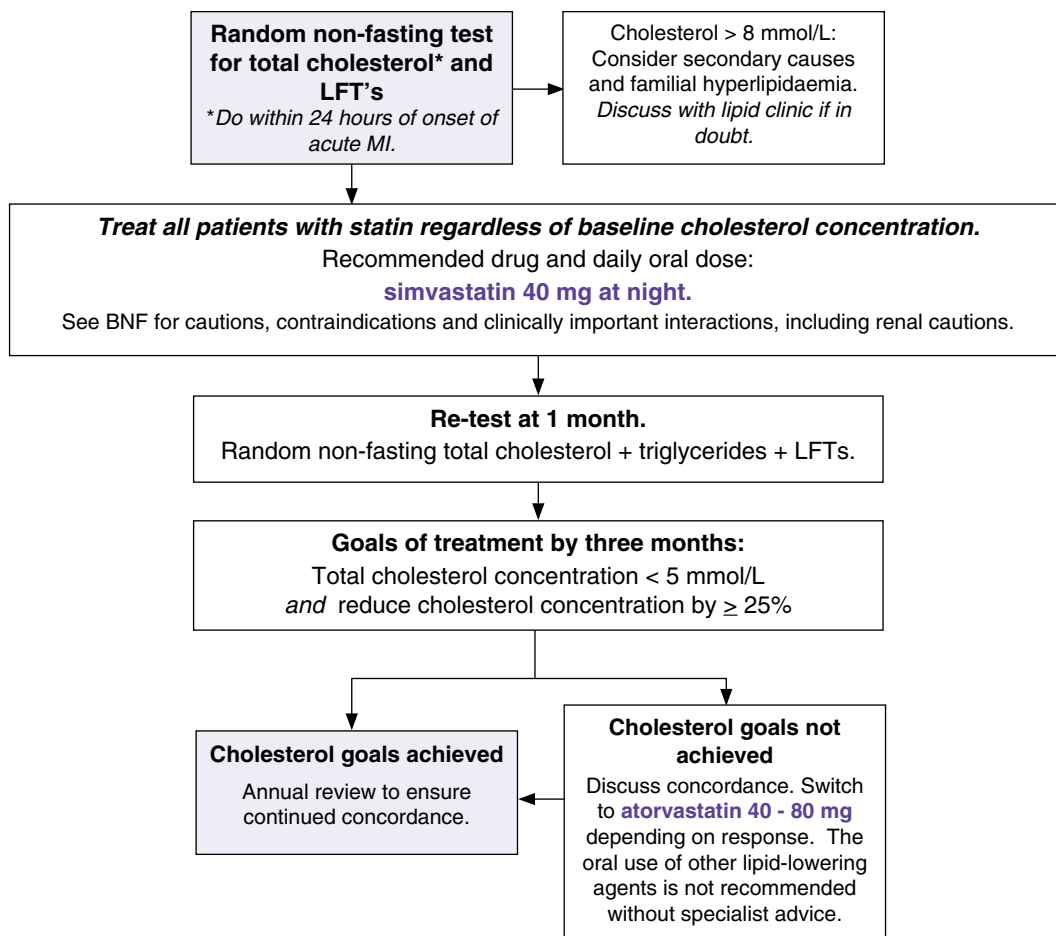


## S Secondary Prevention of Coronary Heart Disease and Stroke – Cholesterol Guideline

**N.B.** The recommendations in this guideline are under review and may change. Please check: StaffNet / Info Centre / Policies, Procedures and Guideline Documents / NHSGGC Clinical Guideline Electronic Resource Directory for the most up to date information.

Patients with established vascular disease are at high risk and should be treated with a statin regardless of total blood cholesterol concentration i.e. previous MI / pre- or post-CABG / pre- or post-angioplasty / angina / angiographic coronary artery disease / ischaemic stroke or transient ischaemic attack / peripheral arterial disease / diabetic patients aged  $\geq 40$  years.

### Cholesterol Management Flowchart



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Atherosclerotic arterial disease is of multifactorial origin. No single risk factor, including cholesterol concentration, should be viewed in isolation.

- Encourage smoking cessation (consider nicotine replacement therapy – see Appendix 1).
- All other risk factors hypertension, diabetic control, should be addressed (see separate guidelines).
- **Aspirin oral dispersible 75 mg daily** (not enteric coated) should be taken by all those with occlusive arterial disease in the absence of contraindications (active peptic ulceration, a bleeding disorder or true hypersensitivity).
- Consider treatment with ACE inhibitors, especially in patients with left ventricular dysfunction or heart failure.
- Consider beta-blockers, and ensure attendance at a rehabilitation programme, for patients after myocardial infarction.
- Dietary and other lifestyle advice e.g. alcohol, obesity, physical activity, should be given.



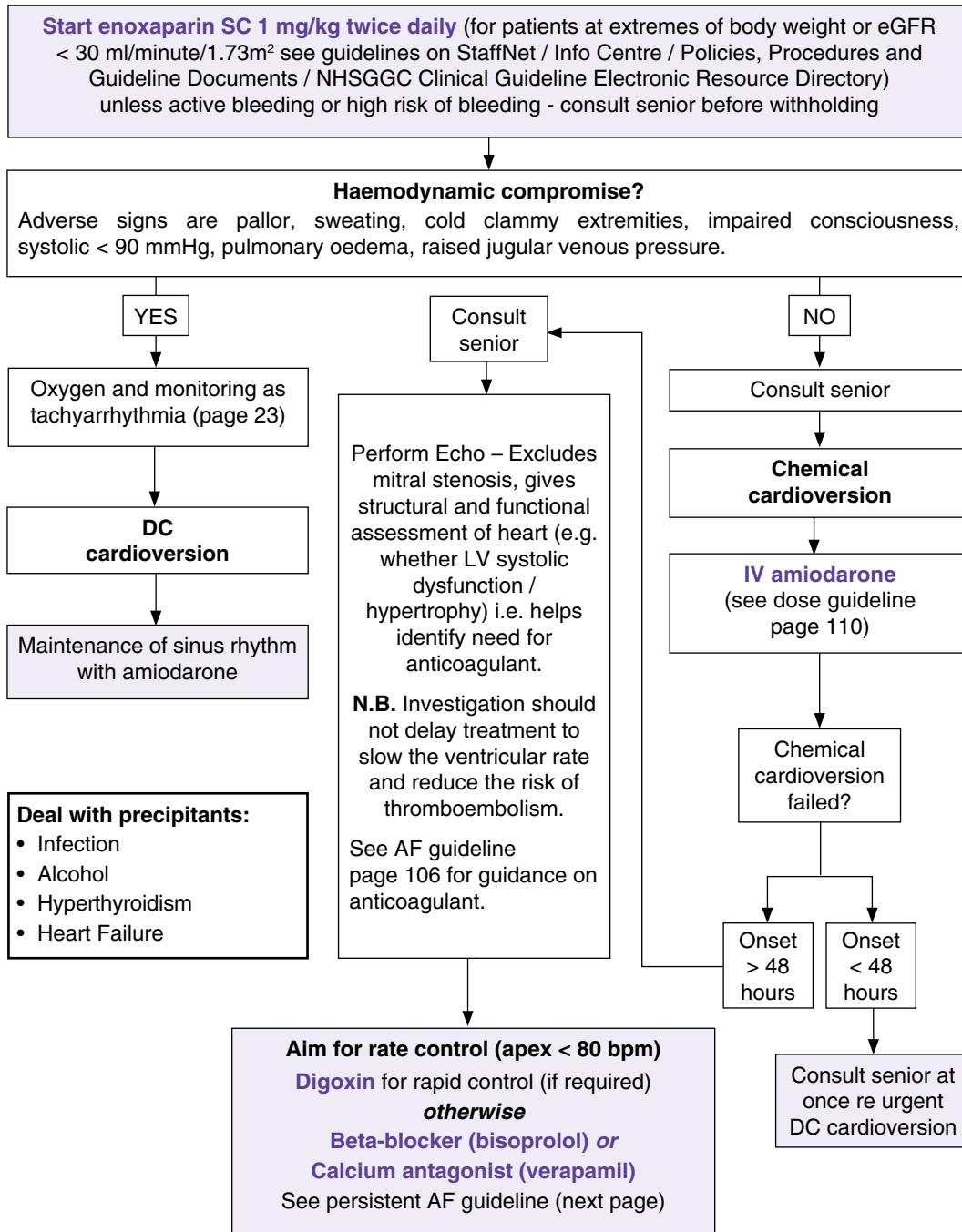
## Atrial Fibrillation (AF) or Flutter – Recent Onset

**Requiring admission, or onset during admission for other problem e.g. post-surgery.**

- Follow guidance for tachyarrhythmia (page 23).
- Haemodynamic compromise is an indication for rapid DC cardioversion - always use sedation or general anaesthesia.
- If the patient is haemodynamically stable, (no reduced conscious level, systolic BP > 90 mmHg, no chest pain and no heart failure), and onset < 48 hours, consider chemical cardioversion with IV amiodarone.
- Control ventricular rate with oral bisoprolol (or digoxin IV if heart failure is present).
- If chemical cardioversion fails, consult senior medical staff re electrical cardioversion.
- Do echo and consider warfarin - see pages 86 - 87 for dose initiation regimen.
- Remember – many cases of new onset AF or flutter will spontaneously revert to sinus rhythm – particularly if there is an obvious precipitating cause such as pneumonia, alcohol intoxication, hyperthyroidism or surgery.
- Cardioversion is much less successful in established AF or flutter than in new onset, and, if being considered, should not be delayed. Anticoagulant cover required if onset > 48 hours, so 4 - 6 week delay required.

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## Algorithm for Cardioversion of AF





# Atrial Fibrillation (AF) – Persistent

## Objectives

### Diagnostic:

1. Exclude thyrotoxicosis.
2. Exclude acute (binge) or chronic alcohol consumption.
3. Exclude mitral stenosis and other valve problems, see below.
4. Determine if there are echocardiographic risk factors for stroke or thromboembolism.
5. Identify concomitant left ventricular (LV) systolic dysfunction and heart failure.

### Therapeutic:

1. Relieve symptoms – often only rate control required; diuretic may also be needed (often only on temporary basis).
2. Control the 'heart' (ventricular apex or ECG) rate adequately (target < 80 bpm).
3. Unless contraindicated, prescribe warfarin as prophylaxis against stroke / thromboembolism; in some patients an antiplatelet agent (usually aspirin) may suffice.
4. In some cases, consider restoration of sinus rhythm by electrical or pharmacological cardioversion (only attempt chemical or electrical cardioversion after adequate anticoagulation with warfarin; risk of thromboembolism if not anticoagulated; limited long-term success).
5. Treat concomitant LV systolic dysfunction / heart failure.

## Essential investigations

1. A resting 12-lead ECG - confirms diagnosis, shows the ventricular rate, may indicate presence of structural heart disease.
2. Thyroid function tests.
3. Liver enzymes if alcohol abuse is suspected.
4. A transthoracic echocardiogram – excludes mitral stenosis, gives structural and functional assessment of heart (e.g. whether LV systolic dysfunction / hypertrophy) and therefore helps identify need for warfarin.

**N.B.** Investigation should not delay treatment to slow the ventricular rate and reduce the risk of thromboembolism.

## Ventricular rate control

1. Target ventricular (apex or ECG) rate < 80 bpm.
2. Treatments of choice either:
  - A beta-blocker – **start with atenolol oral 25 mg twice daily and titrate up to 50 mg twice daily if ventricular rate still > 80 bpm.**  
**Add digoxin if target ventricular rate still not met.**
  - A rate-limiting calcium-channel blocker (CCB) i.e. verapamil or diltiazem (but avoid if LV systolic dysfunction / heart failure).  
**Start with verapamil (slow release) oral 120 mg once daily and titrate up to 240 mg once daily if ventricular rate still > 80 bpm.**  
**Add digoxin if target ventricular rate still not met.**
- N.B.** Beta-blockers and rate-limiting CCBs must not be combined except under specialist supervision.
3. Digoxin has a **limited** role:
  - mainly in heart failure, initially, for rapid control of the ventricular rate – but new evidence shows that beta-blockers are the agents of choice in stable heart failure
  - can be used in **combination** with beta-blocker / rate-limiting CCB when control of the ventricular rate is difficult (see above).

### Heart failure / LV Systolic Dysfunction

See NMSGC guidelines, ACE inhibitors and beta-blockers are strongly recommended. Beta-blockers must be initiated under direction of a hospital physician. Rate-limiting CCBs should be avoided.

## Patients to refer for specialist assessment / consideration of cardioversion

- Young age (< 50 years)
- Reversible precipitating cause of AF (e.g. alcohol binge, thyrotoxicosis, pneumonia, recent surgery) and no major structural or functional heart disease.
- Difficulty with ventricular rate control
- Valve disease
- LV systolic dysfunction / heart failure
- AF causing symptomatic limitation despite rate-limiting treatment e.g. heart failure, excessive exertional breathlessness, undue fatigue.

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## Prevention of stroke / thromboembolism

- Patients with both recurrent paroxysmal AF and sustained AF have a high risk of thromboembolism, particularly stroke. Compared to subjects without AF the absolute risk of stroke is, on average, increased by about 4-fold and the risk of stroke is about 4% per annum.
- This risk is greatest in patients with certain risk factors (see flow diagram on next page).
- For primary prevention, the risk of thromboembolism can be reduced substantially (by 60 - 70%) with warfarin therapy (target INR 2 - 3). This equates to 20 - 30 fewer strokes at the expense of 6 - 8 serious bleeding episodes, per 1000 patient years of treatment.
- Patients with AF and a previous stroke or transient ischaemic attack (TIA) have an absolute risk of a further stroke of the order of 10 - 12% per annum and an absolute benefit of approximately 80 fewer strokes per 1000 patient years of treatment. **N.B.** Patient with a suspected stroke or TIA should first be referred for rapid specialist assessment – see page 116.
- Advanced age is not a contraindication to warfarin.
- In patients with 'lone' AF, i.e. AF and an otherwise normal heart, aspirin 300 mg daily may be sufficient to ensure a low risk of stroke.

## Who should receive anticoagulant therapy

- Patients with clinical risk factors or echocardiographic risk factors (see flow diagram on next page).
- Patients without contraindications to anticoagulant therapy.

## Cautions / contraindications to anticoagulant therapy

- Absolute contraindications include: active bleeding, pregnancy, stroke < 14 days.
- Relative contraindications include: significant bleeding risk e.g. active peptic ulcer or recent head injury; bleeding in the last 6 months; previous cerebral haemorrhage.
- Cautions include: recurrent falls, or alcohol abuse.

## Cautions / contraindications to aspirin

- Aspirin allergy (rare)
- GI bleeding (< 6 months)
- Active proven peptic ulcer
- Systolic BP > 180 mmHg or diastolic BP > 110 mmHg (see Antiplatelet Guideline page 99)

## Initiation and monitoring of warfarin therapy

Urgent anticoagulation required – use Age-adjusted warfarin induction regimen on pages 76 - 77.

Anticoagulation not urgent - consider a slower regime such as low-slow-start warfarin, details available on Staffnet / Clinical Guideline Electronic Resource Directory. This regime involves 2 mg being given daily for 2 weeks with once weekly monitoring. Contact anticoagulation pharmacist if more information is required (see Appendix 6 under GCAS for contact details).

## Combined warfarin and antiplatelet therapy

Adding aspirin to warfarin therapy does not reduce the risk of stroke but substantially increases the risk of bleeding. After PCI, short-term combined double or triple therapy is used according to cardiologist advice.

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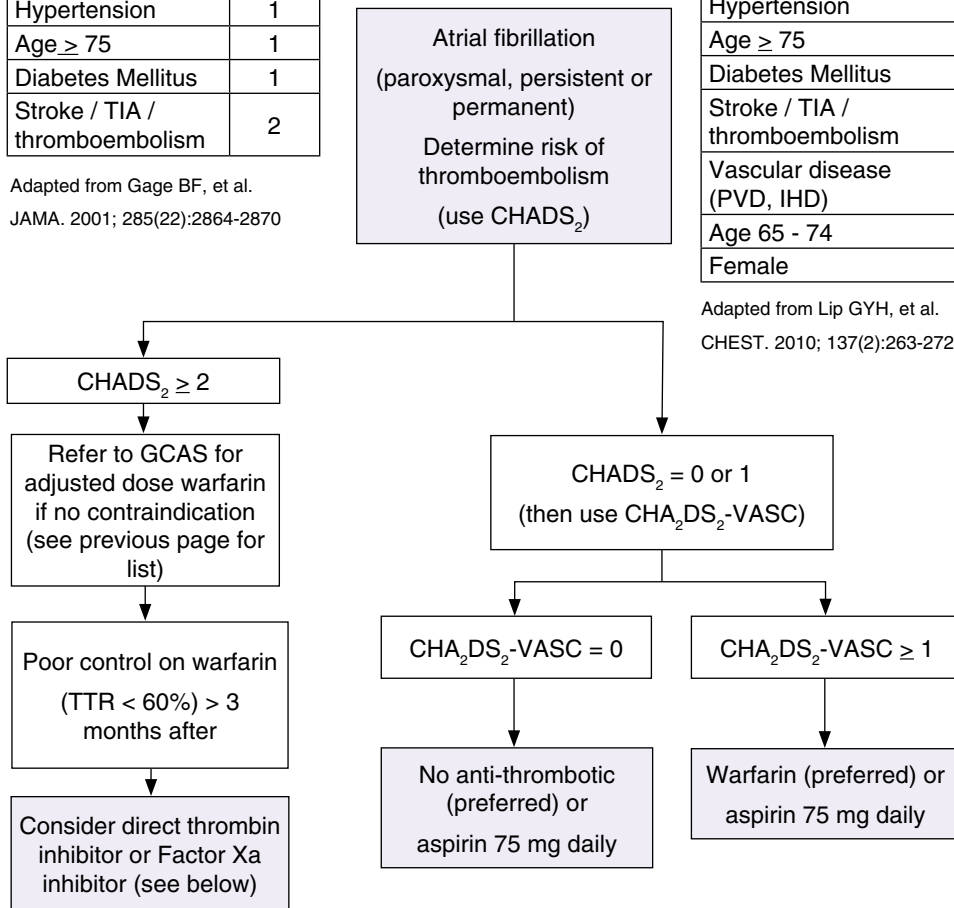
## Prevention of stroke / thromboembolism in AF

CHADS <sub>2</sub>	Score
CHF	1
Hypertension	1
Age $\geq$ 75	1
Diabetes Mellitus	1
Stroke / TIA / thromboembolism	2

Adapted from Gage BF, et al.  
JAMA. 2001; 285(22):2864-2870

CHA <sub>2</sub> DS <sub>2</sub> -VASC	Score
CHF	1
Hypertension	1
Age $\geq$ 75	2
Diabetes Mellitus	1
Stroke / TIA / thromboembolism	2
Vascular disease (PVD, IHD)	1
Age 65 - 74	1
Female	1

Adapted from Lip GYH, et al.  
CHEST. 2010; 137(2):263-272



### New anticoagulants (direct thrombin and Factor Xa inhibitors)

- Warfarin is still the anticoagulant of choice
- New anticoagulants e.g. dabigatran and rivaroxaban, should only be considered in patients at high risk of stroke who are poorly controlled on warfarin (TTR < 60%), despite good compliance, at the recommendation of the GCAS.
- Many contraindications to warfarin also apply to the newer agents.
- Dabigatran / rivaroxaban dosing guidance – see BNF for details. Do not use dabigatran if eGFR < 30 ml/minute/1.73m<sup>2</sup> whilst use rivaroxaban with caution and avoid if eGFR < 15 ml/minute/1.73m<sup>2</sup>.

# Drugs for atrial fibrillation

See guidelines for management of persistent atrial fibrillation (page 106) and recent onset atrial fibrillation and flutter (page 104) for full details of the management of these conditions.

## Anticoagulation

On the recommendation of GCAS, the choice of oral anticoagulant may change for selected patient groups.

**Warfarin** – See page 108 for patients who should receive warfarin and page 77 for dosage advice.

**Enoxaparin SC 1 mg/kg 12 hourly (unlicensed)**

## Chemical cardioversion

### Amiodarone

For chemical cardioversion (see guideline on recent onset atrial fibrillation and flutter on page 104).

**Amiodarone IV 300 mg infused over 1 hour *then* 900 mg over 24 hours through a central line or large peripheral line.**

**Amiodarone oral 200 mg three times daily for 1 week *then* 200 mg twice daily for 1 week *then* 200 mg daily. (Other oral regimens are sometimes used on the advice of a cardiologist.)**

**N.B.** Ideally, check baseline thyroid and liver function tests before starting. Interactions include digoxin and simvastatin (see BNF Appendix 1 for more details).

## Rate control

### Beta-blockers:

**Atenolol oral 25 - 50 mg twice daily**

**Bisoprolol oral 5 - 20 mg daily**

**Caution:** Avoid beta-blockers in patients with a history of asthma or bronchospasm. If there is no alternative, use atenolol or bisoprolol with extreme caution under specialist supervision.

**Continues on next page**



Drugs for atrial fibrillation continued

Digoxin

Loading dose – normal renal function

Digoxin oral (preferred route) 500 micrograms *then* 500 - 1000 micrograms in divided doses > 6 hours apart.

Digoxin IV 500 micrograms *then* 250 - 500 micrograms in divided doses 4 - 6 hours apart.

Loading dose – renal impairment

(creatinine clearance < 30 ml/min)

Digoxin oral (preferred route) 500 micrograms *then* 250 - 375 micrograms in divided doses > 6 hours apart.

Digoxin IV 250 - 500 micrograms

N.B. Digoxin injection: 25 micrograms = 0.1 ml. Additional loading doses may be required; give according to ventricular (heart rate) response.

Table 1 – Daily maintenance dose of digoxin

CrCl (page 256)	< 60 kg		> 60 kg	
	Oral	IV	Oral	IV
> 50 ml/minute	250 to 312.5 micrograms	175 to 200 micrograms	250 to 375 micrograms	175 to 250 micrograms
20 - 50 ml/minute	125 to 187.5 micrograms	100 micrograms	187.5 micrograms	125 micrograms
< 20 ml/minute	62.5 to 125 micrograms	50 to 75 micrograms	62.5 to 125 micrograms	50 to 75 micrograms

Target concentration range                      0.5 - 2 micrograms/L (6 - 24 hours after the dose)

Time to steady state                                5 - 10 days

Concentration increased by amiodarone, diltiazem, quinine, verapamil (see BNF Appendix 1 for more details).



# Management of Acute Pulmonary Oedema / Heart Failure

## Introduction

Acute pulmonary oedema may be the first presentation of heart failure or an exacerbation of existing known heart failure. It also may be secondary to another cause e.g. atrial fibrillation (AF), other tachycardias or bradycardia, critical cardiac ischaemia, valvular disease or renal artery stenosis.

## Assessment

- If critical cardiac ischaemia / infarction, see thrombolysis / PCI guideline.
- Measure blood gases, record ECG and CXR and pulse oximetry.
- If in fast AF / flutter, see guideline page 104.

## General management / drug treatment

- Sit patient upright and give 100% oxygen via facemask unless CO<sub>2</sub> retention (see page 126 for interpretation of blood gases).
- Consider slow titrated small increments of intravenous diamorphine or morphine if associated chest pain or severe distress. Also consider antiemetic. Do not give opiate if patient is drowsy, exhausted or hypotensive. Give: **furosemide IV 50 mg (or in patients already receiving oral diuretics, give, intravenously, double the patient's normal oral dose). Repeat bolus at 30 mins to 1 hour. Double dose at first repeat. If further diuretic required - refer immediately to senior medical staff.**
- **Glyceryl trinitrate IV. Commence at 0.5 mg/hour. Titrate according to BP (but only if systolic BP  $\geq$  90 mmHg (see local dosing charts for details).**
- Consider CPAP (CPAP protocol on next page) or NIV if acidotic or poor response to furosemide and nitrates.
- Refer to senior medical staff and intensive care for consideration of intravenous inotropes or invasive ventilation.

**N.B.** Once the acute episode is resolved and the patient is more stable consider long-term management.

# CPAP in cardiogenic pulmonary oedema

- Continuous positive airway pressure (CPAP) can be considered in patients who have not responded to medical treatment. However, discuss this option with a senior.
- CPAP increases intrathoracic pressure, which reduces preload by decreasing venous return.
- CPAP lowers afterload by increasing the pressure gradient between the left ventricle and the extrathoracic arteries, which may contribute to the associated increase in stroke volume.
- Intubation should be considered in patients with persistent hypoxaemia on CPAP or persistent hypercapnia despite the administration of oxygen, morphine, diuretics, and vasodilators. In addition, intubation is required in the setting of apnoea or profound respiratory depression (respiratory rate < 10 bpm).

## **Contraindications to CPAP:**

- Reduced conscious level (not responding to pain or unconscious on the AVPU scale: unable to protect airway therefore **consider invasive ventilation**)
- Dementia resulting in intolerance of therapy
- Systolic blood pressure < 90 mmHg
- Pneumothorax
- Facial trauma / base of skull fracture
- Type II respiratory failure / severe emphysema

## **Complications of CPAP:**

- Hypotension – CPAP increases mean intrathoracic pressure, reducing systemic venous return and cardiac output
- Aspiration – gastric contents may be aspirated due to large volumes of air being blown into the stomach
- Gastric distension – large volumes of air swallowed can overcome resistance of lower oesophageal sphincter
- Anxiety – hypoxia and tight fitting mask can induce anxiety and panic

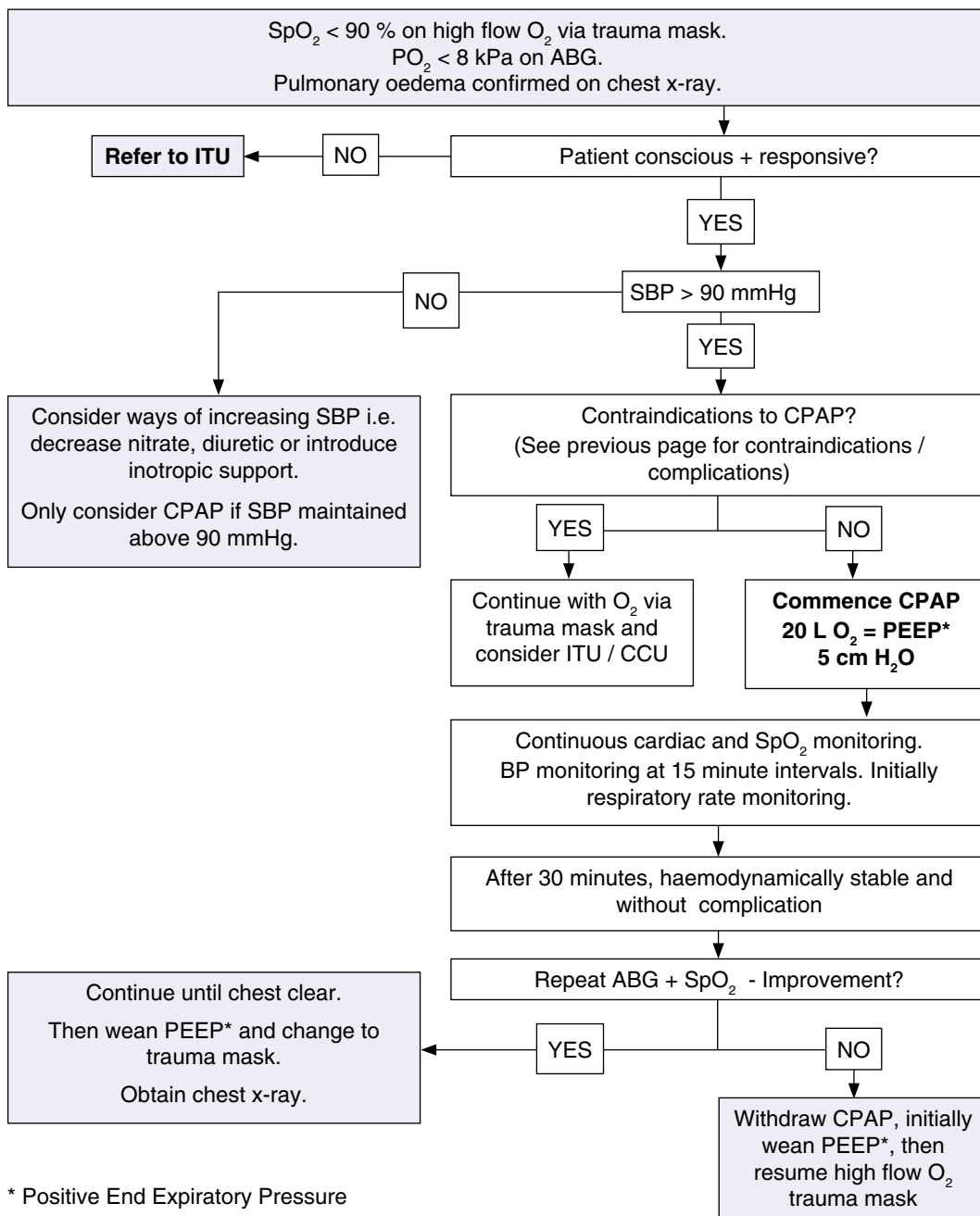
## **When to stop CPAP:**

Continue CPAP until chest clear of rales and haemodynamically stable. Initially wean airway pressure then wean supplemental oxygen and change to standard facemask.

If there has been no clinical improvement after 30 minutes, CPAP should be stopped.

*Continues on next page*

## CPAP algorithm



# Management of Hypertension



The full NHSGGC hypertension guideline is currently under review and once updated will be available at:

StaffNet / Info Centre / Policies, Procedures and Guideline Documents / NHSGGC Clinical Guideline Electronic Resource Directory.

## Introduction

Hypertension is usually asymptomatic, often going unnoticed or untreated. It increases the risk of coronary heart disease (CHD), heart failure, stroke and renal disease. Only 25% of patients will achieve satisfactory control of blood pressure with one drug alone. Many will require drugs from 3 different groups. Compliance with medication is poor, as in many long-term conditions, but particularly when the condition is asymptomatic. Emergency or urgent situations regarding hypertension are rare, but when they present must be treated immediately.

### Hypertension emergencies

These include encephalopathy, aortic dissection, phaeochromocytoma, LVF with severe hypertension or eclampsia or recreational drug-induced severe hypertension which can lead to MI. These need rapid but not immediate or precipitous treatment. **Seek immediate on-call consultant advice.**

### Hypertension urgencies

These include severe hypertension with Grade 3 or 4 retinopathy and headache but no other features, which need around a 25% reduction over 6 hours or so. **Seek immediate on-call consultant advice.**

## General management

Most hypertension is managed well by GPs and that should be the default. It is part of the Quality and Outcomes Framework of the nGMS contract. Only when there is a problem in achieving targets after trying at least 3 drug groups in combination, unusual variability in blood pressure measurement, certain other co-morbidities such as AF or heart failure or an obvious cause of the hypertension (e.g. renal failure), is expert care required.

Non-drug treatment (management of obesity, moderating alcohol intake, reduction in salt intake, and increased exercise) should be instituted in all patients, where relevant. All other cardiovascular risk factors should be addressed e.g. smoking and diet.

Compliance issues require to be addressed.

It is important that return outpatient appointments are not offered unnecessarily and that outpatient recommendations for prescribing are in line with the agreed guidelines.

## Presentation with focal neurological symptoms, < 24 hours

### Introduction

The sudden onset of **focal** neurological symptoms implies a transient ischaemic attack (TIA) or stroke. A diagnostic distinction can sometimes be made between patients with suspected TIA or stroke. For management purposes, however, patients with the recent onset of focal neurological symptoms should be managed according to the continuing presence, or absence, of symptoms when assessed.

**Focal** symptoms include weakness of limb(s), facial weakness, and speech disturbance.

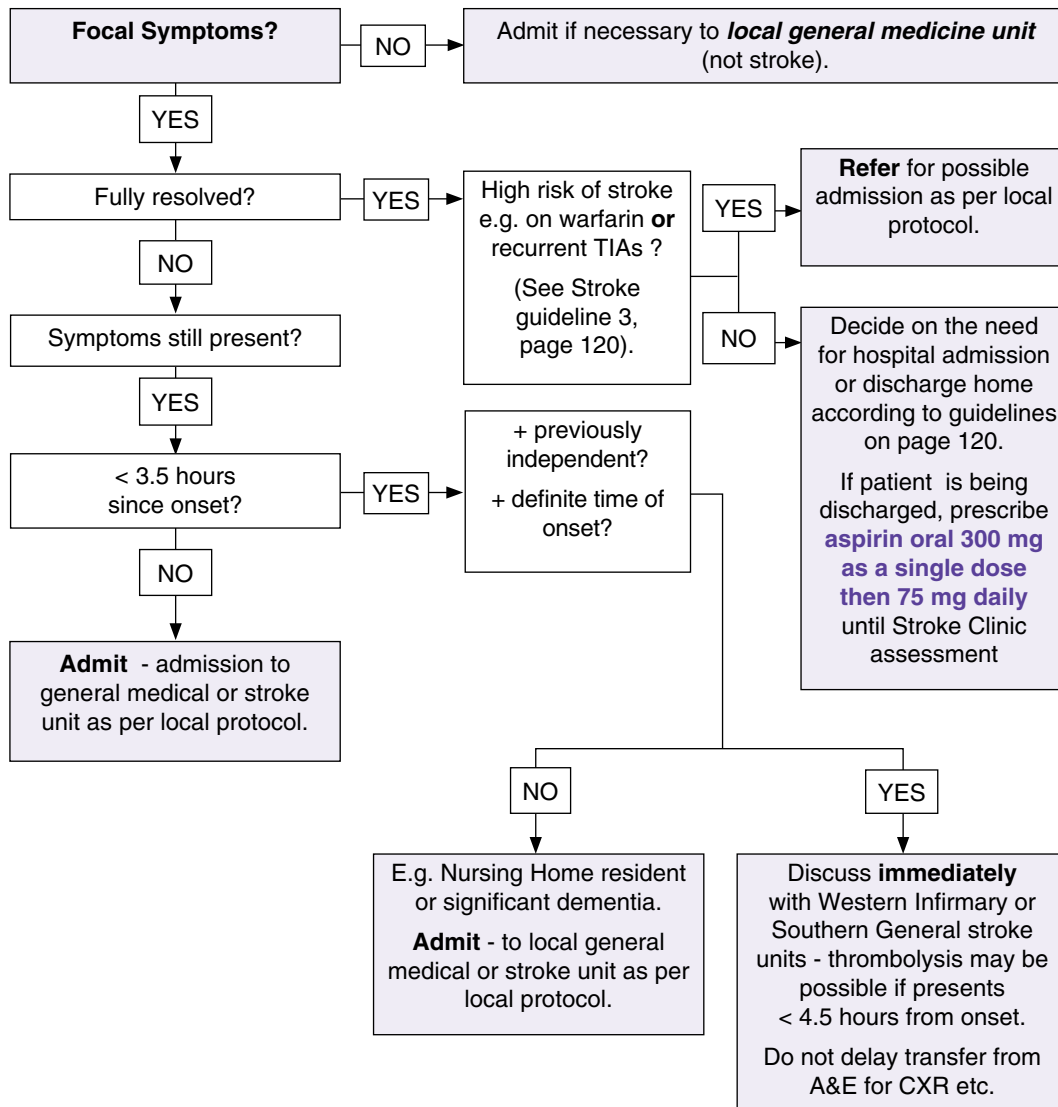
**Non-focal** symptoms include generalised collapse, loss of consciousness, and confusion without focal signs.

Stroke Unit care (available in all NHSGGC hospitals) confers advantages on mortality and discharge home for all stroke patients (except those with significant previous impairment of physical or cognitive function). Selected patients, approximately 10% of all admissions, may achieve additional advantage with IV thrombolysis. However, this requires to be given in specialised stroke units within 4.5 hours of the onset of symptoms, or when last known to be definitely well. Therefore, refer immediately without delay to the appropriate Acute Stroke Unit – the Southern General hospital for hospitals south of the river Clyde and the Western Infirmary hospital for those north of the river.

See algorithm on next page which outlines the admission process of patients presenting with focal symptoms.

*Continues on next page*

## General management and drug therapy



TIA referral forms available in GP Practice and A&E Departments fax numbers on form.

## The first 24 hours

### Assessment / Monitoring

- Potential Thrombolysis case:
    - If the patient presents **within 3.5 hours of onset** of focal symptoms, thrombolysis referral may be appropriate – see Acute Stroke Guideline 1.
    - If patient presents > 3.5 hours, follow local protocol for stroke admissions.
  - Request ECG, U&Es, glucose (non-fasting), LFTs, cholesterol, FBC and ESR
  - Swallow test: check **before** prescribing and administering oral medication, oral fluids or diet.
  - Check BP:
    - If < 100/60 mmHg seek cause and consider commencing IV fluids (see General management and drug therapy section on next page for details).
    - If > 200/130 mmHg seek evidence of malignant hypertension and consider treatment **only** after discussion with consultant.

Otherwise, document blood pressure but **do not intervene**.
  - Temperature: if > 37.5°C look for evidence of infection and send blood / urine / sputum culture as appropriate. If aspiration is probable, commence appropriate therapy (see General management and drug therapy on next page).
  - Check oxygen saturation and treat hypoxaemia if necessary (see General management and drug therapy on next page).
  - Withhold antiplatelet / antithrombotic medication until CT scan excludes haemorrhage.
- CT brain scans should be requested as soon as possible after admission, and *immediate scanning should be carried out in the following instances*:
- Deteriorating consciousness level or coma.
  - On anticoagulants (ensure INR / coagulation is checked and discuss with consultant whether reversal of anticoagulation is appropriate for patient).
  - Brain stem symptoms plus bilateral limb signs or progression of signs or 'locked in'.
  - Cerebellar stroke with headache or features of raised intracranial pressure.
  - Severe headache.
  - 'Stuttering' onset.
  - Rhythm check – atrial fibrillation may be present (see page 104 for management).

*Continues on next page*



## General management and drug therapy

- **Do not prescribe** antihypertensive drugs, warfarin, heparin or steroids except after discussion with consultant.
- Blood glucose:
  - if low – correct
  - if high – may require insulin but important to avoid hypoglycaemia.
- All patients should receive fluids. Prescribe intravenous fluids as clinically indicated and adjust infusion volume of fluids as clinically necessary.
- Oxygen saturation: Target O<sub>2</sub> saturation is 95% – if less than 95% change posture, clear upper airway, start oxygen supplements as clinically appropriate and check arterial blood gases.

### • After CT brain:

If CT scan shows no haemorrhage prescribe a 'one-off' dose of:

**aspirin oral 300 mg (or PR if swallow impaired).** Ensure aspirin is given immediately i.e. do not leave for administration at next morning's drug round.

If patient has had thrombolysis, delay aspirin initiation for 24 hours. After the initial stat dose of aspirin, further antiplatelet therapy should be prescribed according to your local stroke unit protocols. This area of stroke management is currently changing and your stroke unit will have up to date guidelines.

If CT scan shows haemorrhage:

- Consider Neurosurgical referral
- Check urgent coagulation screen and discuss treatment of coagulopathies with consultant.
- Stop all antithrombotics or anticoagulants patient may have been on previously, and consider anticoagulant reversal – should be discussed with consultant.

If CT scan shows an alternative pathology (e.g. tumour, subdural haematoma), discuss with consultant.

- Temperature > 37.5°C and evidence of infection:

If aspiration probable, commence appropriate antibiotic therapy while awaiting culture results (see Infections section) and

**paracetamol oral or PR 1 g every four to six hours as required (maximum dose 4 g/day)**

**N.B.** Consider dose reduction in patients with low body weight ( $\leq 50$ kg), renal / hepatic impairment or glutathione deficiency (chronic malnourishment, chronic alcoholism) to 15 mg/kg/dose up to four times daily (max 60mg/kg/day) An example is: paracetamol oral 500 mg four times daily.

- Atrial fibrillation: see page 104 for management.

### In the event of deterioration after admission, re-examine and specifically:

- Check oxygenation and correct hypoxaemia with oxygen supplementation and postural change.
- Check blood pressure: treat as outlined at the start of this guideline.
- Check temperature: if pyrexial, check for signs of infection and treat. Also administer antipyretic (paracetamol dose as above).
- Check blood sugar and correct hypoglycaemia, consider insulin for hyperglycaemia (blood glucose > 9 mmol/L).
- Consider repeat ECG and treat as appropriate.
- Reconsider potential indications for urgent CT or discuss repeat CT with stroke consultant.

## Transient Ischaemic Attacks (TIAs)

### Guideline applicability

**N.B.** TIAs by definition have full resolution of all symptoms within 24 hours, but typically within minutes. Patients with residual symptoms have had a stroke and should be managed according to Acute Stroke guidelines 1 and 2. If in any doubt, admit and follow Acute Stroke guideline 2.

### Suitability for discharge

Patients with TIA can be allowed home only in the following circumstances:

1. Fully conscious
2. Adequate communication
3. Safe swallow
4. Safe mobility (consider home environment)
5. Adequate social support
6. Clinic appointment requested and patient and family aware this has been done
7. Not on anticoagulants
8. No headache or confusion
9. No fluctuating symptoms
10. Must be single episode. Patients with recurrent TIAs should always be admitted.
11. Blood pressure > 100/60 mmHg and < 200/130 mmHg
12. Not in atrial fibrillation

*If in any doubt, admit and follow Acute Stroke Guideline 2: The First 24 hours.*

### Prior to discharge

If criteria 1 - 12 are all satisfactory, then discharge can go ahead but **only after** the following:

- Check, review and document in the notes:
  - Blood glucose
  - ECG
  - Blood pressure (admit if < 100/60 mmHg or > 200/130 mmHg).
  - FBC, U&Es, liver function and lipids.

*Continues on next page*

- Prescribe:  
**Aspirin oral 300 mg loading dose** then contact local stroke unit for further guidance on antiplatelet therapy.
- Advise patient not to drive (there is a 1 month ban after a TIA but DVLA do not need to be informed). Document in the notes the advice given.
- Advise patient and carers to return to A&E or call ambulance immediately if any further symptoms.
- Arrange outpatient TIA clinic review by contacting local TIA clinic – information available in A&E Departments. Complete the TIA referral form then phone (and fax) details to the Stroke / TIA secretary for your hospital.

## ⑤ Secondary prevention of stroke and Transient Ischaemic Attack (TIA)

### Introduction

Secondary prevention of stroke should be considered in all patients as soon as possible after their stroke or TIA. Initiation of secondary prevention investigations and treatment should be guided by the stroke team, therefore, ensure that all **new** stroke or TIA patients are referred to the local stroke service.

### Drug therapy

The A to F of secondary prevention after a stroke or TIA

#### A. Antithrombotics

Patients in sinus rhythm:

First choice is:

**Clopidogrel oral 75 mg each day (N.B. In TIA it would be an unlicensed indication).**

If the patient is allergic or intolerant to clopidogrel then prescribe combination therapy:

**Aspirin oral 300 mg each day for 14 days or until hospital discharge, then reduce to aspirin oral 75 mg each day and**

**Dipyridamole MR oral 200 mg, starting with 200 mg each night and increasing to 200 mg twice daily if tolerated** (severe ischaemic heart disease is one possible contraindication).

**Patients in atrial fibrillation (AF):**

- Consider warfarin once acute phase over and no contraindications to anticoagulation. Ensure stroke team advise before prescribing warfarin (see page 106 for information on AF management and page 76 for warfarin initiation information). If discharging patient home on warfarin ensure follow up arrangements are in place (see page 82 for referral to anticoagulation clinic).
- If contraindications to warfarin, seek advice from the stroke consultant.

**Patients with haemorrhagic stroke:**

- Antiplatelet drugs are contraindicated unless cause of intracerebral bleed resolves and patients also have concomitant ischaemic heart or stroke disease. This is a risk / benefit balance and advice should be sought from the stroke team.

*Continues on next page*

## B. Blood Pressure (BP)

After the acute phase, all patients with a BP > 130 mmHg systolic or > 80 mmHg diastolic should be considered for a:

- Long-acting angiotensin-converting enzyme inhibitor (ACEI) and a diuretic (such as bendroflumethiazide), if tolerated and not contraindicated.
- Add additional antihypertensives if BP remains above target level (see NHSGGC Hypertension Guideline). Even 'normotensive' patients (< 130 mmHg systolic or < 80 mmHg diastolic) may benefit from antihypertensive treatment, especially with ACEIs.

## C. Cholesterol

Unless contraindicated, treat all patients who have had an ischaemic stroke with a statin regardless of baseline cholesterol concentration. Recommended drug of choice is:

**Simvastatin oral 40 mg each night** (refer to NHSGGC Lipid Lowering Guideline on StaffNet).

## D. Diabetes

If initial blood sugar is elevated, investigate for diabetes. If already diabetic, check HbA1c and aim for good control. This may be difficult to achieve for many patients, but this is an important, modifiable risk factor.

## E. Endarterectomy? Echo?

Ensure stroke team have advised on the need for carotid investigations (if stroke within 3 months). No carotid investigation is required for patients with primary intracerebral haemorrhage. A cardiac echo may be needed to look for a source of emboli or to assess left ventricular hypertrophy. Again, discuss with the stroke team on the need for this.

## F. Further advice for a healthy lifestyle

- Smoking – Record tobacco consumption, advise smoking cessation and offer referral to Smoking Cessation Service (see Appendix 1).
- Exercise – Provide general supportive advice for healthy active lifestyle within functional limits.
- Weight – Record height and weight. Aim for improved BMI (Gold standard is < 25).
- Nutrition – Offer supportive advice for healthy eating, particularly for patients with diabetes or high cholesterol.
- Driving – Offer advice as per DVLA guidance – driving is prohibited for 1 month after event and longer if recurrent events or presence of a disability impairing driving, or if PSV/HGV driver.
- Alcohol – Advise on safe limits and refer to Addiction Team if appropriate.



## Section 5

# Respiratory System

# Guidelines for Blood Gas Analysis

## Oxygen therapy

In critical illness, initial oxygen therapy is a reservoir mask at 15 L/minute.

For most acutely unwell patients, oxygen should be prescribed to achieve a target oxygen saturation of 94 - 98%.

For patients at risk of hypercapnic respiratory failure (e.g. exacerbation of chronic obstructive pulmonary disease (COPD), chest wall deformity, neuromuscular disorder, obesity-hypoventilation syndrome), oxygen should be prescribed to achieve a target oxygen saturation of 88 - 92%.

It is recommended that oxygen be commenced at 28% via a venturi mask pre-hospital and 24% via a venturi mask in hospital for patients with prior hypercapnic failure (i.e. required non-invasive ventilation - NIV).

For patients with COPD, nebulisers should be driven using an air cylinder and oxygen supplement via nasal cannulae. For patients with asthma or other conditions, nebulisers should be oxygen-driven.

Arterial blood gases should be rechecked 30 - 60 minutes after initiation of controlled oxygen or initiation of NIV, or immediately if clinical deterioration.

Oxygen is a drug and should be prescribed on the drug chart detailing delivery device, flow rate and oxygen concentration.

## Indications for blood gas analysis

- All critically ill patients.
- Unexpected or inappropriate hypoxaemia ( $\text{SpO}_2 < 94\%$  in patients breathing room air or oxygen) or any patient requiring oxygen to achieve the above target range. Allowance should be made for transient dips in saturation to 90% or less in normal subjects during sleep.
- Deteriorating oxygen saturation or increasing breathlessness in a patient with previously stable hypoxaemia (e.g. severe COPD).
- Any previously stable patient who deteriorates and requires a significantly increased  $\text{FiO}_2$  to maintain a constant oxygen saturation.
- Any patient with risk factors for hypercapnic respiratory failure who develops acute breathlessness, deteriorating oxygen saturation, drowsiness or other symptoms of carbon dioxide retention e.g. COPD or neuromuscular disorders.
- Acutely breathless or with poor peripheral circulation in whom a reliable oximetry signal cannot be obtained.
- Severe metabolic disturbance e.g. diabetic ketoacidosis (DKA) or renal failure, hypothermia (temperature  $< 32^\circ\text{C}$ ), severe sepsis, shock or altered conscious level.
- Any other evidence from the patient's medical condition that would indicate that blood gas results would be useful in the patient's management (e.g. an unexpected change in the MEWS score or an unexpected fall in oxygen saturation of 3% or more, even if within the target range).
- Smoke inhalation / carbon monoxide poisoning / cyanide poisoning.



## Interpretation of blood gases

First consider oxygen and carbon dioxide; *patients die of hypoxia faster than any other blood gas abnormality.*

### 1. Examine the $\text{PaO}_2$ (normal range on air 10 - 13 kPa)

#### Is the patient hypoxaemic?

- If the  $\text{PaO}_2$  is low, consider increasing the oxygen.
- If the  $\text{PaO}_2$  is low in the context of chronic respiratory disease, consider what the normal level of  $\text{PaO}_2$  would be for any given patient and aim for that.

**Example:** *In some patients with COPD, simply targeting a  $\text{pO}_2 > 8 \text{ kPa}$  (or oxygen saturations between 88 - 92%) will suffice, and will reduce the likelihood of  $\text{CO}_2$  retention.*

#### Is the $\text{PaO}_2$ normal?

- Consider whether this is appropriate in the context of flow of oxygen delivered.

**Example:** *If a 20 year old is requiring 60% oxygen via a venturi mask to maintain their  $\text{PaO}_2$  in the normal range, then their oxygen delivery is significantly compromised.*

- **Rule of thumb:**      %  $\text{O}_2$  delivered **minus** (10 to 15)  $\longleftrightarrow$  expected  $\text{pO}_2$   
**Examples:**              60%  $\text{O}_2$  delivered **minus** (10 to 15)  $\longleftrightarrow$  then expected  $\text{pO}_2$  45 - 50 kPa  
                                  28%  $\text{O}_2$  delivered **minus** (10 to 15)  $\longleftrightarrow$  then expected  $\text{pO}_2$  13 to 18 kPa

### 2. Examine the $\text{PaCO}_2$ (normal range 4.6 - 6 kPa)

#### Is the patient hypercapnic?

- Do they have underlying COPD?  
*If so, give controlled oxygen using a venturi mask, targeting oxygen saturations of 88 - 92%, and optimise medical management. If unable to maintain oxygen saturations at this level or worsening hypercapnia / acidosis despite optimum therapy then discuss with ITU / consider non-invasive ventilation.*
- Are they tiring?  
*Patients who have had persistently increased work of breathing can begin to retain  $\text{CO}_2$  and should be discussed with ITU.*
- Is their respiratory function suppressed?  
*Check patients have not been taking opiates or sedatives.*
- Patients with acute severe asthma who have a normal or raised  $\text{pCO}_2$  merit early discussion with ITU.

#### Is the patient hypocapnic?

- If the patient is acidotic or has a normal hydrogen ion, then this is likely respiratory compensation for a metabolic acidosis.
- If the patient is alkalotic, then this is commonly due to hyperventilation.
- If the patient has a normal  $\text{PaO}_2$ , then they may have an underlying oxygen delivery problem e.g. pulmonary embolism.

Next consider acid-base balance.

### 3. Examine the hydrogen ion ( $H^+$ normal range 35 - 45 nmol/L)

#### If the $H^+$ is increased, the patient is acidotic

- If the  $PaCO_2$  is increased this is a respiratory acidosis  
*Common causes of respiratory acidosis include some exacerbations of COPD, respiratory depression e.g. opiate / sedative use or neuromuscular disorders*
- If the  $PaCO_2$  is normal or reduced, this is a metabolic acidosis  
*Common causes of a metabolic acidosis include diabetic ketoacidosis (DKA), lactic acidosis, renal failure, drugs.*

#### If the $H^+$ is reduced, the patient is alkalotic

- If the  $PaCO_2$  is reduced this is a respiratory alkalosis  
*Common cause of respiratory alkalosis includes hyperventilation.*
- If the  $PaCO_2$  is normal or increased this is a metabolic alkalosis.  
*Common causes of a metabolic alkalosis include vomiting and diarrhoea.*

#### If the $H^+$ is normal, then the patient may have a compensated acid-base disturbance

- If the bicarbonate (normal range 22 - 27 mmol/L) is raised, then the patient has a compensated respiratory acidosis (commonly in severe COPD or neuromuscular disease).
- In DKA, the treatment should be adjusted according to the bicarbonate as it lags behind the hydrogen ion which normalises first (see DKA management page 266).

Venous gases can be used for following improvement in metabolic acidosis e.g. in DKA or for quick initial review of electrolytes in emergency situation.

# Guidelines on Oxygen and Oximetry

Guidelines on Blood Gas Analysis on page 126



## Pneumonia

- In severe pneumonia use continuous monitoring.
- Adjust oxygen treatment to maintain target saturation as per page 144.
- Check arterial gases initially, and again if saturation falls.
- Consider referral to ITU if saturation cannot be maintained > 90%.

## Asthma

- Use continuous monitoring for persistent severe asthma (aim for saturation as per pages 139 and 141).
- Arterial gas measurement to exclude CO<sub>2</sub> retention if any clinical deterioration.

## COPD

See section on COPD, page 132.

## Shocked patient

- Oximetry may be unreliable due to poor perfusion.
- Patients should be given medium flow, high concentration oxygen via reservoir mask until condition assessed.
- Always check arterial gases as a baseline.

**N.B.** Do not rely on oxygen saturation alone in isolation from arterial gas measurement and/or clinical assessment.

## Chronic oxygen therapy

Oxygen in the home is provided to correct chronic hypoxia particularly if associated with cor pulmonale, and sometimes for symptomatic relief in intermittent hypoxia. Do not assess patients for home oxygen therapy during an acute admission but refer to your local respiratory department for review.



# Management of Chronic Obstructive Pulmonary Disease (COPD)

## Introduction

COPD is a chronic, usually progressive disorder, characterised by airflow obstruction with little reversibility and usually > 20 pack years of smoking. Referral for a chest opinion is indicated in those with no or minimal smoking history, or age less than 40 years. Treatment for COPD is used to decrease symptoms and/or complications. Dyspnoea is the reason most patients seek medical attention and is a major cause of disability and anxiety associated with the disease.

## Assessment / monitoring

- Dyspnoea / exercise tolerance
- Spirometry
- Oximetry
- Weight

## General management

- Smoking cessation has the greatest capacity to influence mortality in COPD and all patients with COPD should receive education and support relating to this (see Appendix 1).
- Pneumococcal vaccination (**once only**) and influenza vaccination (**annually**) should be offered to all patients with COPD.
- A stepped approach with increases in treatment according to severity of disease is taken in the pharmacological management of chronic COPD. (The step down approach used in asthma is not applicable as COPD is a progressive disease).
- Patients with exertional dyspnoea (MRC grade 3/5 or more) should be considered for pulmonary rehabilitation.
- Peripheral oedema may indicate the development of *cor pulmonale* and the need for long-term oxygen therapy. If oxygen saturation < 92% check ABG. If  $\text{PaO}_2 < 8 \text{ kPa}$  refer to chest clinic to assess for long-term oxygen therapy.
- Patients with a BMI < 20 or significant (> 3 kg) unintended weight loss should be assessed for causes of weight loss, in particular the development of lung cancer, and referred for dietary advice.

## Drug therapy / treatment options

### Inhaler devices

Metered dose inhalers (MDIs) are first line, however, not all patients can use them. Spacer devices can improve lung deposition with MDIs. Some examples of inhalers which may be used are detailed on the next page; however the drug choice at each step may be determined by the appropriate inhaler device for the patient. Your clinical pharmacist or respiratory nurse specialist can assess the patient and advise on alternative inhaler devices if appropriate.

**Continues on next page**

## Drug therapy / treatment options continued

**Table 1 : Inhaled treatment options for COPD**

	FEV1 > 50%	FEV1 ≤ 50%
<b>1st line inhaled treatment</b>	SABA	SABA
<b>2nd line inhaled treatment</b>	LAMA or LABA	LAMA or LCCI*
<b>3rd line inhaled treatment</b>	LAMA + LABA	LAMA + LCCI*

\* where patient has had 2 or more exacerbations in 12 consecutive months

### Notes:

- SABA = short-acting Beta<sub>2</sub> agonist e.g. **Salbutamol inhaler 2 puffs (200 microgram) as required.**
- LAMA = long-acting muscarinic antagonist e.g.
  - **Tiotropium Handihaler® (dry powder) 18 microgram once daily** or
  - **Tiotropium Respimat® 2 puffs (5 microgram) once daily (restricted to patients with poor dexterity and those that have difficulty using the Handihaler®)**
- LABA = long-acting Beta<sub>2</sub> agonist e.g.
  - **Salmeterol evohaler 2 puffs (50 microgram) twice daily** or
  - **Formeterol 12 microgram twice daily.**
- LCCI = LABA + corticosteroid combination inhaler – choice can vary - see BNF / NHSGGC Formulary.
- If still symptomatic despite maximal inhaled therapy, consider adding oral theophylline and mucolytic therapy. Prescribe theophylline by brand name as the pharmacokinetic profiles of controlled preparations differ. Theophylline dose will need to be reduced if patient is treated with a macrolide or fluoroquinolone. See page 335 for monitoring advice.
- Consider long-term oxygen therapy (LTOT) in patients with PaO<sub>2</sub> ≤ 7.3 kPa when stable, or > 7.3 kPa and < 8 kPa when stable and: secondary polycythaemia, peripheral oedema, nocturnal hypoxaemia or pulmonary hypertension, if they have stopped smoking.



# Acute Exacerbation of Chronic Obstructive Pulmonary Disease (COPD)

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## Introduction

COPD is a chronic, usually progressive, disorder characterised by airflow obstruction with little reversibility and usually > 20 pack years of smoking. An acute exacerbation may be described as a worsening of a stable situation.

Common features are, increased:

- Dyspnoea
- Cough
- Sputum (volume or purulence)
- Wheeze

## Assessment / monitoring

- Arterial blood gases (document oxygen therapy)
- CXR
- ECG
- U&Es, LFTs, and CRP
- FBC
- Theophylline level (if patient on theophylline)

The differential diagnosis includes:

- Pneumonia, pneumothorax, pulmonary embolus
- Left ventricular failure
- Lung cancer

## Treatment options

### Treatment: immediate

- **Oxygen 28% via venturi mask until gases checked – then titrate according to arterial blood gases.**

Aim for  $\text{PaO}_2 > 7.5 \text{ kPa}$  but  $< 10 \text{ kPa}$ . If worsening respiratory acidosis or hypercapnia occurs, despite achieving target oxygen levels and adequate immediate therapy, ventilation (see page 135) may be indicated.

**Continues on next page**

### Treatment options continued

- Bronchodilators
  - Nebulised: Nebulisation should be with air. Supplementary oxygen (1 - 6 L/min to maintain oxygen saturation 88 - 92%) can be given by nasal cannula during nebulisation. If air driven nebuliser is not available, use up to 6 L/min of oxygen for a maximum of 10 minutes to drive nebuliser. Use a mouth-piece or close fitting mask to avoid risk of acute angle-closure glaucoma with ipratropium.

**Salbutamol 5 mg nebulises four times daily (but can be given up to 2 hourly as needed)**

**Ipratropium 0.5 mg nebulises four times daily (add if poor response to salbutamol *and if also on tiotropium, withhold the tiotropium*)**

- IV bronchodilators: Aminophylline may be considered if there is no response to nebulised therapy.

**N.B.** The evidence for aminophylline is not conclusive although individual patients may benefit. Discuss with senior doctors. Side effects include nausea, seizures and it can precipitate arrhythmias.

**Aminophylline infusion – dose administration and monitoring guidance see appendices 2 and 3.**

- Corticosteroids:
  - Prednisolone oral 30 mg - 50 mg each morning, for 7 days.** (Refer to local unit protocols for more detail) or if patient is unable to take oral treatment give:
  - Hydrocortisone IV 100 mg immediately then review, and if there is a need to continue IV therapy, prescribe 50 - 100 mg 6 - 8 hourly.**
- Antibiotics: Indicated in the presence of purulent sputum, raised inflammatory markers or focal radiological changes. They should be given orally unless there is a clinical reason for giving IV antibiotics. Send sputum for microscopy and culture. Course duration for non-severe exacerbation is 5 days, and for severe exacerbation a total of 7 days.

### First line therapy

**Amoxicillin oral 500 mg every 8 hours (in severe exacerbation give IV 1 g 8 hourly) or**

**Doxycycline oral 200 mg immediately then 100 mg daily (not available IV) or**

**Clarithromycin oral 500 mg every 12 hours**

**N.B.** Serious drug interactions with clarithromycin, see BNF (Appendix 1).

- DVT Prophylaxis :
  - Enoxaparin SC 40 mg once daily (reduce to 20 mg daily if eGFR < 30 ml/minute/1.73m<sup>2</sup>).**
- Physiotherapy: but **N.B.** there is no data to support emergency call out
- If persistent acidotic hypercapnic ventilatory failure despite optimal medical therapy consider discussion with ITU and/or non-invasive ventilation (NIV) - see protocol on page 135)

**Continues on next page**

**Treatment options continued**

- Mucolytic therapy may be of symptomatic benefit in patients where sputum clearance is troublesome:

**Carbocisteine oral 750 mg three times daily then reduced to 1.5 g daily in divided doses as condition improves.**

- **Nicotine replacement therapy if appropriate (see Appendix 1).**
- Consider for referral to early supported discharge team (British Lung Foundation Nurses).

**Prior to discharge**

1. Check inhaler technique and drug regimen: stop nebulised bronchodilator for 24 hours prior to discharge (if not used at home and not discharged under early supported discharge protocol). Home nebulisers should not be introduced as routine treatment immediately after acute exacerbation.
2. **Prednisolone oral 30 mg - 50 mg each morning for 7 days, without dose tapering, will be suitable for most patients.**

**N.B.** There may be circumstances however where a tapering dose is necessary, e.g. in patients who are oral steroid dependent. In such circumstances reduce the dose to the normal maintenance dose or 10 mg daily (whichever is the greater) with a plan for early outpatient review or refer to local unit protocol.

*Clinical improvement with oral steroids in acute COPD does not indicate need for long-term inhaled steroid.*

3. Physiotherapy advice regarding pulmonary rehabilitation.
4. Smoking cessation advice and referral if appropriate (see Appendix 1).
5. Home oxygen is usually assessed as an outpatient when patients are stable for at least 6 weeks post exacerbation and an ex-smoker or non-smoker.
6. Ensure optimal inhaled medication prior to discharge (see page 131).



# Non-Invasive Ventilation (NIV) Protocol in COPD

---

**AIM = To ensure patients are correctly and promptly identified as candidates for NIV.**

## Step 1

- History
- Examination
- CXR
- Arterial Blood Gases (ABGs)

### Is the patient a candidate for NIV?

- Does the patient have a diagnosis of COPD?
- Does the patient have an acidotic exacerbation of COPD?
- If 'NO' to either of the above then discuss with senior medical staff suitability for NIV.
- Physiological criteria: decompensated type 2 respiratory failure i.e. pH < 7.35 ( $H^+ > 45 \text{ nmol/L}$ ) and  $pCO_2 > 6 \text{ kPa}$ .
- On maximum medical therapy (and has been for 1 hour), nebulised salbutamol when required, corticosteroids, antibiotics if appropriate, controlled  $FiO_2$  (usually 28% venturi mask – aim for  $O_2$  saturation 86 - 90%), and reversal of respiratory depressants.
- Moderate to severe dyspnoea, RR > 25 bpm.

## Step 2 – Are there any contraindications to NIV?

### Absolute contraindications:

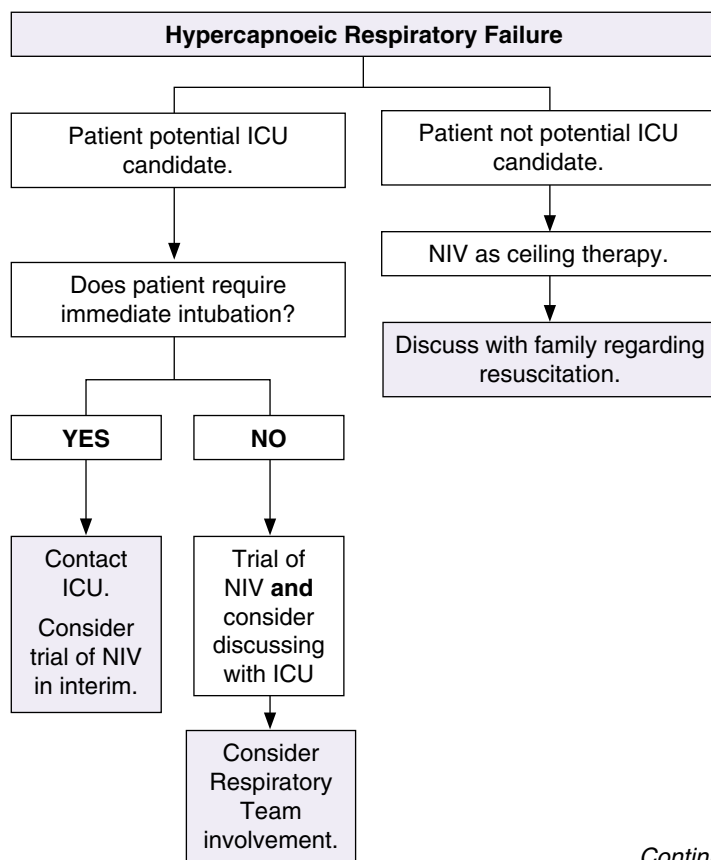
- Respiratory arrest / need for immediate intubation
- Facial trauma / burns / surgery / abnormalities
- Fixed upper airway obstruction
- Severe vomiting
- Acute severe asthma
- Pneumothorax (unless chest drain inserted)

*Continues on next page*

**Relative contraindications:**

- Inability to protect airway
- Life-threatening hypoxaemia
- Haemodynamic instability
- Impaired consciousness
- Confusion / agitation
- Bowel obstruction
- Recent facial / upper airway or upper GI tract surgery
- Copious respiratory secretions
- Pneumonia

(NIV may be used despite 'relative contraindications' if this is the 'ceiling' of treatment and the patient is not for ICU / intubation.)

**Step 3 – Patient for ICU / intubation?**

*Continues on next page*

## Step 4 – Initiation of NIV

**AIM** = To ensure patients are correctly and safely initiated on NIV.

*Arterial blood gases must be checked prior to starting NIV and whilst the patient is on controlled  $\text{FiO}_2$ .*

1. Size for face mask (select the smallest mask that fits comfortably):
  - small leaks are permitted but not into the eyes.
  - assess mask fit by monitoring mask leak, aim to keep any leaks to a minimum.
  - demonstrate use of quick release strap.
2. Position the patient in bed or chair at  $> 30^\circ$  angle.
3. Set ventilator settings:
  - a. IPAP = 10 cm  $\text{H}_2\text{O}$ .
  - b. EPAP = 4 cm  $\text{H}_2\text{O}$ .
  - c. RATE = 12 bpm (becomes active should patient stop breathing or have periods of apnoea).
  - d. EXPIRATION TRIGGER = 1.
  - e. INSPIRATION TRIGGER = 1.
  - f. RISE TIME = 5.
  - g. OXYGEN = if supplementary oxygen required, set at 4 L/min and titrate as necessary to maintain  $\text{SpO}_2$  88 - 92%.
4. Increase IPAP in increments of 2 cm  $\text{H}_2\text{O}$  to the maximum that patient will tolerate (usually not more than 20 cm  $\text{H}_2\text{O}$ ).

## Step 5 – Monitoring the patient on NIV

*Record observations on NIV Observation Chart every 15 minutes for the first hour, evaluate thereafter:*

- $\text{SpO}_2$  – continuous monitoring with pulse oximeter.
- ABGs – 1 hour post commencement of NIV, thereafter evaluate as per patient's condition (if ABGs worsening after 4 - 6 hours then this is a poor prognostic factor for NIV).
- Respiratory rate.
- Heart rate.
- Evaluate accessory muscle use.
- Chest wall movement (to ensure adequate ventilation).
- Synchrony with the ventilator and air leaks.

*Continues on next page*

## Step 6 – Treatment failure

- Indications of failure:
  - No improvement in acidosis
  - No improvement in  $\text{CO}_2$
  - No reduction in respiratory rate
  - Patient not tolerating
  - Patient refusal
- If patient is not tolerant of, or refuses NIV, rediscuss management with senior medical staff.
- *If ceiling of treatment and NIV fails, refer to local palliative care guidelines.*
- *Ensure documentation of patient and family views.*

## Step 7 – Weaning criteria

Is the patient ready to wean?

- Clinically stable for > 6 hours
- $\text{RR} < 24$  bpm
- $\text{HR} < 110$  bpm
- $\text{H}^+ < 45$  nmol/L
- $\text{SpO}_2 > 88\%$  on 4 L  $\text{O}_2$  whilst on NIV

**If 'NO' to the above:**

- Continuous NIV (monitor as before)

**If 'YES' to the above:**

- Allow breaks for meals, medication, physiotherapy etc
- Consider nocturnal NIV only
- Controlled  $\text{O}_2$  therapy

*If worsening respiratory distress, reassess patient, review therapy and consider recommencing NIV.*

## Patients on home NIV

Some patient use NIV chronically at home. Typical reasons are:

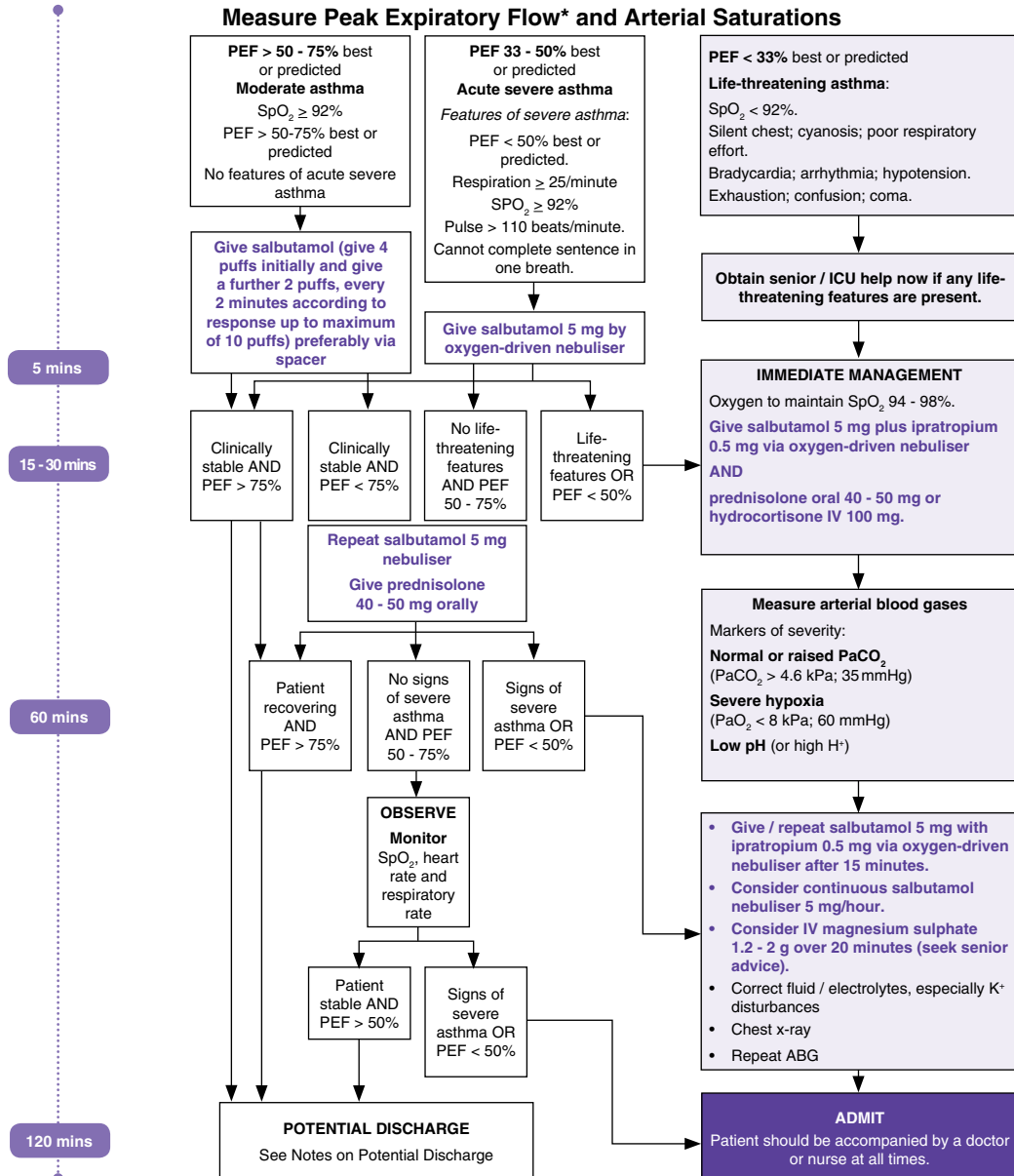
- Chronic hypercapnic respiratory failure:
  - obesity hypoventilation
  - chest bellows disease
  - neuromuscular disease
  - occasionally COPD
- Palliation in motor neurone disease (MND / ALS)

The local respiratory unit should be involved early in the care of these patients.

# Management of Acute Severe Asthma in Adults in A&E



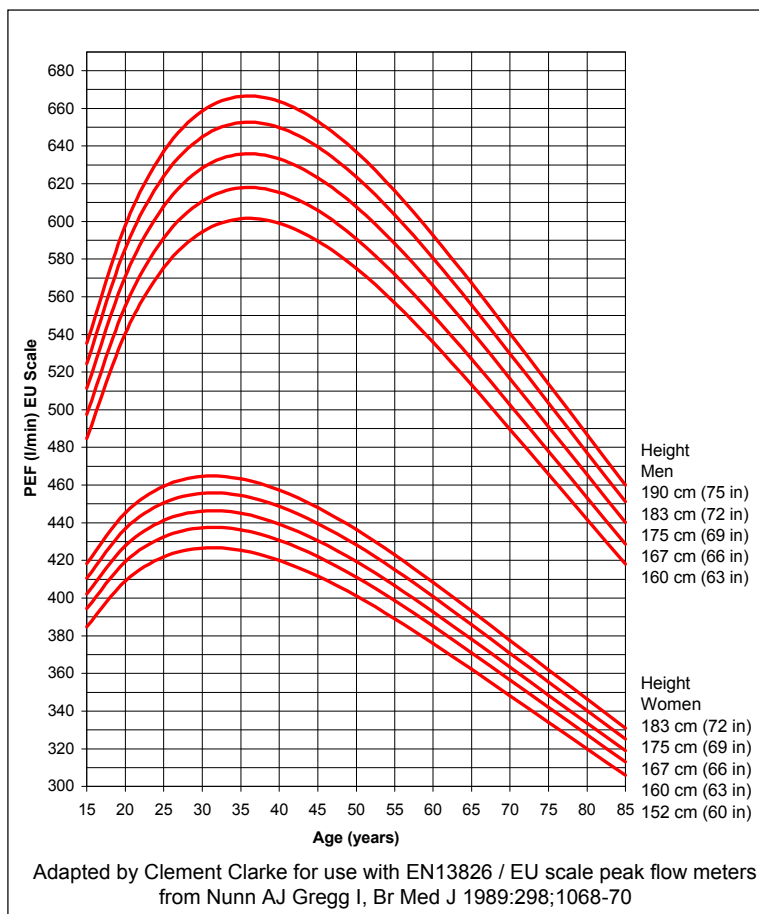
SIGN 101 British Guideline on the Management of Asthma (revised Jan 2012). Algorithm adapted with permission from the British Thoracic Society



## Notes on Potential Discharge from A&E

- In all patients who received nebulised Beta<sub>2</sub> agonists prior to presentation, consider an extended observation period prior to discharge.
- If PEF < 50% on presentation, prescribe **prednisolone oral 40 - 50 mg/day for 5 days**.
- In all patients ensure treatment supply of inhaled steroid and Beta<sub>2</sub> agonist and check inhaler technique.
- Arrange GP follow up for 2 days post discharge.
- Fax discharge letter to GP.
- Refer to asthma liaison nurse / chest clinic.

## \*Peak Expiratory Flow Rate – Normal Values



From SIGN Guideline 101 with permission

# Management of Acute Severe Asthma in Adults in Hospital



SIGN 101 British Guideline on the Management of Asthma (revised Jan 2012). Algorithm adapted with permission from the British Thoracic Society

## Features of acute severe asthma:

- Peak expiratory flow (PEF) 33 - 50% of best (use % predicted if recent best unknown).
- Can't complete sentences in one breath.
- Respiration  $\geq$  25 breaths/minute.
- Pulse  $\geq$  110 beats/minute.

## Life-threatening features:

- PEF < 33% of best or predicted.
- SpO<sub>2</sub> < 92%
- Silent chest, cyanosis, or feeble respiratory effort.
- Bradycardia, dysrhythmia, or hypotension.
- Exhaustion, confusion, or coma.

## If patient has any life-threatening feature:

Measure arterial blood gases. No other investigations are needed for immediate management.

## Blood gas markers of a life-threatening attack:

- Normal (4.6 - 6 kPa, 35 - 45 mmHg) PaCO<sub>2</sub>
- Severe hypoxia: PaO<sub>2</sub> < 8 kPa (60 mmHg) irrespective of treatment with oxygen.
- A low pH (or high H<sup>+</sup>).

**Caution:** *Patients with severe or life-threatening attacks may not be distressed and may not have all these abnormalities. The presence of any should alert the doctor.*

## Near fatal asthma:

- Raised PaCO<sub>2</sub>
- Requiring IPPV with raised inflation pressures.

## IMMEDIATE MANAGEMENT

- Oxygen to maintain SpO<sub>2</sub> 94 - 98%.  
(CO<sub>2</sub> retention is not usually aggravated by oxygen therapy in asthma).
- **Salbutamol 5 mg or terbutaline 10 mg via an oxygen-driven nebuliser.**
- **Ipratropium bromide 0.5 mg via an oxygen-driven nebuliser.**
- **Prednisolone oral 40 - 50 mg or hydrocortisone IV 100 mg or both if very ill.**
- No sedatives of any kind.
- Chest radiograph only if pneumothorax or consolidation are suspected or patient requires IPPV.

## If life-threatening features are present:

- Discuss with senior clinician and ICU team.
- **Add IV magnesium sulphate 1.2 - 2 g infusion over 20 minutes (unless already given).**
- **Give nebulised Beta<sub>2</sub> agonist more frequently e.g. salbutamol 5 mg up to every 15 - 30 minutes or 10 mg continuously hourly.**

## SUBSEQUENT MANAGEMENT

### If patient is improving continue:

- Oxygen to maintain SpO<sub>2</sub> 94 - 98%.
- **Prednisolone oral 40 - 50 mg each day or hydrocortisone IV 100 mg 6 hourly.**
- **Nebulised Beta<sub>2</sub> agonist and ipratropium 4 - 6 hourly.**

### If patient not improving after 15 - 30 minutes:

- Continue oxygen and steroids.
- **Give nebulised Beta<sub>2</sub> agonist more frequently e.g. salbutamol 5 mg up to every 15 - 30 minutes**
- **Continue ipratropium 0.5 mg 4 - 6 hourly until patient is improving.**

### If patient is still not improving:

- Discuss patient with senior clinician and ICU team.
- **IV magnesium sulphate 1.2 - 2 g over 20 minutes (unless already given).**
- **Senior clinician may consider use of IV Salbutamol\* or IV aminophylline or progression to IPPV.**

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**MONITORING**

- Repeat measurement of PEF 15 - 30 minutes after starting treatment.
- Oximetry: maintain SpO<sub>2</sub> 94-98%.
- Repeat blood gas measurements within 1 hour of starting treatment if:
  - initial PaO<sub>2</sub> < 8 kPa (60 mmHg) unless subsequent SpO<sub>2</sub> > 92%
  - PaCO<sub>2</sub> normal or raised
  - patient deteriorates.
- Chart PEF before and after giving Beta<sub>2</sub> agonists and at least 4 times daily during hospital stay.

*Transfer to ICU accompanied by doctor prepared to intubate if:*

- Deteriorating PEF, worsening or persisting hypoxia, or hypercapnea.
- Exhaustion, feeble respirations, confusion or drowsiness.
- Coma or respiratory arrest.

**DISCHARGE**

When discharged from hospital, patients should have:

- Been on discharge medication for 24 hours and *have had inhaler technique checked and recorded.*
- PEF > 75% of best or predicted and PEF diurnal variability < 25% *unless discharge is agreed with respiratory physician.*
- Treatment with **oral and inhaled steroids** in addition to bronchodilators.
- Own PEF meter and written asthma action plan.
- GP follow up arranged *within 2 working days.*
- Follow up appointment in respiratory clinic *within 4 weeks.*

Patients with severe asthma (*indicated by need for admission*) and adverse behavioural or psychological features are at risk of further severe or fatal attacks:

- Determine reason(s) for exacerbation and admission.
- Send details of admission, discharge and potential best PEF to GP.

**\*Salbutamol (Infusion solution 5 mg/5 ml)**

**N.B.** There are two formulations of salbutamol available for parenteral use. The infusion formulation, NOT the IV injection formulation, should be used to prepare infusions.

**Dose** – Initially 5 microgram/minute adjusted according to response and heart rate, usually in the range 3 - 20 microgram/minute.

**Administration** – Dilute 5 ml of solution with 500 ml glucose 5% or sodium chloride 0.9% to give a concentration of 10 microgram/ml

**Table 1 – Infusion rates for salbutamol**

Dose (microgram/minute)	Infusion Rate (ml/hour)
3	18
5	30
8	48
10	60
15	90
20	120

Please refer all patients admitted with a new diagnosis or exacerbation of asthma to the respiratory nurse specialists for education and inhaler technique prior to discharge.

For peak expiratory flow in normal adults, see chart on page 140.



# Management of Pneumonia



## Introduction

Pneumonia may be classified as Community Acquired (present on admission to hospital or developing within 48 hours of admission) or Hospital Acquired (developing at least 48 hours after admission or within 10 days of discharge). Pneumonia is defined as features of respiratory infection (cough, purulent sputum, fever, pleurisy, with new focal abnormalities on respiratory examination or CXR).

## Assessment / monitoring

The CURB-65 score predicts 30 day mortality and is a useful tool to support decisions regarding admission and management of community acquired pneumonia (see page 145 for flow diagram and page 229 for CURB-65 criteria). It should be used in conjunction with SIRS criteria (page 210) and should aid clinical judgement, not replace it. It is not used for aspiration pneumonia or infective exacerbations of asthma / COPD.

### Immediate investigations:

- Assess Airway, Breathing and Circulation and then give oxygen therapy as appropriate (see under General management).
- Arterial blood gas if oxygen saturations < 95% on air.
- BP – Give fluid challenge if hypotensive (systolic < 90 mmHg), 250 ml over 15 minutes with repeat BP every 15 minutes. Clinically review if no response to 1L fluid.
- FBC, U&Es, LFTs, CRP, blood cultures, sputum culture and sensitivity.
- EDTA sample of blood for multiplex PCR for pneumococcal and *Haem influenzae* DNA detection.
- CXR (lobar / bronchopneumonia)
- ECG
- Urine for *Legionella* and pneumococcal Ag
- Consider possibility of *M. tuberculosis*, particularly in upper lobe or cavitating disease – request sputum AFB as emergency.
- Respiratory secretions / mouthwash to virology if possibility of atypical or viral pneumonia.

### Further investigations:

- Nasopharyngeal aspirates / washings.
- Broncho-Alveolar Lavage (BAL) and tracheal aspirate or sputum for viral PCR.
- Throat swab in viral transport fluid may be sent (but less useful than samples listed above).
- Ensure travel history and contacts established (including animal and occupational).

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## General management

- Oxygen as appropriate to achieve target oxygen saturations as follows:
  - 94 - 98% for most patients
  - 92 - 96% may be acceptable if > 70 years old
  - 88 - 92% for those with COPD or at risk of hypercapnic respiratory failure (e.g. morbid obesity, neuromuscular or chest wall disease).
- Antibiotics as per flow diagram on next page - **start immediately**. Consider changing to appropriate antibiotic if specific organism identified.
- IV fluids (fever / excess fluid loss)
- Analgesia for pleuritic pain (NSAIDs if not contraindicated).
- Physiotherapy if copious secretions.
- Consider nursing patient in high dependency unit if severe.
- Low molecular weight heparin prophylaxis for DVT (see page 66)
- Repeat CXR and CRP and consider early respiratory referral if not improving within 3 days, atypical features, or effusion / empyema suspected.

## Treatment options

Community acquired pneumonia studies show increased mortality in young patients when antibiotic treatment is delayed. Prescribe antibiotic for **immediate administration** - see flow diagram on next page for antibiotic choice. Before prescribing, calculate patient's CURB-65 score (see page 229).

Pneumonia	Management
Hospital acquired	See page 231
Suspected <i>Staphylococcus aureus</i> pneumonia (e.g. IVDA, post influenzae or chicken pox)	See page 232
Aspiration pneumonia	See page 232
<i>Legionella</i> pneumonia	If confirmed, discuss with microbiology to guide antibiotic choice. If severe consider extending treatment up to 14 - 21 days
Cavitating pneumonia of any type	Discuss with local Respiratory Team early on. Consider <i>Staphylococcus</i> , <i>Streptococcus</i> , tuberculosis, Gram-negative (e.g. <i>Klebsiella</i> ) and non-infectious causes (lung cancer, vasculitis).

For oral step down – see page 205 IVOST guideline

NIV / CPAP should not be used for respiratory failure in pneumonia outside of an ITU setting as delayed transition to invasive ventilation (if required) increases mortality. If ITU admission is not appropriate due to comorbidities then NIV / CPAP on the ward could be considered as ceiling of treatment.

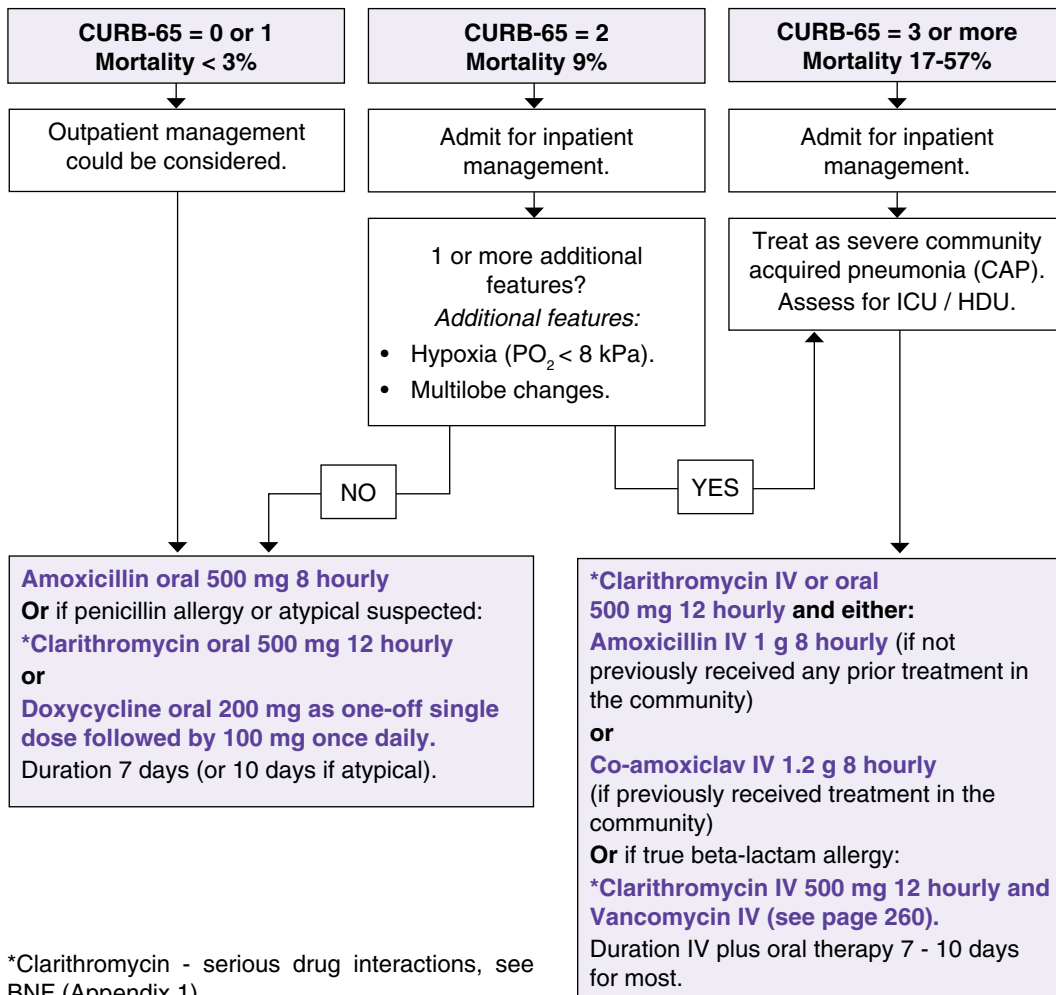
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## Treatment options continued

### Discharge planning

- Consider discharge when off oxygen and on oral antibiotics > 24 hours, CRP falling and clinical improvement (temperature < 37.3°C, RR < 24 breaths/minute, HR < 100 bpm, systolic BP > 90 mmHg).
- Follow up and repeat CXR required at 6 - 8 weeks post discharge.

## Antibiotic Choice Based on CURB-65 Score



\*Clarithromycin - serious drug interactions, see BNF (Appendix 1)

# Investigation of Unilateral Pleural Effusion

## Introduction

Pleural effusions, the result of the accumulation of fluid in the pleural space, are a common medical problem. They can be caused by several mechanisms including increased permeability of the pleural membrane, increased pulmonary capillary pressure, decreased negative intrapleural pressure, decreased oncotic pressure, and obstructed lymphatic flow.

Pleural effusions are classified into transudates and exudates:

- A transudative pleural effusion occurs when the balance of hydrostatic forces influencing the formation and absorption of pleural fluid is altered to favour pleural fluid accumulation. The permeability of the capillaries to proteins is normal. (Common causes – left ventricular failure (LVF), liver cirrhosis, hypoalbuminaemia and peritoneal dialysis).
- In contrast, an exudative pleural effusion develops when the pleural surface and/or the local capillary permeability are altered. (Common causes – malignancy and parapneumonic effusions).

## Assessment / monitoring

- The differential diagnosis of an effusion is wide, and may include pulmonary, pleural or extrapulmonary disease. Please contact local Respiratory team early to guide aspiration and further systematic investigation and management (see flow diagram on next page).
- According to Light's criteria an effusion is an exudate if any one of the following is true of pleural fluid aspirate:
  - Pleural total protein: serum total protein  $> 0.5$
  - Pleural LDH: serum LDH  $> 0.6$
  - Pleural LDH  $> 0.66$  upper limit normal range in your hospital.
- An accurate drug history should be taken during clinical assessment. Although uncommon, a number of medications have been reported to cause exudative pleural effusions. Discuss with a respiratory physician or your clinical pharmacist if necessary.
- Aspiration should not be performed for bilateral effusions in a clinical setting strongly suggestive of a pleural transudate, unless there are atypical features or they fail to respond to therapy.

## Safety and timing of pleural procedures

- Current BTS guidance recommends the use of bedside pleural ultrasound at the time of procedure where available to guide the site of pleural aspiration and chest drain insertion for pleural effusion. The aim is to reduce complications from perforation of viscera.
- Diagnostic / therapeutic aspiration should occur during normal working hours where possible, unless urgently indicated (e.g. large effusion causing significant breathlessness or hypoxia).
- Avoid chest drain placement out of hours if possible unless empyema present on diagnostic tap. Removal of all fluid prior to definitive diagnosis may delay further investigations and definitive management, especially of possible malignant effusions.

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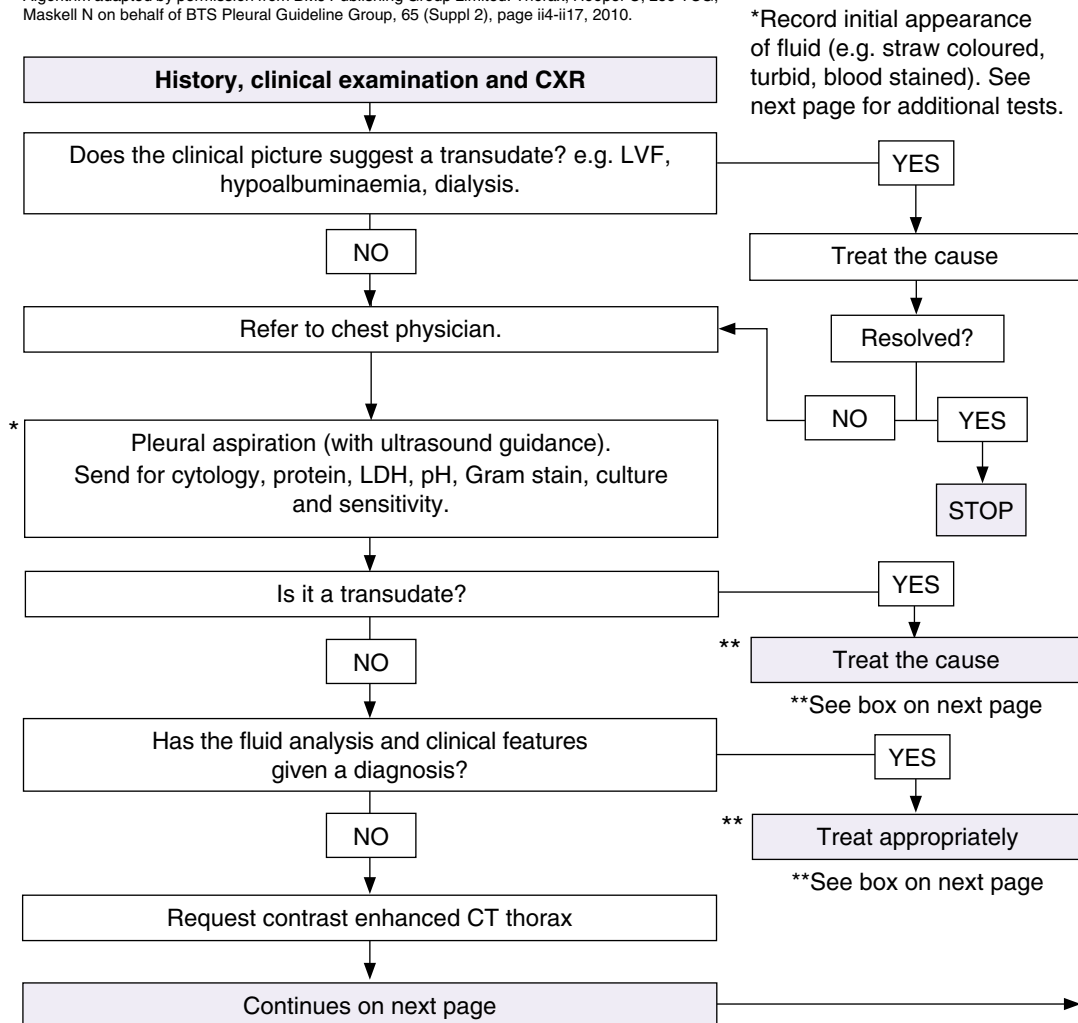
- Anticoagulation (raised prothrombin time, warfarin), low platelets ( $< 50 \times 10^9/L$ ), low molecular weight heparin (enoxaparin, dalteparin) and clopidogrel are relative contraindications to pleural aspiration / drainage and the procedure should be delayed until these factors are corrected, unless required as an emergency. Aspirin alone is not a contraindication to pleural procedures.

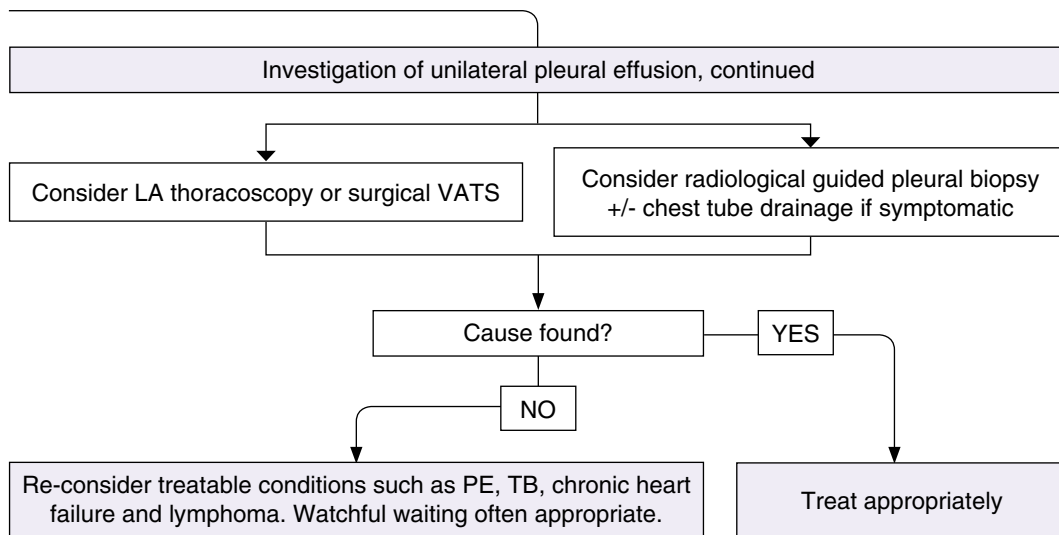
## General management

This aim of this guideline is to assist in the **investigation** of pleural effusion. Treatment is dependent on the cause e.g. if the cause is found to be pulmonary embolism then refer to the guideline for **treatment** of DVT / PTE (page 71).

## Investigation of unilateral pleural effusion

Algorithm adapted by permission from BMJ Publishing Group Limited. Thorax, Hooper C, Lee YCG, Maskell N on behalf of BTS Pleural Guideline Group, 65 (Suppl 2), page iii4-ii17, 2010.





Suspected cause	Test results	Management
Parapneumonic	Straw coloured exudate Normal pH / glucose	Treat as pneumonia Therapeutic aspirate / drainage if large / symptomatic
Complicated parapneumonic	May look opaque / turbid Acidic (pH < 7.2) Glucose < 2.2 mmol/L	Treat as pneumonia Early drainage – risk of progression to empyema
Empyema	Frank pus / organisms on gram film. Positive culture	Discuss antibiotics with microbiology Urgent drainage (same day)
Malignant (lung, mesothelioma, lymphoma, breast most common)	Often bloodstained (if in doubt – haematocrit) Normal pH. High LDH Send for cytology (as much as possible)	<b>Do not drain</b> until discussed with Respiratory. Therapeutic aspirate if symptomatic. Further investigation and definitive management may be affected if drained.
Chylothorax (e.g. post thoracic surgery / injury, haem malignancy)	Looks like milky tea Test for cholesterol and TGs Consider flow cytometry if available.	<b>Do not drain</b> until discussed with Respiratory. Therapeutic aspirate if symptomatic.
Rheumatoid	Turbid fluid Very low pH / glucose. Very high LDH	Discuss with Respiratory and/or Rheumatology May mimic empyema – if in doubt treat as this
Tuberculous	Normal pH / glucose Ensure sample for AAFB sent	<b>Do not drain</b> until discussed with Respiratory.

# Management of Pneumothorax

## Introduction

Pneumothorax is defined as air in the pleural space – that is, between the lung and the chest wall. Primary spontaneous pneumothoraces arise in otherwise healthy people without any lung disease. Secondary spontaneous pneumothoraces arise in subjects with underlying lung disease. By definition, there is no apparent precipitating event in either.

## Assessment / monitoring

- In both primary and secondary spontaneous pneumothoraces the diagnosis is usually established by plain chest radiography. (Expiratory chest radiographs are not recommended for the routine diagnosis of pneumothorax).
- A lateral chest or lateral decubitus radiograph should be performed if the clinical suspicion of pneumothorax is high, but a CXR is normal.
- CT scanning is recommended when differentiating a pneumothorax from complex bullous lung disease, when aberrant tube placement is suspected, and when the plain chest radiograph is obscured by surgical emphysema.
- The clinical history is not a reliable indicator of pneumothorax size.

## General management

- The flow diagrams for primary and secondary pneumothoraces provide a systematic approach to treatment decisions.
- Remember that breathless patients should not be left without intervention regardless of pneumothorax size on chest radiograph.
- There is no evidence that large chest drains are more effective except in trauma. Smaller drains (e.g.  $\leq 16$  Fr) are easier to insert and better tolerated by the patient.
- Ideally patients with chest drains should be managed in a ward used to dealing with them (e.g. respiratory ward) to minimise complications.

## Treatment options

- Further treatment options include chest drain suction, chemical pleurodesis and thoracic surgery. If a pneumothorax fails to respond to treatment within 48 hours, prompt referral to a respiratory physician is essential so that these options may be considered.
- Persons with a second or recurrent pneumothorax should be referred for a respiratory opinion as pleurodesis and investigation for underlying lung disease may be indicated.
- Patients should be advised that they should not fly until the pneumothorax has resolved radiologically and for 6 weeks afterwards. They should further be advised to seek specialist medical advice prior to scuba-diving as this may be permanently contraindicated.

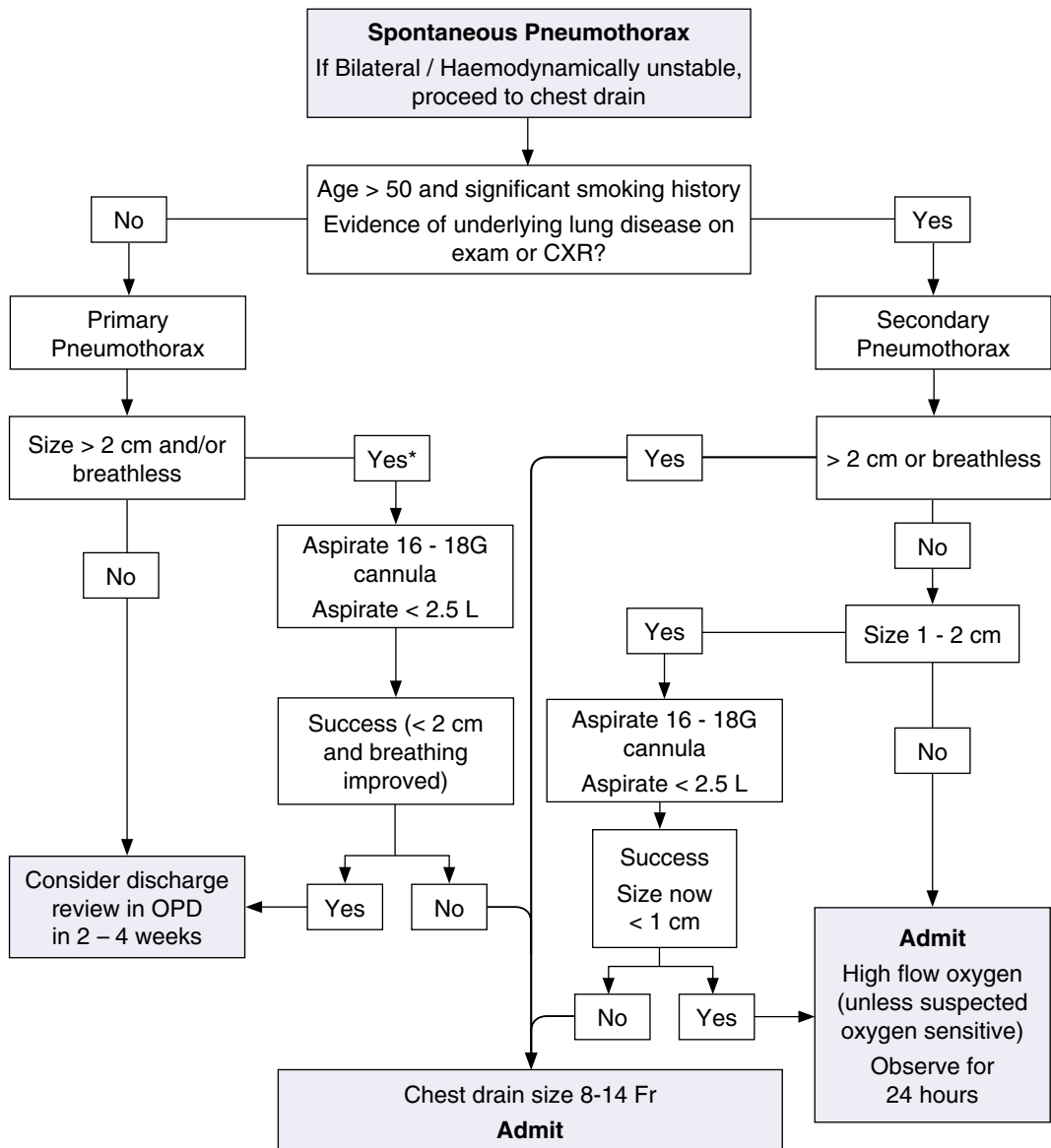
## Other

Strong emphasis should be placed on the relationship between the recurrence of pneumothorax and smoking in an effort to encourage patients to stop smoking.

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# Management of Spontaneous Pneumothorax

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\* In some patients with a large pneumothorax but minimal symptoms conservative management may be appropriate



# Management of Stridor

## Introduction

Stridor is an unusual, high pitched **inspiratory** sound which indicates significant airway obstruction and is usually caused by tracheal obstruction although can be a result of obstruction of the main bronchi. It is essential to distinguish it from other causes of dyspnoea as it signifies airway compromise.

Stridor represents an emergency situation and may require urgent ENT or Respiratory assessment. You may need to discuss the patient with ITU in order to secure the airway, particularly if the history is not clear cut. Discuss any patients with a Registrar or above immediately.

## Assessment / Monitoring

The initial assessment includes:

- Assess airways, breathing and circulation – immediate resuscitation as needed
- Oxygen saturations
- CXR – portable if patient not safe to go to department

Obtain full history including:

- The development of new or worsening respiratory symptoms
- Details of known malignancies and their treatment
- Co-morbidities
- Medication including use of and contraindications to corticosteroids

## Treatment / drug therapy

Treatment should include:

- **Oxygen (humidified if possible)**
- **Dexamethasone oral (unless swallowing problems then IV) 8 mg twice daily (morning and lunchtime)** if no contraindications and gastroprotection if appropriate (e.g. **Omeprazole oral 20 mg once daily or lansoprazole 15 mg once daily if no contraindications**).
- **Nebulised Salbutamol 5 mg when required**
- Treatment of any infection
- If severe and not improving on conservative management may need to **consider**
  - Tracheostomy if upper airway obstruction – discuss with oncall ENT
  - Nebulised adrenaline – discuss with senior doctor used to giving this e.g. ITU

Definitive treatment includes:

- Radiotherapy if appropriate – discuss with on-call clinical oncologist
- Laser / stenting for tracheal obstruction – discuss with local Respiratory team

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### **Treatment / drug therapy continued**

If no other treatment options then make patient comfortable with sedation. ALWAYS discuss with senior member of team.

- Consider Heliox 80:20 if available (helium oxygen mix which is less viscous than air and easier to inhale past obstruction).

# Initial Management of Superior Vena Cava Obstruction

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## Introduction

Superior Vena Cava Obstruction (SVCO) is an oncological emergency and any patients should be discussed with a Registrar or above immediately, and with the local Respiratory team or on-call Oncology team at the Beatson, as soon as possible to guide investigation and management.

SVCO results from the compression of the superior vena cava by either a tumour arising in the right main or upper lobe bronchus or mediastinal lymphadenopathy. Initially it is diagnosed clinically in the presence of neck and facial swelling and distended veins over the anterior chest wall. There may also be swelling of one or both arms and symptoms of dyspnoea and headache. Malignancy is the commonest cause (> 90%), most typically lung cancer, lymphoma, metastatic disease, mesothelioma and thymoma.

## Assessment / monitoring

The initial assessment includes:

- Obtain full history including:
  - Details of known malignancies and their treatment
  - The development of new or worsening respiratory symptoms, arm swelling and headaches, and rapidity of onset
  - Co-morbidities
  - Medication including use of and contraindications to corticosteroids and anticoagulation.

Examine for distended external and internal jugular veins, collateral veins on the anterior chest wall, facial, arm and neck swelling, and conjunctival redness.

- The investigation of choice is a contrast enhanced spiral or multi-slice chest CT (CTPA). This defines tumour extent, and often the site of occlusion or stenosis and the extent of any thrombus formation. Impending SVCO can be an incidental finding on CT.
- Confirmation of diagnosis by histology may involve fine needle aspirate of palpable nodes, bronchoscopy, or CT guided biopsy. Seek advice from Respiratory or Oncology as soon as possible to guide investigation and management.

In addition to above, questions that may influence whether the patient should be considered for SVC stent or chemotherapy / radiotherapy are:

- Is there a relative contraindication for radiotherapy? E.g. Previous chest / mediastinal radiotherapy? Is the patient able to lie reasonably flat?
- Performance status (0 = normal activity, 1 = restricted daily activity, 2 = ambulatory and self caring, out of bed > 50% of the day, 3 = capable of limited self care, in bed > 50% time, 4 = unable to self care, chair / bed-bound)
- Availability of stenting (performed by interventional radiology)



## Treatment / drug therapy

- Treatment is initially to alleviate symptoms and when known directed at the underlying cause.
- Ensure that the patient has no life-threatening symptoms (e.g. associated stridor) and is fit enough for active treatment.
- If no contraindication to corticosteroids commence:

**Dexamethasone oral (unless swallowing problems then IV) 8 mg twice daily (morning and lunchtime)** with gastroprotection for 48 - 72 hours (e.g. **Omeprazole oral 20 mg daily or lansoprazole oral 15 mg once daily if appropriate**).

This may be commenced while waiting for CT if clinical suspicion of SVCO is high. If CT confirms SVCO continue dexamethasone and seek urgent advice. As symptoms improve, dose may be gradually reduced over several weeks. If symptoms do not improve after 7 days consider stopping. If the CT scan shows no SVCO then stop dexamethasone.

- Other treatments frequently used are radiotherapy, stent insertion and chemotherapy and will depend on clinical scenario. If thrombus is present consider anticoagulation if no contraindications (see guideline on LMWH for VTE in cancer on the Clinical Guideline Electronic Resource Directory on StaffNet).

## Section 6

# Central Nervous System

# General Principles of Acute Pain Management

This guideline is aimed at providing quick and general guidance on acute pain management in adults, whether medical or surgical in origin. It does not replace the more detailed local guidelines available at each site, which should be referred to as appropriate. Contact your local Acute Pain Team for further advice.

For acute pain management in paediatrics, see Paediatric Analgesia in the Emergency Department guideline on StaffNet.

## Introduction

There is good evidence that effective pain relief reduces patient morbidity, helps facilitate early recovery, mobilisation and discharge from hospital. As pain is subjective, drug regimens need to be tailored to meet individual requirements. There are local variations in which particular drugs from each class of analgesics may be preferred and may be indicated in a specialty specific analgesic ladder.

## Assessment / monitoring

- Pain should be considered the fifth vital sign. It should be assessed on movement and the pain score recorded when routine observations are carried out.
- Use pain scores to assess initial analgesic requirements and the effects of treatment. Ensure the scores are documented.
- For post-operative pain monitor pain regularly. This should begin as soon as the patient is admitted to the recovery room and continued onto the ward thereafter.
- If pain scores are increasing **always** consider that there may be a reason for this e.g. worsening of condition, presence of wound infection, constipation, etc.

**N.B.** Pain assessment tools will vary between hospitals in NHSGGC.

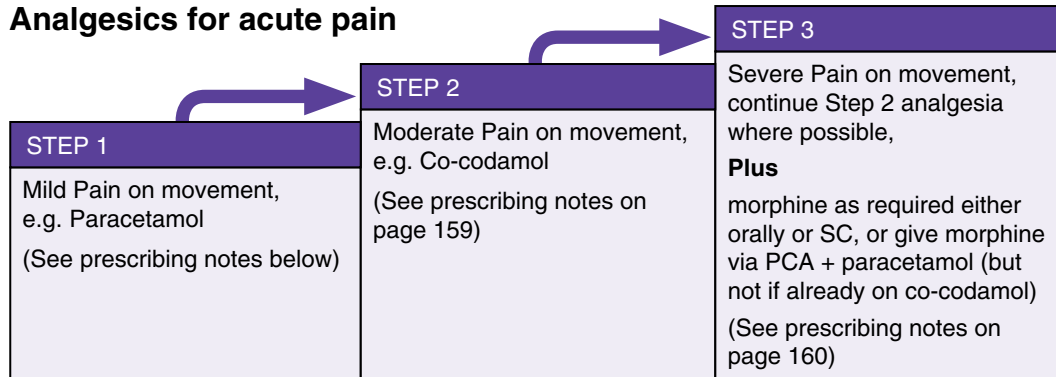
## Treatment options

### Some general principles of acute pain management:

- Before prescribing, ascertain whether patient is intolerant to any analgesic. If intolerant to opioid, establish which one as most patients are not intolerant of every opioid.
- Prescribe analgesia **regularly** according to guidelines on the next page or as per local guidelines, bearing in mind any documented sensitivities / allergies.
- Review analgesia at least daily and always at discharge.
- If an analgesic has failed to control the pain, step up to the analgesic on the next step of the ladder – it is pointless to try another analgesic of similar strength. For example, if a patient has pain not controlled by co-codamol 30/500 mg, prescribe a strong opioid such as morphine.
- Consider the available routes of administration. Use the oral route whenever possible and appropriate.
- Remember that analgesia can be **stepped down** as well as up.
- Consider the potential side effects of analgesia.

*Continues on next page*

## Analgesics for acute pain



Consider addition of NSAID if:

- No history of peptic ulceration.
- No renal impairment.
- No bleeding problems.
- No asthma.
- No aspirin sensitivity.

## Analgesics for acute pain – prescribing notes

### Step 1. Paracetamol

- Is an effective analgesic for mild to moderate pain
- Improves the effect of other analgesics in the treatment of moderate to severe pain.

#### General cautions:

- Haematology / ICU patients where pyrexia of sepsis may be masked.
- Hepatic failure (see below under each preparation)
- Renal impairment (see under IV preparation below)
- Low weight (see under IV preparation below)
- Do not use different routes of administration of paracetamol at the one time

**Paracetamol oral: 1 g four times daily (max dose). Consider dose reduction in patients with low body weight ( $\leq 50$  kg), renal / hepatic impairment or glutathione deficiency (chronic malnourishment, chronic alcoholism) to 15 mg/kg/dose up to four times daily (max 60 mg/kg/day). An example is: paracetamol oral 500 mg four times daily.**

#### Paracetamol IV

**Indication:** Short-term treatment of moderate pain following surgery, and for the short-term treatment of fever, when administration by IV route is clinically justified. Paracetamol IV is not more effective than oral paracetamol. If used, change to oral route as soon as possible. There are prescribing restrictions with IV paracetamol – acquaint yourself with local practice before prescribing.

**Dose:** Varies – dependent on weight, renal function and other co-morbidities. See general caution above, notes and dosing tables on the following page to determine dose.

**Continues on next page**

**Paracetamol IV continued**

**Administration:** Infuse ready-made solution over 15 minutes. For doses < 1 g, remove and discard excess drug / volume then administer required amount from vial.

**Important notes for IV paracetamol:**

- Low weight ( $\leq 50$  kg) or renal impairment ( $\text{CrCl} \leq 30$  ml/minute) dose reduce using the tables below.
- Maximum daily dose of paracetamol IV must not exceed 3 g per day in patients with:
  - hepatocellular insufficiency
  - chronic alcoholism
  - chronic malnutrition (low reserves of hepatic glutathione)
  - dehydration
- In overdose, paracetamol IV may possibly be more toxic than the oral route. See TOXBASE [www.toxbase.org](http://www.toxbase.org) (password required) for management.

**Table 1 – IV Paracetamol dosing table**

Patient group	Dose	Dosage interval	Maximum daily dose
Adults > 50 kg	1 g up to four times daily	4 hours	4 g
Adults $\leq 50$ kg	15 mg/kg per administration (see Table 2)	4 hours	60 mg/kg without exceeding 3 g
Renal impairment with creatinine clearance $\leq 30$ ml/minute	As above, depending on weight (see Table 2)	6 hours	As above, depending on weight

**Table 2 – IV Paracetamol dose for patients  $\leq 50$  kg**

Weight (kg)	Dose (mg)	Volume (ml)
30 - 34	500	50
35 - 39	550	55
40 - 44	650	65
45 - 50	700	70

**Continues on next page**



## Analgesics for acute pain – prescribing notes continued

### Step 2. Weak opioid analgesics for moderate pain

**Co-codamol\* oral 30/500 mg 1 - 2 tablets four times daily (max 8 tablets in 24 hours) or**

**Codeine oral 30 - 60 mg four times daily (max 240 mg/day orally) or**

**Dihydrocodeine oral 30 mg four times daily (max 120 mg/day orally).** Dihydrocodeine 60 mg will provide little additional analgesia but more pronounced side effects.

or

**Tramadol oral 50 - 100 mg four times daily.**

#### Notes

- \*Co-codamol contains paracetamol. Certain patients groups may require a dose reduction (see page 157 for details).
- Tramadol should not be used routinely. In particular it **should not** be used as breakthrough analgesia when patients are already prescribed Step 2 opioids.
- Where possible co-prescribe a stimulant laxative (see page 45).

### Adjuvants: NSAIDs (Non-Steroidal Anti-Inflammatory Drugs):

**Ibuprofen oral 400 mg three times daily.** Rarely will 800 mg three times daily be required as there is very little additional benefit but an increase in side effects.

or

**Diclofenac oral / rectal / IV 50 mg three times daily.**

Adding NSAIDs can be beneficial and may reduce opioid requirements. They can be used at any step of the analgesic ladder.

#### Caution with NSAIDs:

- Age > 70 years
- If patients are at risk of gastrointestinal mucosal damage (elderly, previous ulcer history, dyspepsia, also on steroids) but still need NSAIDs, prescribe gastric protection with a proton pump inhibitor:  
**omeprazole oral 20 mg daily or**  
**lansoprazole oral 15 mg daily.**
- Consider the patient's overall condition and concomitant medication e.g. hypovolaemia, hypotension, heart failure, other nephrotoxic medication.
- NSAIDs may be associated with a small increased risk of thrombotic events, particularly when used in high doses and for long-term treatment. Use the lowest effective dose for the shortest period possible.

#### Avoid NSAIDs:

- In patients with bleeding or past history of upper GI ulceration, aspirin-sensitive asthma, renal insufficiency including oliguria.
- In patients taking warfarin or aspirin.
- In severe heart failure

**Continues on next page**

**Analgesics for acute pain – prescribing notes continued****Step 3. Strong opioids for severe pain****Morphine oral:**

Age	Initial Dose
≤ 70 years	10 mg every 1 - 2 hours (regularly monitor / review sedation score and respiratory rate).
> 70 years	5 mg every 1 - 2 hours (regularly monitor / review sedation score and respiratory rate).

**Morphine IV – post-operative administration:**

Age	Dose
< 65 years	1 - 2 mg at 5 minute intervals, up to a maximum of 10 mg then reassess
65 - 80 years	1 mg at 10 minute intervals
> 80 years	0.5 - 1 mg at 10 minute intervals

**General notes on morphine**

- Morphine should be prescribed on an age-related basis rather than weight-related.
- Adding paracetamol and/or an NSAID can reduce opioid dose requirements and enhance analgesic effect of morphine.
- Titrate dose of morphine to response, monitor closely for oversedation and respiratory depression (refer to page 41)
- Co-prescribe a stimulant laxative (see page 45 on Management of Constipation).
- Co-prescribe an antiemetic. Patients with a history of post-operative nausea and vomiting (PONV) or who are at high risk may particularly benefit from prophylactic antiemetics (see page 162 on Management of PONV).

**Caution:**

- In renal and hepatic impairment seek dosing advice from your ward pharmacist or senior member of staff.

**Notes on parenteral morphine**

- For subcutaneous morphine (acute, pre- or post-operative pain) refer to local protocols.
- Use IV only to initiate analgesia, or as PCA. It should not be used as breakthrough analgesia and patients must be closely monitored during and after administration for oversedation and respiratory depression.
- Consider oral morphine when parenteral morphine is discontinued.

**Continues on next page**

## **Analgesics for acute pain – prescribing notes continued**

### **Patient controlled analgesia (PCA) and epidurals**

- PCA and epidurals are prescribed by anaesthetists.
- For management of these patients refer to local guidelines or contact the Acute Pain Team for advice.
- Use the appropriate observation charts – note specific charts are available on some sites for patients with renal failure.

### **Step down analgesia**

- Prescribe 'step-down' analgesia **before** epidural or PCA is discontinued.
- Whenever possible, ensure at least Step 2 analgesia is prescribed regularly, with a strong opioid prescribed for breakthrough pain.
- Further step down to paracetamol is usually possible within 3 days depending on pain scores.

## **Pain management in patients on long-term methadone**

Inadequate treatment of pain in methadone-maintained patients commonly leads to disruptive behaviour by angry and frightened patients who then may discharge themselves against medical advice, often to the detriment of the patient's health. For patients on long-term methadone contact the acute pain team.

Some general guidance until more detailed advice from a specialist can be sought:

- Methadone in maintenance doses does not have analgesic effects.
- Where possible do not interrupt daily methadone maintenance or change the patient's dose of methadone.
- Manage pain as described previously:
  - Opioids should be used as needed and in conjunction with non-opioid analgesia.
  - Titrate dose according to side effects and pain relief starting with a low dose initially, as the dose of methadone and the use of illicit drugs prior to admission may be unknown. Sedation scores are more sensitive than respiratory rate when assessing opiates.
  - These patients may eventually need higher and more frequent doses of analgesia.
- Do not use agonist / antagonist drugs such as pentazocine, buprenorphine.
- Cease the parenteral use of opioid analgesics as soon as possible and convert to oral preparations.
- These patients can be complex and their pain difficult to manage - contact the Acute Pain Team for further advice.

For opioid-induced side effects and management see page 41.

# ⑤ Management of Postoperative Nausea and Vomiting (PONV)

This guideline is aimed at providing quick and general guidance on PONV. Refer to local protocols for more detailed guidance.

## Introduction

Nausea and vomiting is a common and distressing symptom or side effect in medicine, surgery and following anaesthesia. It can cause complications such as wound dehiscence, electrolyte imbalance, increased pain, dehydration and aspiration. Generally, uncomplicated PONV rarely goes beyond 24 hours post-operatively. Problematic PONV however is more multifactorial in origin and can be difficult to treat effectively. Patients at risk of this should be identified by the anaesthetist and may be given prophylactic antiemetic treatment. Post-operative patients with nausea and vomiting may be considered as either failure of prophylaxis or for primary treatment.

## Assessment / monitoring

- Regularly use PONV score to assess patient (scoring varies across NHS/GGC hospitals).
- Assess hydration and perfusion
- Assess gastric emptying or paralytic ileus – consider nasogastric (NG) tube.
- Seek cause of PONV. Is it:
  - Inadequate pain relief, infection, hypovolaemia, hypoxia, hypotension, anxiety, removal or insertion of NG tube?
  - Has enough primary antiemetic been given? Check both anaesthetic and prescription charts.

## General management

- Minimise patient movement.
- Ensure analgesia is adequate – see previous guideline.
- Ensure good oxygenation and normal blood pressure.
- Give IV fluids if dehydrated.
- Administer antiemetic early when patient is nauseated rather than waiting for patient to vomit before treating PONV (see drug therapy section).
- If cause of PONV is known, correct if possible. For instance, postoperative opiates increase patient's risk of PONV so where possible consider other analgesics.

*Continues on next page*

## Drug therapy

The table below is a general quick guide on the prescribing of antiemetics, but see local guidelines.

Antiemetic	Dose and route of administration	Site of Action
<b>Prochlorperazine</b>	3 - 6 mg buccal every 12 hours or 12.5 mg deep IM as a 'one-off' dose ( <b>never IV</b> ). In elderly use 3 mg buccal or 6.25 mg IM.	Medullary chemoreceptor trigger zone. Dopamine (D2) receptor antagonist.
<b>Cyclizine</b>	50 mg orally / IM / IV every 8 hours. In elderly use 25 mg.	Acts on vomiting centre. Histamine (H1) receptor antagonist.
<sup>1</sup> <b>Ondansetron</b>	4 mg IV every 8 hours.	5HT <sub>3</sub> receptor antagonist.
<sup>2</sup> <b>Dexamethasone</b>	4 mg IV / IM single dose.	Unknown
<sup>3</sup> <b>Droperidol</b>	IV dose varies – see BNF	Mainly dopaminergic receptor antagonist in chemoreceptor trigger zone.

<sup>1</sup>See local policies for when to use ondansetron. No dose adjustment in the elderly is needed.

<sup>2</sup>Dexamethasone, is restricted for use by the acute pain team or on-call anaesthetist. It is not currently licensed for PONV. It can produce intense rectal pain when given IV to awake patients.

<sup>3</sup>Droperidol is restricted to use by consultant anaesthetists as a third-line antiemetic for PONV in patients unresponsive to other agents.

### General notes

- Prochlorperazine is usually used first line, however, it can cause extrapyramidal side effects and may not be the best first choice in certain patients. Seek senior advice.
- Cyclizine may be used first line, however it is not appropriate for patients with severe heart failure.
- If, after regular routine observation and assessment, it is apparent that one antiemetic is ineffective add in another. Use one which acts by a different mechanism as a combination of two antiemetic drugs acting at different sites may be more effective in resistant PONV (see table above).
- If not possible to stop opioid analgesia, consider change of opioid, and remember to prescribe simple analgesics and NSAIDs where possible.

**Continues on next page**

**Drug therapy continued**

- For choice of antiemetic in breastfeeding or pregnant women contact your clinical pharmacist for advice or Medicines Information department (Appendix 6 for contact details).
- In elderly patients (> 70 years) use lower doses of prochlorperazine and cyclizine (see table on previous page).
- Intractable vomiting may have a surgical / other serious underlying cause. Senior review is recommended.

**Other information**

- ***Metoclopramide is ineffective as an antiemetic for PONV*** in licensed dosage and **should not be prescribed** as a routine antiemetic unless gastric stasis is the cause of the nausea. Restrict use in young adults under 20 years (especially women) to certain circumstances because of the risk of extrapyramidal side effects. Seek senior / specialist advice if necessary. Metoclopramide is contraindicated in gastrointestinal obstruction and should be avoided post gastrointestinal surgery.

# Management of Acutely Disturbed Patients, including Delirium

This guideline outlines the management of acutely disturbed patients and includes brief guidance on delirium. More detailed information on the diagnosis, prevention and treatment of delirium can be found on StaffNet.

This guideline does not cover the management of acutely disturbed young people or adolescents. Instead contact your local adolescent psychiatry liaison for young people or adolescents for advice.

## Introduction

Most violent, aggressive or bizarre patients in general hospital wards or A&E departments are not mentally ill. Many have delirium caused by an acute physical illness and may be seriously unwell. A very small number have nothing wrong with them and should, once serious illness is excluded, be managed according to local policy for Management of Violence and Aggression.

- Causes of confusion or coma may include:
  - T** ..... *Trauma, temperature*
  - I** ..... *Infection*
  - P** ..... *Psychiatric*
  - S** ..... *Space occupying lesion, subarachnoid haemorrhage, shock*
  - A** ..... *Alcohol and other drugs*
  - E** ..... *Endocrine, exocrine, electrolytes*
  - I** ..... *Insulin (diabetes)*
  - O** ..... *Oxygen (lack of), opiates*
  - U** ..... *Uraemia*
- Head injury *Refer to senior staff immediately and see head injury guideline page 187.*
- If acute alcohol withdrawal suspected see alcohol withdrawal guidelines page 171, but exclude other serious problems first!

## Signs and symptoms of delirium:

- Recent change (hours / days) in cognition or other mental function.
- History of change from relatives / GP letter / ward staff.
- May be withdrawn / unresponsive / drowsy.
- May be agitated, uncooperative, suspicious.
- Common if age > 65 years and acute illness / surgery / change in drugs.

Further information on preventing and diagnosing delirium on StaffNet.

## Assessment / monitoring

- Consider delirium – see above
- Basic observation: RR, oxygen saturation (SpO<sub>2</sub>), BP, temperature, blood sugar, Glasgow Coma Scale
- Check nursing notes, medical notes and observation sheets for possible causes of acute confusional states e.g. documented vital signs preceding abnormal behavior.
- Have you excluded Hypoglycaemia, Hypoxia, Shock and Sepsis?

## Immediate non-pharmacological management

- Investigate and treat any obvious underlying cause (e.g. hypoxia).
- Correct sensory impairments and manage in a well-lit, uncluttered environment with familiar staff or relatives.
- Record duration of cognitive impairment and drug history, including alcohol and non prescribed medications.
- Review bladder and bowels – exclude retention of urine and constipation.
- Assess and manage pain.
- See algorithm on StaffNet for treating delirium including verbal and non-verbal de-escalation techniques.

## Pharmacological management (general points to read before prescribing)

- Emergency sedation should **always** be discussed with senior staff (STR or above). It should only be used when non-pharmacological approaches have been implemented and patient continues to be distressed or is a danger to themselves or others.
- Oral is preferred to parenteral therapy whenever possible.
- If drug treatment is necessary consider short-term (usually for 1 week or less) antipsychotic haloperidol **or** olanzapine (**Note:** this is an unlicensed indication for haloperidol and olanzapine).
- Start at the lowest clinically appropriate dose, titrate cautiously according to symptoms and review at least every 24 hours.
- Side effects of antipsychotics include extrapyramidal and cardiovascular side effect and rarely neuroleptic malignant syndrome.
- **Cautions / Contraindications:**
  - **Haloperidol / olanzapine** – Contraindicated in Parkinsonism and suspicion of Lewy Body dementia. Caution in patients with seizure disorders or cardiac disorders.  
Haloperidol has been linked to cardiotoxicity. Haloperidol can be considered if patient's cardiac status is known and does not give cause for concern. Seek senior advice if unclear whether patient should receive haloperidol.
  - **Lorazepam** – Caution in respiratory failure, may worsen delirium.
- In Parkinson's Disease and dementia with Lewy bodies low dose lorazepam **may** be preferred and should be used with caution as low dose benzodiazepine can **worsen delirium**. Contact movement disorder specialist for advice wherever possible – low dose quetiapine may be considered by specialists.
- **Dose administration:**
  - After administering any dose, wait a **minimum of 1 hour** to judge effect and before considering repeat dosing. If there is no response after two doses, seek senior advice.
  - Do not give simultaneous injection of intramuscular olanzapine and parenteral benzodiazepine due to the potential for excessive sedation, cardiorespiratory depression and in very rare cases, death.  
If parenteral benzodiazepine is being considered, do not give until at least one hour after olanzapine IM administration.  
If the patient has received parenteral benzodiazepine, olanzapine IM administration should only be considered after careful evaluation of clinical status, and the patient should be closely monitored for excessive sedation and cardiorespiratory depression.



## Pharmacological Management – Patients with Delirium

**Before prescribing** see previous page for cautions / contraindications / dose administration advice

- **Haloperidol oral 0.5 - 1 mg** or if oral not possible:  
**Haloperidol 0.5 - 1 mg initially as single IM dose (preferred route)**, reassess after 1 hour and discuss need for repeat dosing with senior staff. **Repeat 1 - 2 mg if necessary, to maximum 5 mg.**
- **Olanzapine oral 2.5 – 5 mg (maximum combined oral / IM dose 20 mg in 24 hours).** If oral not possible: **Olanzapine 2.5 – 5 mg initially as a single IM dose**, reassess after 1 hour and discuss need for repeat dosing with senior staff. **Repeat 5 – 10 mg if necessary up to a maximum of 20 mg in 24 hours.** *Only to be given via IM route.*  
**NB:** Olanzapine IM licensed for short-term use; maximum three IM doses daily for a maximum duration of three days.

Alternative **only** if haloperidol and olanzapine are inappropriate:

- **Lorazepam oral 0.5 - 1 mg or**  
**\*Lorazepam IV 12 - 15 micrograms/kg over 2 - 3 minutes into a large vein**  
**(50 kg=0. 7mg, 80 kg=1.1mg) at a maximum rate of 2 mg/minute.**  
**Or if oral or IV not possible \*Lorazepam IM 12 - 15 micrograms/kg.**

## Pharmacological Management – Severely disturbed patients (but not elderly and no co-morbidities)

**Before prescribing** see previous page for cautions / contraindications / dose administration advice

- **Lorazepam oral 1 - 4 mg (N.B. Higher oral doses may be required for patients tolerant to benzodiazepines.) Or**  
**\*Lorazepam IV 25 - 30 micrograms/kg over 2 - 3 minutes into a large vein**  
**(50 kg = 1.4 mg, 80 kg = 2.2 mg) at a maximum rate of 2 mg/minute.**  
**Or if oral or IV not possible: \*Lorazepam IM 25 - 30 micrograms/kg**  
**Or (only if lorazepam is not available):**  
**Diazepam (Diazemuls®) IV 2 - 5 mg into a large vein with 2 - 5 mg increments, if required, to a maximum of 10 mg (maximum rate 5 mg/minute).**
- **Haloperidol oral 1.5 - 3 mg or if oral not possible:**  
**Haloperidol IM 2 - 10 mg IM to a maximum total dose of 18 mg.**

**\*Lorazepam IV:** Ongoing supply issues with IV lorazepam – seek advice from pharmacy if unable to obtain. When given by IM injection it should always be diluted 1:1 immediately before administration with water for injection or sodium chloride 0.9% as it is quite viscid when taken out of the fridge.

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## Pharmacological Management – Acutely disturbed elderly patients

**Before prescribing** see page 166 for cautions / contraindications / dose administration advice

- **Haloperidol oral 0.5 - 1 mg or if oral not possible then give IM or**
- **Olanzapine oral 2.5 mg or if oral not possible then give IM or**
- **\*Lorazepam oral 0.5 - 1 mg or if oral not possible then give IM**, see dosing advice under delirium on previous page.

**\*Lorazepam IV:** Ongoing supply issues with IV lorazepam – seek advice from pharmacy if unable to obtain. When given by IM injection it should always be diluted 1:1 immediately before administration with water for injection or sodium chloride 0.9% as it is quite viscid when taken out of the fridge.

## Important information

- Intensive nursing observation is mandatory after parenteral lorazepam or diazepam. **Monitor closely for respiratory depression and have full resuscitative facilities, including high flow oxygen, suction, monitor / defibrillator and flumazenil, available.** Ensure presence of staff able to maintain a clear airway and perform basic resuscitation if necessary.
- Vital signs with HR, RR, SpO<sub>2</sub> and conscious level (AVPU or GCS) must be recorded at least hourly after emergency sedation or until senior medical review.
- Summon ward STR (or above) if no response to verbal stimulus.
- Contact duty ITU registrar immediately if any of the following occur:
  - Airway problem
  - Respiratory irregularity, RR < 10 breaths/minute or > 30 breaths/minute or SpO<sub>2</sub> < 90%
  - Acute and sustained hypotension (SBP < 90 mmHg).
- Gag reflex is not reliable as a measure of a safe airway.
- Once the acute situation has been stabilised, perform more detailed clinical assessment to identify potential underlying causes.

## Patient Consent

May require use of AWI Scotland Act.

- Always document in medical case record reasons for prescribing sedation, indicating review dates.
- Emergency sedation can be given under common law i.e. patient does not need to be detained (see Appendix 4 for more details). More routine sedation however requires consideration of the patient's capacity to consent. Psychiatric services can advise on the use of legislation in this regard (see Appendix 6 for contact details).

# Guidance on Night Sedation



## Patients on night sedation prior to admission

- Enquire whether the patient is a regular or occasional user of night sedation
- Continue prescription if appropriate

## Patients who have not received night sedation before

- Routine prescribing of night sedation is undesirable.
- Consider rectifiable causes of insomnia e.g. depression, pain, drugs (e.g. decongestants, theophylline, steroids or selective serotonin reuptake inhibitors (SSRIs) late in the day).
- Discuss advantages and disadvantages of night sedation with patient.
- Prescribe:  
**temazepam oral 10 - 20 mg at night, preferably in the 'once only' part of the prescription form – see cautions below.**
- If prescribing temazepam regularly, review daily and stop after the shortest possible time.

## Discharge procedure

Pharmacy **will not** supply any drug prescribed for night sedation at discharge, unless it is prescribed for a fixed interval **and** an acceptable reason for this is given in the comments section of the prescription. Contact your clinical pharmacist or dispensary for further advice (see Appendix 6 for contact details).

## Cautions

**(Refer to BNF / summary of product characteristics for full prescribing information)**

Hypnotics should be used with extreme caution in patients:

- With respiratory disease
- With a history of drug / alcohol abuse
- Who have been co-prescribed other CNS depressants
- Who are elderly or debilitated and/or have hepatic and renal impairment.

If required, a very small dose of a short-acting agent e.g. **temazepam oral 5 mg at night** is safest in these patients.

- Hypnotics are contraindicated in severe respiratory depression and severe hepatic insufficiency.
- Abrupt withdrawal of benzodiazepines may cause confusion, toxic psychosis, convulsions.

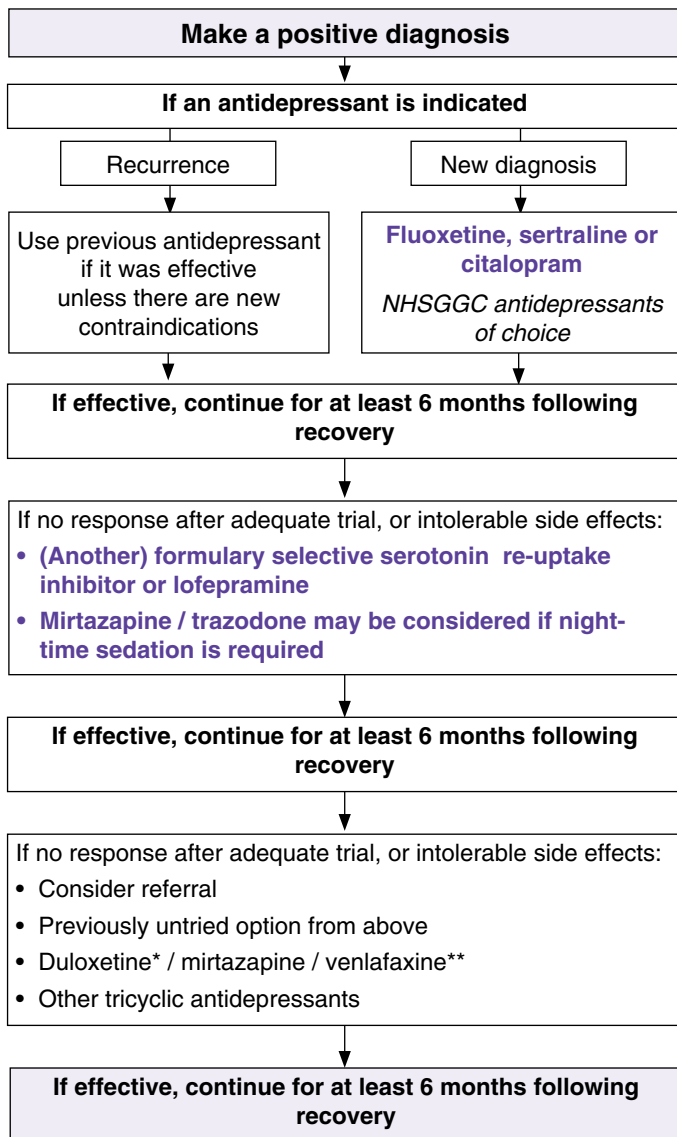
## Notes

Due to the potential for dependence, there may be important legal implications for the prescriber if a patient who has been prescribed night sedation while in hospital is discharged on the drug long-term.



# Management of Depression

**N.B.** MHRA has issued dose recommendations for citalopram due to risk of a dose-dependent QT interval prolongation. The maximum dose is 40 mg/day in adults and 20 mg/day in the > 65 years and people with reduced hepatic function. See [www.mhra.gov.uk](http://www.mhra.gov.uk) for more information on cautions and contraindications.



- If mild depression, antidepressant is not indicated (NICE CG23, Management of Depression in Primary and Secondary Care, December 2004).
- Consider referral if there is a risk of suicide or the depression is severe (including psychotic symptoms).

- Safety in overdose.
- Lower potential for withdrawal effects.
- As effective as other antidepressants.
- More cost-effective.
- Citalopram is contraindicated in patients with QT interval prolongation and in combination with drugs known to prolong QT interval. Also see note above.

- If patient is very anxious or agitated, consider the use of benzodiazepines as an adjunct for a maximum of 2 weeks.
- Agitation may be a side effect of antidepressant treatment and usually resolves after a few weeks.

\*Psychiatrist initiation only.  
\*\*Regular monitoring of BP as clinically appropriate.  
Psychiatric supervision required for patients of daily doses of venlafaxine 300 mg and above and on initiation of a severely depressed patient.

# Management of Alcohol Withdrawal Syndrome



## Assessment / monitoring

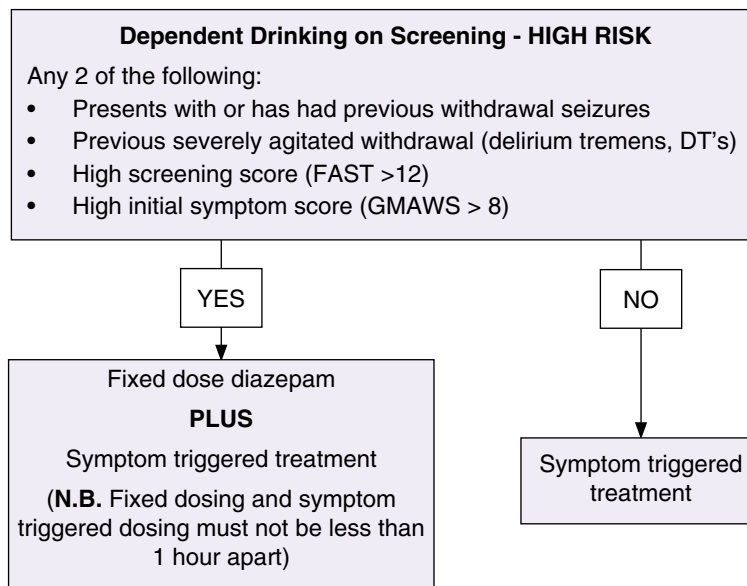
The likelihood of withdrawal reaction is indicated from a patient's history. Use the alcohol misuse assessment form to establish patient's alcohol consumption and to calculate FAST (Fast Alcohol Screening Tool) score. This will guide what initial intervention is required e.g. advice only, leaflets, referral to addiction liaison, drug intervention.

Use the flowchart below to assess whether patient is at high risk of withdrawal or not. The Glasgow Modified Alcohol Withdrawal Scale (GMAWS) sheet can be found on:

StaffNet / Clinical Info section / Clinical Guidelines.

If patient is a chronic alcohol misuser or has hazardous / harmful alcohol intake then also assess for risk of Wernicke's encephalopathy (see page 174).

### Flowchart 1: Management of Alcohol withdrawal



## General management

For patients at high risk of alcohol withdrawal see next page for fixed dose diazepam treatment regime. There may be certain groups of patients in whom an alternative choice or route of benzodiazepine should be considered (see the next page for further information).

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### **Baseline treatment regime**

- For patients at high risk of alcohol withdrawal give a fixed dose of diazepam. In the initial 24 hours prescribe:

**Diazepam oral 20 mg 6 hourly.** If no additional symptom triggered treatment, *then reduce as follows:*

**diazepam oral 15 mg 6 hourly for 24 hours then**

**10 mg 6 hourly for 24 hours then**

**5 mg 6 hourly for 24 hours then**

**5 mg 12 hourly for 24 hours**

For patients unable to tolerate diazepam via the oral route or presenting with severe alcohol withdrawal, see guidance below and on next page.

- Review diazepam dose if patient is excessively drowsy.
- Request senior medical review if more than 120 mg diazepam in 24 hours is given. Diazepam 120 mg is not expected to be problematic over 24 hours in uncomplicated patients.

### **Exceptional patient groups**

- Elderly patients
- Patients with evidence of liver disease: especially jaundice, encephalopathy.
- Patients with other significant co-morbidity (i.e. COPD, pneumonia, cerebrovascular disease, reduced GCS)

In these groups of patients consider using oral lorazepam in a symptom triggered fashion as:

**Lorazepam oral 1 - 2 mg (to a maximum of 12 mg in 24 hours before requesting senior medical review).**

**N.B.** Lorazepam has a slower onset of peak effect but ultimately a more rapid elimination.

### **Severe alcohol withdrawal**

These patients can exhibit aggressive / uncontrollable / dangerous behaviour. Give:

- **Diazemuls IV up to 40 mg over the first 30 minutes (max rate 2 mg/minute; flumazenil should be made available).**

**N.B.** IV benzodiazepine should be given by experienced members of staff (FY2 or above, or nursing staff who have completed appropriate competency training on administering IV sedation).

- **Adjunctive therapy with haloperidol IV/IM 5 – 10 mg (smaller doses unlikely to be effective).**

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### **Unable to tolerate oral medication**

An alternative to oral diazepam or lorazepam in these patients may be IV diazepam or lorazepam at 50% of the oral dose in the first instance (see previous page), and then assess response. Intravenous benzodiazepines should be given by experienced members of staff – see note on previous page on who can administer.

**N.B.** There are supply problems with IV lorazepam and it may not be readily available.

### **Monitoring**

- Closely observe for signs of over-sedation with regular observations.
- Exceptional patient groups (see previous page), patients with severe withdrawal and patients requiring IV or IM sedation require close monitoring (MEWS / SEWS), ideally with one-to-one nursing care.
- Consultation regarding intensive care support may be necessary in extreme situations.

### **Other information**

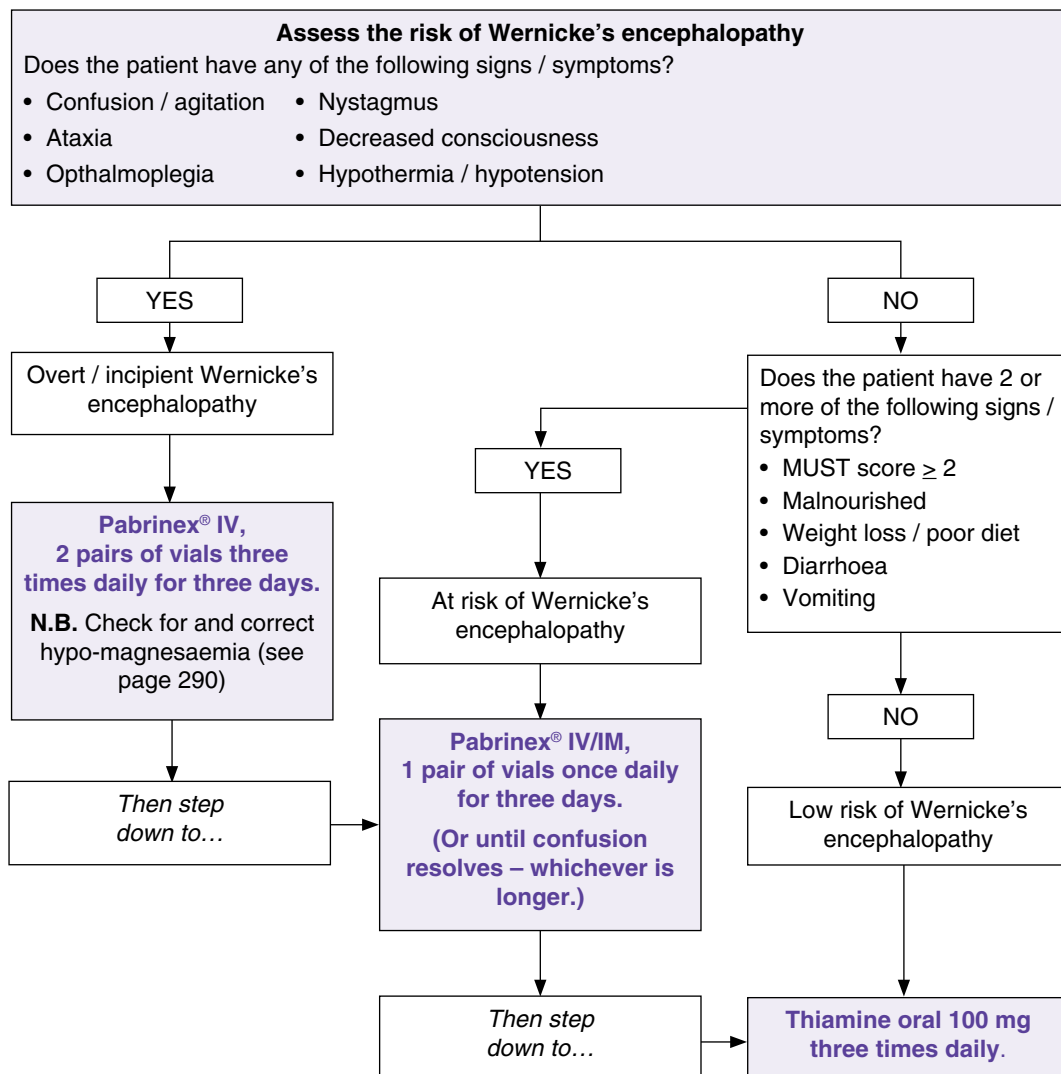
- On discharge patients should not be given regular benzodiazepine unless there is confirmed arrangement with the Community Addiction Services. Chlordiazepoxide is the recommended benzodiazepine for community use.
- Approximate oral benzodiazepine dose equivalence:  
Diazepam 10 mg = Lorazepam 1 mg = Chlordiazepoxide 30 mg



# Vitamin Prophylaxis and Treatment of Wernicke-Korsakoff Encephalopathy

## Introduction

The guidance applies to patients who are chronic alcohol abusers. This includes those who are dependent on alcohol but also those who have a hazardous / harmful alcohol intake.





## Important notes

- Patients with overt / incipient Wernicke's encephalopathy or 'at risk' of Wernicke's encephalopathy **must** be given Pabrinex® **before** the administration of glucose or nutritional support.
- Intravenous Pabrinex® should be administered over 30 minutes.
- Anaphylaxis is a rare complication of IV Pabrinex® administration and even more uncommon with IM administration. Monitor patient for wheeze, tachycardia, breathlessness and skin rash. Facilities for the administration of adrenaline and other resuscitation should be available (see page 18 for anaphylaxis management).
- Further vitamin supplementation as clinically indicated by responsible medical team in the context of a general nutritional assessment.



# Management of Drug Misusers in Hospital

**N.B.** For patients on Buprenorphine (Subutex® / Suboxone®) prescriptions, or for guidance on pain management in patients on substitute prescriptions, refer to the full guideline titled the Management of Drug Misusers in Glasgow and Clyde Acute Hospitals on StaffNet at:

StaffNet / Info Centre / Policies, Procedures and Guideline Documents / NHSGGC Clinical Guideline Electronic Resource Directory.

## Introduction

This guideline primarily focuses on opiate (heroin) and benzodiazepine misuse. Primary alcohol misuse is not covered here, but in co-dependent users (heroin +/- benzodiazepines + alcohol) table 3 on page 182 can be used to cover alcohol withdrawal.

The following is intended only as a guidance and is not comprehensive. Patients with complex needs and challenging behaviours should be discussed on an individual case basis with either a Hospital Liaison Nurse (Glasgow) or Addiction Services medical staff (Clyde) (see Appendix 6 under 'Drug Misuse' for contact details).

The source and level of support by addiction specialists varies dependant on acute site. See Appendix 6 under 'Drug Misuse' for contact details.

## Principles of management

Admission to an acute hospital can be an ideal opportunity, not to be squandered, for engagement and retention in treatment for substance users. There is a current and increasing body of evidence that concurrent treatment of their substance use problems will increase compliance, retention and success of their other medical and surgical regimes.

The principles of medical practice are not different in this patient group. There are different management issues in pregnancy, contact the Special Needs in Pregnancy Service (SNIPs) for NHSGGC to discuss with a maternity addiction specialist (see Appendix 6 under 'Drug Misuse' for contact details).

## Assessment / monitoring

### General initial assessment

#### 1. Establish history of drug abuse:

- Recent use over past few days
- Which drugs and how used (e.g. IV, smoked, ingested)
- Frequency
- Amount used and whether increasing / decreasing
- Previous or current treatments

Dependent users will most likely require medical interventions. **Drug dependence** is defined by the ICD10 classification of mental and behavioural disorders to exist when 3 or more of the following have been present together in the past year:

- A strong desire or sense of compulsion to take the substance.
- Loss of control of substance-taking behaviour.

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- A characteristic withdrawal syndrome for the substance; or use of the same (or closely related) substance with the intention of relieving or avoiding withdrawal symptoms.
  - Evidence of tolerance, such that increased doses of the psychoactive substance are required in order to achieve effects originally produced by lower dose.
  - Salience over alternative pleasures or interests.
  - Persisting despite harmful consequences.
- 2. On examination of patient, check:**
- IV sites, local and systemic sequelae of injecting
  - Assess whether their clinical state is compatible with their declared use (frequent injectors will have multiple sites of different age and usage - Opiate Withdrawal Scale (SOWS) to be undertaken).
- 3. Investigate:**
- Urinalysis for illicit drugs must be undertaken. Near patient testing strips will give a drug screen for the major drugs of addiction in a few minutes. If patients decline consent for this then treatment, especially substitute prescribing cannot be safely undertaken, and will therefore not be part of their treatment plan.

## Assessment of opiate withdrawal - Subjective Opioid Withdrawal Scale (SOWS)

Observe the patient and score according to Table 1.

Exclude other illnesses, which may cause symptoms similar to opiate withdrawal.

**Table 1 – Opiate withdrawal scoring**

	2 points	1 point	0 points
<b>Pupil size</b>	Wide	Normal	Pin point
<b>Palms</b>	Wet	Moist	Dry
<b>Skin</b>	Goosed	Cold	Warm
<b>Nasal</b>	Running	Sniffing	Dry
<b>Agitation</b>	Can't sit	Agitated	Calm
<b>GIT</b>	Vomiting	Nausea	Normal
<b>Pulse</b>	> 100	80 - 100	< 80
<b>TOTAL</b>	A score of > 5 is strongly suggestive that the patient is suffering from opiate withdrawal		

## Assessment of benzodiazepine withdrawal

For patients experiencing pain following injury or surgical procedure and who are on evidenced substitute prescribing, refer to the Pain Management Guideline within the Guidelines for Management of Drug Misusers in Glasgow and Clyde Acute Hospitals (available on StaffNet / Info Centre / Policies, Procedures and Guideline Documents / NHSGGC Clinical Guideline Electronic Resource Directory).

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## General management

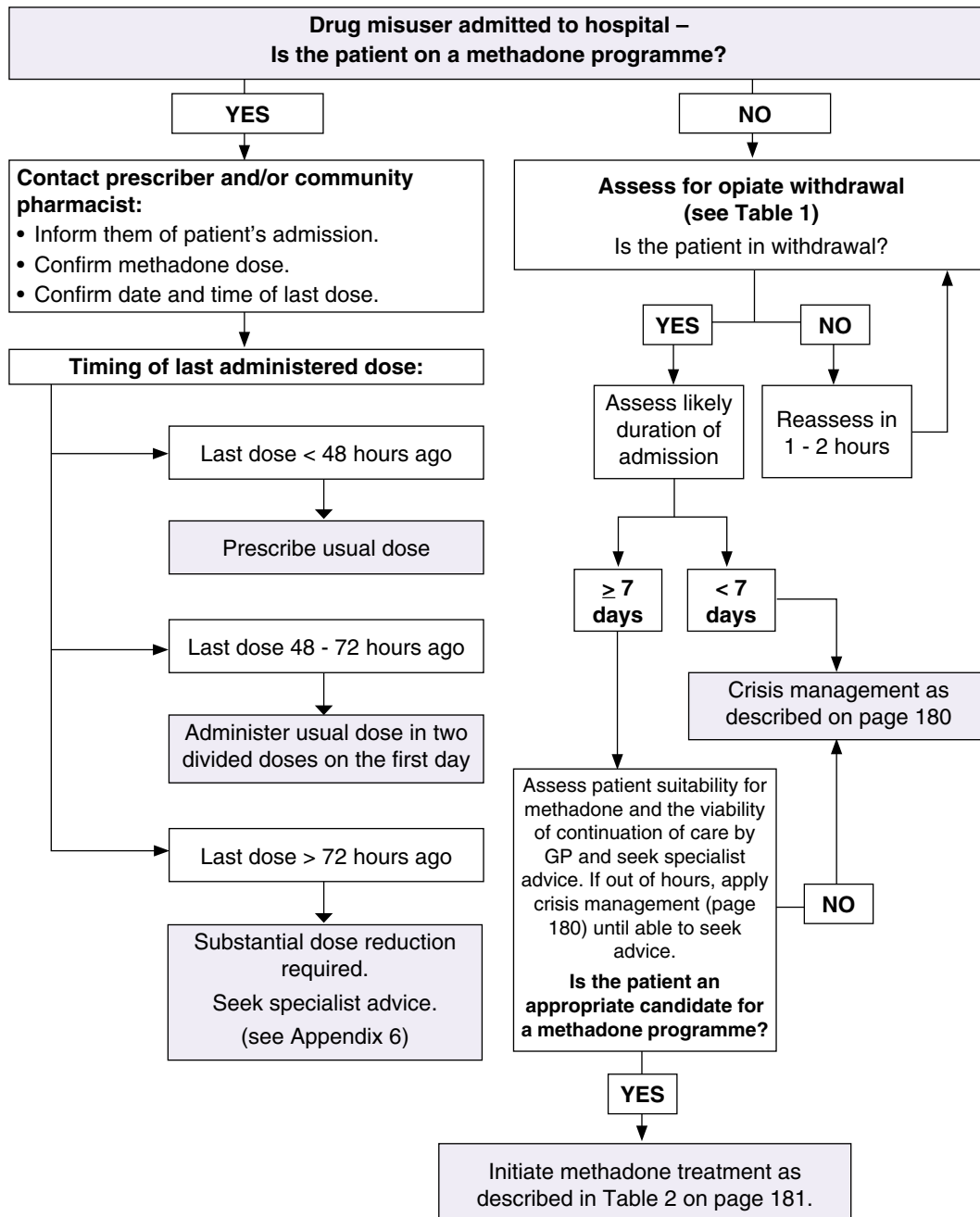
### Opiate misusers

- Management is dependent on whether the patient was already receiving a methadone prescription in community and how long their admission to hospital is likely to be. Refer to flow diagram on next page for guidance.
- Withdrawals may develop within 24 - 36 hours so a dose may be needed within the first hours of admission unless they are pregnant, in which case refer to specialists for prescribing advice in maternity (see Appendix 6 under 'Drug Misuse' for contact details).
- If patient is a polydrug user not on treatment, presenting with withdrawal and requiring overnight admission then crisis management regimens described under the 'Treatment Options' section on pages 180 and 182 may be appropriate.
- Remember that methadone has a long half-life (14 - 72 hours, mean about 24 hours). It is frequently lethal in overdose and lethal in appropriate maintenance dose (60 mg to 120 mg) when given to patients who have lost their tolerance to opiates, or opiate naïve patients.

**Do not feel pressurised to prescribe.** Only prescribe when assessment, examination and investigations have been completed and indicate that prescription is appropriate.

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## Flow diagram for use with Hospital Guidelines on the Management of Opiate Misusers in Hospital



## Treatment options

(N.B. All these medications should be taken under supervision.)

### Opiate and benzodiazepines misusers

Exercise extra caution when prescribing methadone or benzodiazepine in:

- Patients with severe pain (in this group titrated IV/ subcutaneous morphine is the regimen of choice, avoid IM analgesics and do not use pethidine).
- If oral doses cannot be given, greatly reduced parenteral doses may be required. Advice must be sought from addiction specialists on an individual basis for conversion.
- Respiratory disease or suppressed respiratory drive – observe respiratory rate closely.
- Liver disease / hepatitis
- Head injury – in such patients the Glasgow Coma Scale is not sensitive enough to assess opiate intoxication.
- If receiving opiate analgesia or other sedating medications.
- Altered concomitant therapy, check if it will alter the effects of methadone or benzodiazepines.
- Benzodiazepines are especially contraindicated in pregnancy unless fitting or likely to fit due to benzodiazepine withdrawal. As always contact NHSGGC SNIPs for advice (see Appendix 6).

### Crisis management prescribing for opiate misusers

(See flow diagram on page 179 for when to use crisis management.)

#### Dihydrocodeine oral up to 60 mg four times daily (unlicensed use).

- Dihydrocodeine can be given for the first 24 - 48 hours, but not in pregnancy (contact NHSGGC SNIPs for advice), if use of methadone is either inappropriate or there is a delay in initiating methadone because:
  - Awaiting further assessment
  - Awaiting methadone dose confirmation
  - It is a short-term admission and through care is not possible.
- Dihydrocodeine dose can be reduced or maintained during short admissions depending on the clinical condition of the patient.
- If required, incremental reductions can be daily or every other day.
- Liquid preparations are preferred to enable supervised administration.
- **Do not** supply on discharge but **do prescribe to pregnant women** on discharge.

### Methadone prescribing – general notes

Patients already on a methadone prescription – see flow diagram on page 179.

Patients not previously on methadone should only be prescribed it after examinations and investigations indicate that a prescription is appropriate. The flow diagram gives a systematic approach to making this decision. Table 3 gives initial dosing guidance if methadone is considered appropriate. Contact NHSGGC SNIPs for advice from a maternity addiction specialist (Appendix 6 under 'Drug Misuse').

**Methadone mixture 1 mg/1ml is the preparation of choice.**

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**Table 2 – Initial methadone oral dose**

Day	Methadone dose
1	20 mg initially. Reassess 12 hours later and give further 10 mg dose only if withdrawal effects are still evident (maximum total dose on day 1 is 30 mg)
2	Same total dose as day 1
3	As above
4	As day 3, but if necessary adjusted up or down by no more than 10 mg dependant on response
5	As day 4
6	As day 5
7	As day 6, but if necessary adjusted up or down by no more than 10 mg dependant on response
8	As day 7
9	As day 8
10	As day 9, but if necessary adjusted up or down by no more than 10 mg dependant on response

- Stop if any signs of intoxication, e.g. drowsiness, slurred speech or respiratory depression. If necessary give naloxone IV / IM. Repeated doses or infusion may be required (see BNF). Naloxone is contraindicated in pregnancy, in life-threatening situations however, use with caution at the lowest possible dose.
- Always seek advice before prescribing > 60 mg / day or if it seems larger doses may be indicated. Contact numbers as Appendix 6 under 'Drug Misuse'.
- Patients requiring > 100 mg of methadone should be monitored for prolongation of QT interval and torsades de pointes.
- Do not initiate methadone or buprenorphine (Subutex® / Suboxone®) treatment without advice from acute addiction liaison nurses and/or Glasgow Addiction Services Senior Medical Officers, or Clyde doctors and without arranging continuation of treatment on discharge with addiction services or Clyde Community Drug Services.

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## Methadone discharge procedure

**If discharge for short period (< 3 days) before return to hospital then:**

- Responsibility of the hospital to continue prescribing during this period.
- Advise patient to return to ward for daily dispensing.
- Do not give a 'take home' supply.

**For all other patients:**

- If the acute addiction liaison nurses are involved they may be able to make appropriate arrangements.
- Inform GP / Community Addiction Team prescriber of discharge and methadone dose and inform community pharmacist of last dose given in hospital.
- Arrange appointment for continued prescription with the GP / Community Addiction Team and ensure interim continuity of care.
- Advise patients to make an appointment to see their GP whether or not continued methadone prescribing is by the GP.
- *Do not supply methadone / buprenorphine on discharge.*

## Crisis management prescribing for benzodiazepine misusers

There are two suggested regimens to prevent withdrawal in patients who have been taking over 40 mg diazepam or 80 mg temazepam daily.

### Option 1

**Table 3 – Suggested oral detoxification or maintenance regimen for short-term admissions for a benzodiazepine misuse.**

Diazepam oral daily dose	Regimen
20 mg three times daily	for 3 days (Days 1-3)
15 mg three times daily	for 3 days (Days 4-6)
10 mg three times daily	for 3 days (Days 7-9)
5 mg three times daily	for 3 days (Days 10-12)
5 mg twice daily	for 3 days (Days 13-15)
5 mg once daily	for 3 days (Days 16-18)

If required, incremental reductions can be daily or every other day.

### Option 2

An alternative regimen for patients whose benzodiazepine use is uncertain or lower than described above:

**Diazepam oral 10 mg as a single dose.** Reassess patient 6 hours later and if not drowsy or intoxicated then this may be repeated 6 hourly. Reduce dose during stay.

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## **Benzodiazepine prescribing – general notes**

- Diazepam detox should be agreed on an individual basis according to level of use and length of hospitalisation. In pregnancy always consult NHSGGC SNIPs (see Appendix 6 for contact details).
- For those abusing opiates plus benzodiazepines and/or alcohol, for whom no through care is possible, a combination of treatments outlined above and in the crisis management prescribing for opiate misusers section of the guideline can be given.
- It is recognised that the doses of diazepam for this patient group are well above those normally prescribed.
- If sedation or intoxication is produced the dose can be withheld until clinical condition is satisfactory. Then proceed with reduced dosage.
- Whilst anyone unusually drowsy could have had illegal drugs at a visit they must be medically assessed for other possible causes.



# Management of Suspected Subarachnoid Haemorrhage (SAH)

(Also see SIGN 107)

## Introduction

A patient presenting with *headache that reaches its maximum severity instantaneously or over a few minutes* should be assessed for possible SAH, unless a history of similar recurrent stereotyped events indicates an alternative diagnosis (e.g. coital headache, cough headache, severe migraine).

## Assessment / monitoring

Use the flow diagram on the next page to systematically assess the patient for SAH. CT scanning should **ideally** be done before proceeding to lumbar puncture (LP).

Differential diagnoses to consider in the case of a negative CT result include:

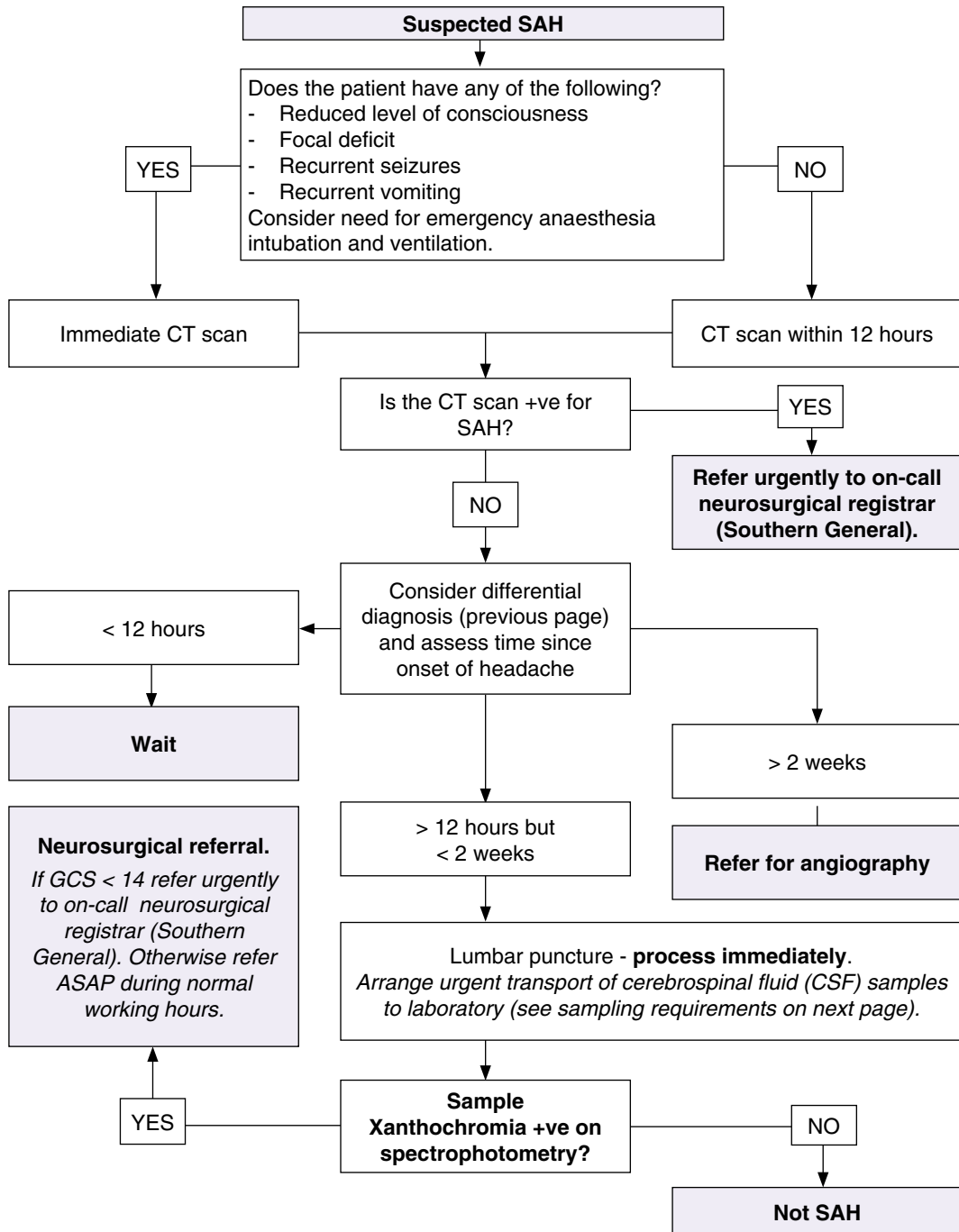
- Sagittal sinus thrombosis
- Pituitary apoplexy
- Intracranial hypertension
- Malignant hypertension
- Carotid or vertebral dissection
- Ischaemic stroke
- Migraine / cluster headache
- CNS infection

Most alternative diagnoses which require immediate management can be excluded by history, routine examination, CT and LP. However, some patients may require additional tests such as a CT venogram for patients with suspected Sagittal sinus thrombosis.

Further assessment and monitoring **in patients with confirmed SAH:**

- **A**irway, **B**reathing and **C**irculation optimised
- Monitor (2 hourly) vitals (BP, Pulse), GCS
- Urinary input / output
- FBC, U&Es (including magnesium), glucose, coagulation screen, Group and Hold
- Pregnancy screen

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**Sampling requirements for the Biochemical Investigation of SAH (CSF Xanthochromia):**

1. Spectrophotometric analysis of CSF for xanthochromia is useful in the diagnosis of SAH particularly when CT is not conclusive.
2. It is recommended that CSF is not sampled until at least 12 hours after a suspected event.
3. The CSF sample should be centrifuged within 15 minutes of sampling. Phone the laboratory to ensure a technician is available before taking the CSF sample.
4. The CSF sample for xanthochromia analysis should always be **the last fraction to be taken** and the volume of sample must be **a minimum of 1 ml**.
5. Record on the request form:
  - the clinical indication for the request
  - the time of headache onset
  - the time of LP
  - if the differential diagnosis includes meningitis.
6. Protect the CSF sample from light by placing it in a brown paper envelope.
7. Analysis is done between 9 am - 5 pm weekdays, and Saturday and Sunday mornings. The result will be phoned to the ward.

**General management**

Consider Medical ward / ICU / HDU / Neurosurgical ward (after discussion with the neurosurgeon) depending on the patient's condition.

**Drug therapy / treatment options**

- TED supportive stockings
- Isotonic fluids e.g.:  
**sodium chloride 0.9% IV 3 litres over 24 hours** (do not restrict fluid if hyponatraemia develops).
- Ensure adequate analgesia e.g.:  
**paracetamol +/- dihydrocodeine 50 mg IM or dihydrocodeine 30 mg orally every four to six hours.** (Avoid other opiates, NSAIDs.)
- **Nimodipine 60 mg orally or via NG tube every 4 hours for 21 days.** Once tablet is crushed for NG administration it is extremely light sensitive so must be administered immediately.
- **Ranitidine 50 mg IV three times a day or 150 mg orally twice a day as stress ulcer prophylaxis.**

**Phenytoin if necessary for seizures** (see page 193 for dosage calculations).

# Guidelines for the Management of Patients with Recent Head Injury

(Also see SIGN 110)

Head injuries presenting to hospital should be managed according to SIGN guidelines. Multiply injured patients with a reduced level of consciousness should be managed by experienced staff using principles of Advanced Trauma Life Support. A reduced level of consciousness must not be assumed to be due to drug or alcohol intoxication in a patient with a history or examination findings consistent with a head injury.

## Indications for admission to a hospital ward

### Patient has:

- Impaired level of consciousness (GCS < 15/15).
- Is fully conscious (GCS 15/15) but has any indication for a CT scan (patient can be considered for discharge if CT scan is normal and there are no other reasons for admission).
- Significant existing medical problems e.g. anticoagulant use.
- Social problems or cannot be supervised by a responsible adult.

## Indications for discharge

Patient can be discharged from A&E for observation at home if fully conscious (GCS 15/15) with no additional risk factors or other relevant adverse medical and social factors.

### Prior to discharge the following criteria must be met:

- A responsible adult is available and willing to observe the patient for at least 24 hours.
- Verbal and written instructions about observations to be made and action to be taken are given to and discussed with that adult.
- There is easy access to a telephone.
- The patient is within reasonable access of medical care.
- Transport home is available.

## Referral to Neurosurgical Unit

### Refer if:

- Persisting coma (GCS score  $\leq$  8/15) after initial resuscitation.
- Confusion which persists for more than four hours.
- Deterioration in level of consciousness after admission (a sustained drop of one point on the motor or verbal subscales, or two points on the eye opening subscale of the GCS).

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*Referral to Neurosurgical Unit continued*

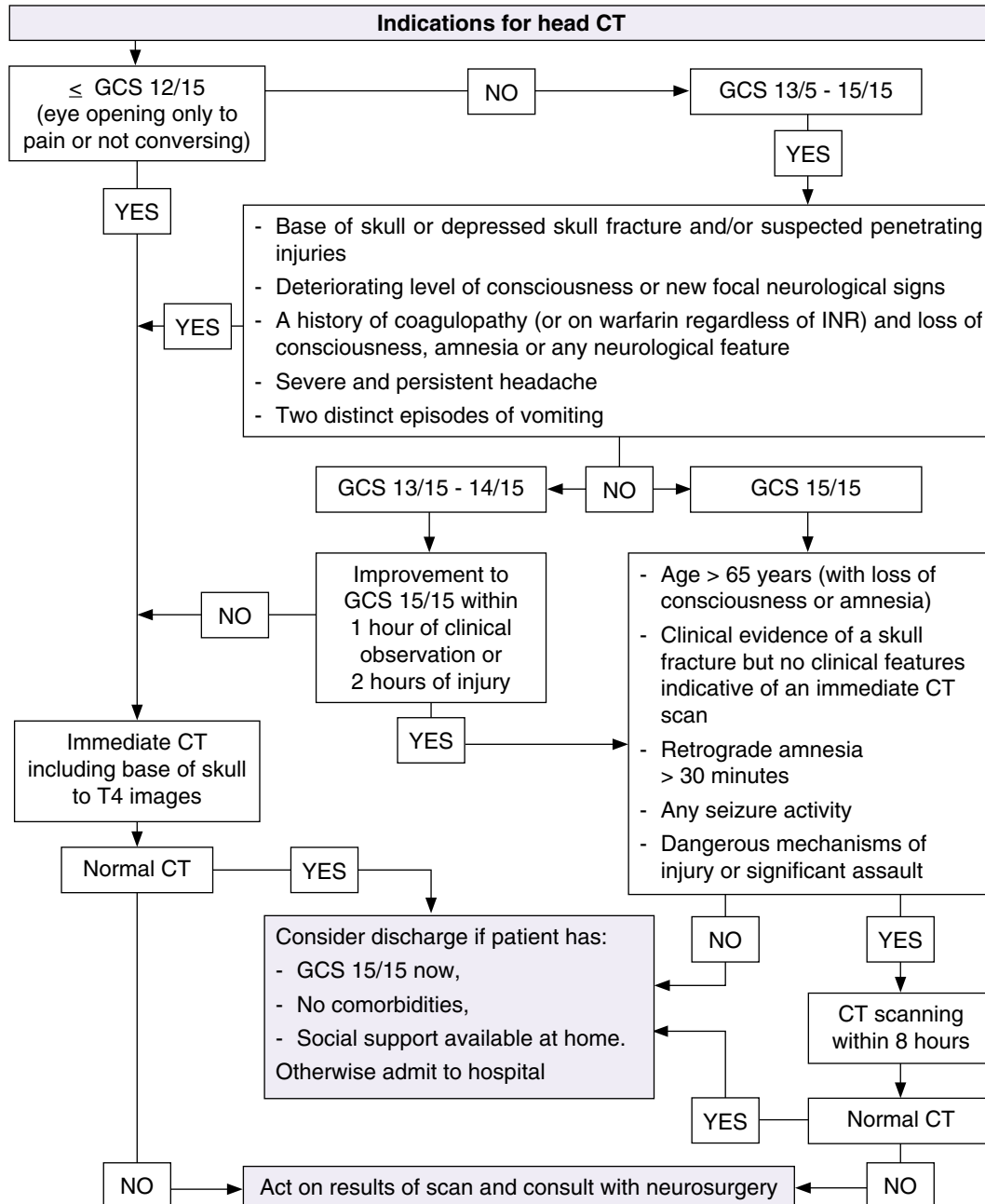
- Focal neurological signs.
- A seizure without full recovery.
- Compound depressed skull fracture.
- Definite or suspected penetrating injury.
- A CSF leak or other sign of a basal fracture.

**Indications for imaging in head injuries**

- Where CT is available, skull x-rays should not be performed.
- In adults with GCS < 15/15, with indications for a head scan, CT of the cervical spine should also be performed down to body of T4.

**See flow chart on next page for indications for head CT.**

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# Management of Status Epilepticus

## Introduction

Tonic-clonic status epilepticus (continuing or recurrent seizures over 30 minutes, or without recovery) is a medical emergency with a 10 - 15% mortality rate. There is a risk that seizures will cause cerebral damage if not controlled within 30 minutes of onset.

Pre-status epilepticus is a phase of accelerating seizures which usually takes place prior to the development of frank status epilepticus. Status epilepticus can be avoided if treatment is given at this stage.

This guideline outlines the general management of tonic-clonic status epilepticus in adults and is based on the SIGN guideline for diagnosis and management of epilepsy in adults. Treatment may differ in individual clinical circumstances

## Assessment / monitoring

See flow chart on next page for general assessment and monitoring. Treatment should not be delayed. Note timings throughout in order to assess when to escalate treatment. Assess patient for possible causes such as:

- Poor compliance with Anti-Epileptic Drugs (AEDs), change of drug therapy, drug interactions.
- Infection
- Acute cerebral insult (encephalitis, meningitis, trauma)
- Cerebral tumour (often frontal lobe)
- Drug overdose (e.g. antidepressants)
- Drug withdrawal (e.g. alcohol, benzodiazepines etc.)
- Pseudostatus should be considered. If blood gases are normal or suggest hyperventilation, despite apparent prolonged major seizures then pseudostatus is likely. Diagnosis is aided by EEG. Get neurological advice before proceeding to general anaesthesia and ITU.

## Management of Status Epilepticus / Pre-status Epilepticus

Prevention: Carers should treat serial or prolonged seizures in the community with rectal diazepam or intranasal / buccal midazolam according to an agreed protocol (protocol must include advice on when to transfer to hospital).

**For status epilepticus** see flow chart on next page for management. Do not delay treatment.

**For pre-status epilepticus**, do not delay treatment. Give lorazepam IV or diazepam rectally as per flowchart. AED treatment needs to be restored / maintained as quickly as possible. If in doubt about compliance give one complete dose of all usual AEDs. If no information on previous treatment or seizures continue to accelerate, proceed to additional AED treatment (as per status epilepticus guideline).

**For both status epilepticus and pre-status epilepticus** assess aetiology and correct if possible.

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# Patients with generalised tonic-clonic status epilepticus

Adapted with permission from SIGN 70: Diagnosis and Management of Epilepsy in Adults. A national clinical guideline (April 2003).

## Immediate measures

- Open and maintain airway.
- Give oxygen.
- Assess cardiac and respiratory function.
- Secure intravenous (IV) access in large veins.
- Collect blood for bedside blood glucose monitoring and FBC, U&Es, LFTs, calcium, glucose, clotting, AED levels and store for later analyses.
- Measure blood gases to assess extent of acidosis.

Give lorazepam IV up to 4 mg (e.g. 2 mg over 1 minute, may be repeated after 3 - 5 minutes) or if lorazepam is unavailable, give diazepam IV up to 10 mg

No response?

Repeat after maximum of 10 minutes if in hospital.

Delay in gaining IV access in community.

Give 10 - 20 mg diazepam rectally.

Determine aetiology:

- Any suggestion of hypoglycaemia: give **50ml of 50% glucose IV**.
- Any suggestion of alcohol abuse or impaired nutritional status: give **thiamine IV (as 2 pairs of Pabrinex<sup>®</sup> ampoules)**.
- **Give usual AED treatment** - can be given by nasogastric tube if airway secured (or IV if necessary for phenytoin, sodium valproate and phenobarbital).

## Within 30 minutes

If status persists

- Give **phenytoin IV 18 mg/kg\*, at a rate of 50 mg/minute or less; with ECG monitoring**  
\*Dose recommended higher than licensed dose but based on SIGN recommendations. **Refer to page 193 for further phenytoin dosing information.**
- Call ITU to inform of patient.

## > 30 minutes

If status persists

- Administer general anaesthesia and admit to ITU.
- Monitor using EEG to assess seizure control.
- Refer for specialist advice.

## Other

### Initiating Long-term Anti-epileptic Drugs

In status epilepticus, immediate treatment is required to reduce the risk of cerebral damage. Once seizures are controlled, consideration should be given to long-term anti-epileptic treatment. Recommendations on appropriate therapy should be sought from an epilepsy specialist, however the patient should not be left untreated while waiting for specialist advice.

Patients who **do not** present with status epilepticus but who require long-term anti-epileptic drugs should be referred to an epilepsy specialist / neurologist (usually outpatient service) and ideally no medication should be started in the meantime. (SIGN Guideline Number 70 recommends that in epilepsy, treatment should only be initiated by a specialist.) For elderly patients current practice of management by a physician specialising in medicine for the elderly should continue, with specialist neurological advice available when necessary.

Generally long-term anti-epileptic therapy is not usually indicated in patients:

- If the cause of the seizures is known and can either be withdrawn or corrected or
- As prophylaxis therapy following an acute brain injury.

# Guideline for Phenytoin Dose Calculations

## 1. Initial loading dose of phenytoin for status epilepticus

If the patient has not already received phenytoin then give:

**Phenytoin sodium IV 18 mg/kg** (see Table 1).

*Ensure ECG, blood pressure and respiratory function are monitored throughout the duration of the infusion.*

**Table 1 – IV phenytoin loading dose**

Weight (kg)	IV Loading Dose (mg)	Volume of IV phenytoin (ml) (vial = 250 mg/5ml)
35 - 44	700	14
45 - 54	900	18
55 - 64	1100	22
65 - 74	1250	25
75 - 84	1450	29
85 - 94	1600	32
> 94	1800	36

### Phenytoin IV administration

- Give phenytoin over 30 - 40 minutes (rate < 50 mg/minute). In patients who are elderly, or have pre-existing cardiac disease, give phenytoin over 60 - 80 minutes (rate < 25 mg/minute).
- Ideally, administer undiluted via a syringe pump through a large gauge needle or IV catheter into a large forearm vein.
- If dilution is essential, mix with 100 - 250 ml sodium chloride 0.9% to a final concentration of < 10 mg/ml, and administer by infusion pump.
- Use the solution immediately, ideally with a 0.2 - 0.5 micron in-line filter.
- To avoid local venous irritation, inject sterile sodium chloride 0.9% through the vein or catheter before and after each phenytoin infusion.
- **Do not** administer as a continuous infusion.

**Phenytoin ‘Top-up’ loading dose continues on next page**

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## 2. 'Top-up' loading dose of phenytoin for status epilepticus

If phenytoin is already present but the patient is still not controlled, a 'top-up' loading dose may be useful.

**Phenytoin sodium 'top-up' dose (mg) = (20 - measured concentration (mg/L)) x 0.7 x wt (kg)**

Table 2 gives the approximate increase in concentration following doses of 250 – 750 mg. For example, if the patient weighs 70 kg and has a measured concentration of 5 mg/L, a single dose of 750 mg will increase the concentration to around 20 mg/L (5 mg/L + 15 mg/L).

**Table 2 – Increase in phenytoin concentration with 'top-up' doses**

Dose \ Weight	Concentration increase with 'top-up' dose			
	50 kg	60 kg	70 kg	80 kg
<b>250 mg</b>	7 mg/L	6 mg/L	5 mg/L	4.5 mg/L
<b>500 mg</b>	14 mg/L	12 mg/L	10 mg/L	9 mg/L
<b>750 mg</b>	21 mg/L	18 mg/L	15 mg/L	13.5 mg/L

## 3. Maintenance dose of phenytoin

**Phenytoin typical doses are 3 - 5 mg/kg/day. The first dose should be given**

**12 - 24 hours after the loading dose.**

Oral or nasogastric administration should be used, whenever possible. Only use intravenous administration when these options are not feasible and where cardiac monitoring is available.

### Notes

- Phenytoin sodium 100 mg capsules / tablets / injection = 15 ml (90 mg) suspension (6 mg/ml).
- There are many drug interactions with phenytoin (consult the BNF Appendix 1 or your clinical pharmacist).
- Phenytoin concentrations increase disproportionately with dose; toxicity may occur if the maintenance dose is increased by more than 25 - 50 mg per day. Table 3 on the next page may help with dosage adjustment. Based on the patient's current dose and the measured concentration (columns 1 and 2), column 3 gives a rough guide to interpretation of the result and possible dosage adjustment.

**N.B.** Table 3 is for maintenance dose adjustment only. For 'top-up' doses in urgent situations see Table 2.

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**N.B.** Table 3 is for phenytoin maintenance dose adjustment only. For phenytoin 'top-up' doses in urgent situations see Table 2 on previous page.

**Table 3 – Phenytoin maintenance dose adjustment**

Measured concentration	Current dose	Maximum dose increase
< 5 mg/L	< 4.5 mg/kg/day	100 mg
	4.5 - 6 mg/kg/day	Check compliance
5 - 10 mg/L	4.5 - 6 mg/kg/day	50 mg
	> 6 mg/kg/day	Check compliance
10 - 20 mg/L	-	25 mg

## 4. Therapeutic Drug Monitoring of Phenytoin

**Target concentration range:** 5 - 20 mg/L

### Routine monitoring during maintenance therapy

- Trough concentration (i.e. sample prior to next dose)
- Sample 3 - 5 days after starting a maintenance dose or following a dose change
- Re-analyse 5 - 10 days later as further accumulation may occur

### Monitoring after a loading / top-up dose

- 2 - 4 hours after an IV dose or 12 - 24 hours after an oral dose or according to clinical response.
- Daily monitoring may be necessary until control is achieved and concentrations stabilise.

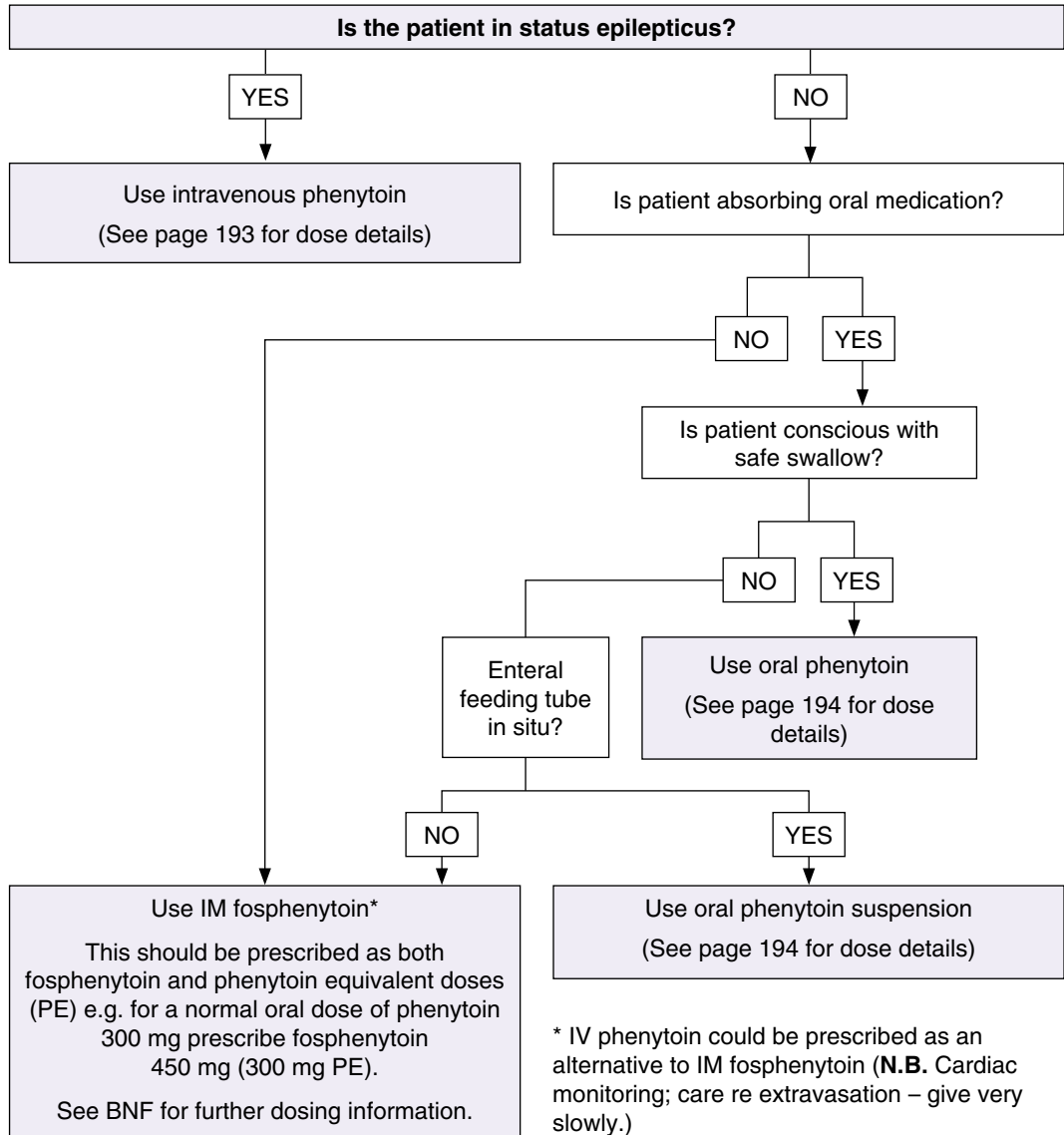
### Notes

- The patient's clinical status is more important than the concentration measurement.
- The interpretation of concentration measurements is altered in:
  - hypoalbuminaemia (especially < 32 g/L),
  - uraemia
  - pregnancy

*Seek advice from biochemistry or your clinical pharmacist.*

*Continues on next page*

## Decision making algorithm for the administration of phenytoin formulations



# Parkinson's Disease in Acute Care



## Introduction

This guidance highlights the importance of continuing Parkinson's disease (PD) medication and covers the first-line management of PD patients who have:

- Nil by mouth status
- Confusion / hallucination / agitation
- Dizziness and falls
- Nausea and vomiting

## Assessment / monitoring

It is **crucial not to stop PD drugs** for any significant length of time i.e. > 2 hours or to miss any doses as there is a risk of Neuroleptic Malignant-Like Syndrome (Parkinson hyperpyrexia syndrome, PHS) which may be fatal. Symptoms include rigidity, pyrexia, and reduced conscious level. There may be features of autonomic instability, and serum creatine kinase (CK) may be elevated. Complications of PHS include acute renal failure, aspiration pneumonia, deep venous thrombosis / pulmonary embolism and disseminated intravascular coagulation.

## General management

Where a patient does not have an individual supply of their PD medication, access supplies via the pharmacy or the local main holding areas of PD medications across NHSGGC (see table below).

It is important for PD medications to be administered at exact times. This should be clearly annotated on the prescription chart.

**Table 1 - Location of PD medicines across acute hospital sites**

Site	Location
Gartnavel General Hospital	Ward 3A
Glasgow Royal Infirmary	Ward 18/19
Inverclyde Royal Hospital	Ward 2
Royal Alexandra Hospital	Ward 5
Southern General Hospital	Ward 57
Victoria Infirmary	Ward 15 MHU – Ward North 2
Vale of Leven	Ward 14
Western Infirmary	Emergency Drug Cupboard

Inform PD nurse specialist of all PD patient admissions (see Appendix 6 for contact details)

*Continues on next page*

## Drug therapy / treatment options

### Nil by mouth patients

Seek advice from a clinical pharmacist, Medicines Information (see Appendix 6 for contact details), Parkinson's disease nurse specialist or on-call pharmacist (out of hours) regarding alternative formulations.

### Confusion / hallucination / agitation

- Only if necessary treat with benzodiazepine.
- **Avoid** first generation antipsychotics e.g. haloperidol or chlorpromazine.
- Refer to Management of Acutely disturbed patients section of the handbook page 165.
- Refer to PD specialist for assessment as soon as possible.

### Dizziness and falls

- Review need for drugs which precipitate postural hypotension or affect cardiac function e.g. hypertensives, heart failure drugs, tricyclic antidepressants, anticholinergics, acetylcholinesterase inhibitors.
- PD medications and PD itself may be associated with orthostatic hypotension (check standing BP).
- Refer to PD specialist for assessment as soon as possible.

### Nausea and Vomiting

- Use domperidone either orally or rectally (if necessary). Use the lowest effective dose. See BNF for further dosing advice.\*

**Caution:** domperidone may prolong QT interval. \*Risk of QT interval prolongation may be higher in patients older than 60 years and at daily doses of more than 30 mg. Avoid prescribing domperidone with other QT interval prolonging drugs (see [www.qtdrugs.org](http://www.qtdrugs.org) for further details). Consider alternatives in at risk patients.

- **Cyclizine oral/IM/IV 50 mg every 8 hours (in elderly use 25 mg)** or ondansetron (unlicensed use) are also appropriate.

**Note:** Ondansetron may prolong QT interval, use with caution.

- **Avoid** metoclopramide and prochlorperazine.

### Subcutaneous Apomorphine (for infusion)

- All patients admitted to hospital on apomorphine should be referred to the PD nurse specialist, movement disorders team or pharmacist for advice as soon as possible (see appendix 6 for contact details).
- An NMSGC monograph for maintaining apomorphine subcutaneous infusion treatment in patients admitted to hospital is available on StaffNet.
- Apomorphine should only be instigated with the guidance of a prescriber experienced in PD (it is not suitable for emergency administration in a drug naïve patient). If a patient is already established on this then it must be continued.



Section 7

Infections



# Management of infections

## Introduction

Appropriate and prudent use of antimicrobials is important as misuse of these agents is associated with treatment failure antibiotic resistance, healthcare associated infections (including *Clostridium difficile* and MRSA) and increasing cost. The following guidelines and policy documents aim to ensure appropriate, prompt and prudent use of antimicrobials within NHS GGC:

- **Infection management guidelines (for empirical antibiotic treatment)**
- **Intravenous to Oral Switch Therapy (IVOST) Guideline**
- **Gentamicin and Vancomycin dosing guidelines**
- **Alert Antimicrobial Policy:**
  - A list of broad-spectrum agents whose use is limited to specific indications and/or on the advice of a clinical microbiologist or infectious diseases physician.
- **Antibiotic prophylaxis in surgery**

These guidelines are reviewed and updated at regular intervals. The most up to date information can be found at StaffNet/ Info Centre / Policies, Procedures and Guideline Documents / NHS GGC Clinical Guideline Electronic Resource Directory or [www.ggcprescribing.org.uk](http://www.ggcprescribing.org.uk)

## Steps to Prudent Antimicrobial Prescribing

Antibiotics are overused, particularly in elderly patients, those with urinary catheters/bacteria in their urine but no signs or symptoms of urinary tract infection and patients with viral or non-infective exacerbations of COPD.

To ensure appropriate and prudent antimicrobial prescribing follow the steps below:

- Establish a clinical diagnosis to minimise unnecessary exposure to antimicrobials.
- Prescribe when clinically justified: there is a clear site of infection or sepsis syndrome is present (see page 210 for sepsis criteria) or there is clinical deterioration.
- Patient and drug specific factors may affect antibiotic choice so look at:
  - Previous antimicrobial history
  - Previous infection with multiresistant organisms (check previous culture results)
  - Allergy (list of penicillins on page 204)
  - Renal / hepatic function
  - Other medication (see Appendix 1 of the BNF for information on drug interactions)
  - Availability and absorption by the oral route.
- Document the antibiotic indication, signs and symptoms of infection and duration of antibiotic therapy or review date in the patient's notes. Document the duration / review date on the kardex after the first dose has been given.
- Prescribe IV only for those with severe / deep seated infections, sepsis syndrome (see page 210) or if the oral route is unavailable. Review IV antibiotics daily and switch to oral when appropriate (see IVOST page 205).

- In patients with sepsis –
  - Start IV antibiotic therapy (including gentamicin) as soon as possible and within 1 hour after recognising the signs of sepsis or severe sepsis. Each hour of delay in administering IV antibiotic therapy is associated with increasing mortality (see page 210).
  - Record the first dose of antibiotic on the 'one-off' section of the kardex, so that it is administered immediately
  - Communicate with the member of staff who is responsible for administration of the IV antibiotic therapy so it is given promptly
  - Administer the antibiotic in the clinical area where infection has been recognised and do not delay until arrival at destination ward.
- Review empirical (best guess) antimicrobial therapy no later than 48 hours after initiation. Simplify and switch to narrow spectrum therapy when microbiology results become available.
- Prescribe Alert Antibiotics only for the specific indications listed (see pages 208 - 209). Document the specific indication in the patient's notes and follow the policy outlined on page 207 to obtain a supply. For indications out with those listed contact microbiology / infectious diseases.
- Minimise Antibiotic expenditure.

## Reducing the risk of *Clostridium difficile* through prudent prescribing

*Clostridium difficile* infection (CDI) is an important healthcare associated infection in Scottish hospitals. It is life-threatening (reported mortality rate 10 - 30%) and has the potential for person to person spread within healthcare settings. Particularly at risk are patients who are aged > 65 years, frail, immunocompromised or who have chronic obstructive pulmonary disease or cardiovascular disease.

Antibiotic therapy disturbs the normal gastrointestinal flora, depleting organisms which are protective against CDI. **Any** antibiotic may be associated; those associated most commonly are listed below. Other broad spectrum agents (particularly the carbapenems) are also likely to show an association as prescribing increases. Overall antibiotic exposure, including excessive duration of therapy is also a risk factor for CDI as is surgical prophylaxis (with cephalosporins and quinolones). Proton pump inhibitors and H<sub>2</sub> antagonists also increase gastric pH which is associated with an increase in the risk of *Clostridium difficile* acquisition.

### Factors associated with CDI:

- Increasing age
- Severe underlying disease
- Non-surgical gastrointestinal procedures
- Nasogastric tube
- Long stay in hospital
- Stay in intensive care

*Continues on next page*

*Factors associated with CDI continued from previous page*



- Antibiotic use (clindamycin, cephalosporins, co-amoxiclav, ciprofloxacin (and other quinolones) and piperacillin / tazobactam)
- Longer duration of antibiotic course
- Proton pump inhibitors or H<sub>2</sub> antagonists

The antimicrobial guidelines are designed to reduce the risk of CDI by limiting overall antibiotic exposure (reduced prescriptions and duration of therapy) and by limiting those agents which have the strongest association.

# Gentamicin and Vancomycin: Reducing Patient Risk



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Gentamicin and vancomycin prescribing within NHSGGC has increased in recent years. Both agents have a narrow therapeutic index i.e. efficacy or the risk of toxicity or treatment failure is related to small changes in concentration of the drugs and hence the accuracy of the dosing. In addition, gentamicin accumulates in the inner ear risking oto-vestibular toxicity if prolonged or recurrent treatment courses. Consequently, accurate prescribing, appropriate therapeutic drug monitoring (TDM) and, in the case of gentamicin, restricted duration of therapy and avoidance of repeat courses are important to minimise risk.

**NOTE:** Before prescribing these agents ensure you refer to the correct dosing and monitoring guidance and use the correct prescription and monitoring documentation.

- Gentamicin: used and prescribed in 3 distinct ways within NHSGGC adult antimicrobial policy
  - Treatment dose (see page 258)
  - Synergistic **low dose** for endocarditis (see page 215)
  - Surgical prophylaxis dose (see page 255 and StaffNet)
- Vancomycin: used and prescribed in 3 distinct ways within NHSGGC adult antimicrobial policy
  - Pulsed IV Infusion (see page 260)
  - Continuous IV Infusion (see page 262)
  - Oral Vancomycin for the local treatment of *C. difficile*. Oral Vancomycin is not absorbed and cannot be used to treat a systemic infection.

# Antibiotic Allergy and Interactions

## Allergy

- Specifically enquire as to the nature of “allergy”. Abdominal pain, nausea, vomiting or dyspepsia does not constitute allergy.
- Document both the allergy and the nature of the allergy in the patient’s medical notes and on the drug kardex.
- Do not give penicillin, cephalosporin or other beta-lactam\* antibiotic if patient has a history of anaphylaxis, urticaria, or rash immediately after penicillin administration.
- Adults with a history of a minor rash (e.g. non-confluent, non-pruritic rash restricted to a small area of the body), or a rash that occurs > 3 days after starting an antibiotic course are unlikely to have an antibiotic allergy and therefore the antibiotic should not be withheld unnecessarily for serious infections.
- Penicillin allergy occurs in 1-10% of patients. Anaphylaxis occurs in < 0.05% of treated patients.
- Co-trimoxazole: rash occurs in  $\geq 1$  in 100 patients prescribed co-trimoxazole. If a rash occurs discontinue co-trimoxazole immediately.
- Be aware of the components of antibiotic co-formulations e.g. co-trimoxazole (trimethoprim and sulphamethoxazole), co-amoxiclav (amoxicillin and clavulanic acid).
- For further advice on antibiotic allergy please contact the allergy service – see Appendix 6 for contact detail.

**\*Beta-lactam antibiotics include:** amoxicillin; ampicillin; benzylpenicillin (Penicillin G); co-amoxiclav (Augmentin®); flucloxacillin; phenoxymethylpenicillin (Penicillin V); piperacillin+tazobactam (Tazocin®), cefaclor; cefalexin; cefotaxime; ceftazidime; ceftriaxone; cefuroxime; aztreonam; meropenem; imipenem with cilastatin, doripenem, ertapenem (see BNF for more details).

## Important Antibiotic Drug Interactions

This is not a comprehensive list; for further information refer to a pharmacist or Appendix 1 of the BNF.

**Clarithromycin:** numerous interactions (some potentially life-threatening) via;

- i) Enzyme inhibition e.g. carbamazepine and simvastatin (see BNF Appendix 1).
- ii) QT prolongation e.g. citalopram, fluconazole; seek advice from pharmacy. Consider other medical risk factors for QT prolongation.

**Rifampicin:** numerous interactions through enzyme induction (see BNF Appendix 1).

**Statins:** Avoid concomitant use with macrolides and sodium fusidate (consult BNF for details). Consider using an alternative antibiotic class; liaise with microbiology / infectious diseases unit where appropriate.

**Warfarin:** INR may be altered by many antibiotics, particularly if a course is prolonged (check BNF Appendix 1).

**Oral contraceptive pill:** no additional contraceptive precautions are now required when combined oral contraceptives are used with antibiotics which do not induce liver enzymes, unless diarrhoea or vomiting occur (see BNF for advice).

# IV-Oral Antibiotic Switch Therapy (IVOST) Guideline



Intravenous therapy is appropriate in patients with:

- Sepsis: clinical symptoms of infection (fever, sweats, chills or rigors, malaise, etc.) or proven infection and at least two of the following:
  - Temperature: < 36°C or > 38°C
  - Tachycardia: HR > 90 bpm
  - Tachypnoea: RR > 20 breaths/minute
  - WCC: < 4 or > 12 x 10<sup>9</sup> /L

**N.B.** Signs of sepsis may be masked in: immunosuppression, the elderly, in the presence of anti-inflammatory drugs or beta-blockers.

- Serious or severe sepsis: sepsis with any of the following:
  - SIRS 3 - 4
  - Organ dysfunction / hypoperfusion (lactic acidosis, oliguria, or confusion)
  - Hypotension (systolic BP < 90 mmHg or a reduction of 40 mmHg from baseline)
- Clinical symptoms / signs of infection and deteriorating clinical condition
- Febrile with neutropenia / immunosuppression
- Meningitis / CNS infection
- Infective endocarditis
- Bronchiectasis
- Bone / joint infection
- Deep abscess
- Cystic fibrosis
- *Staphylococcus aureus* bacteraemia
- Skin and Soft Tissue infection, IV therapy if sepsis or 2 or more of heat, erythema or induration / swelling (IV therapy usually 48 - 96 hours).
- Oral route compromised – vomiting, nil-by-mouth, reduced gastrointestinal absorption, mechanical swallowing disorder, unconscious.
- No oral formulation of the antibiotic available.
- Initial therapy for Biliary Sepsis / Intra-abdominal infection

**Note:** CRP does not reflect the severity of infection and may remain elevated even when infection is resolving. It cannot be used in isolation to assess the severity of infection and hence the need for IV therapy.

If none of the above apply, check microbiology results and switch to an oral narrow spectrum agent whenever possible. If no microbiology results are available use the table on the next page to guide the switch to oral therapy.

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**Table 1 – Antibiotic IV to oral switch**

IV antibiotic	Oral antibiotic
Amoxicillin	Amoxicillin 500 mg - 1 g 8 hourly
Amoxicillin + Gentamicin (for pyelonephritis with sepsis)	Co-amoxiclav 625 mg 8 hourly (assuming narrow spectrum agent not appropriate).
Benzylpenicillin	Amoxicillin 500 mg - 1 g 8 hourly (for suspected pneumococcal infection). Phenoxymethylpenicillin ( Pen V) 500 mg 6 hourly or 1 g 12 hourly (for pharyngitis / tonsillitis).
Clarithromycin	Clarithromycin 500 mg 12 hourly
Clindamycin	Clindamycin is indicated in: suspected necrotising fasciitis, severe / rapidly progressive skin and soft tissue infection, possible streptococcal / staphylococcal toxic shock or severe pharyngitis. Clindamycin 450 mg 8 hourly (< 70 kg) Clindamycin 600 mg 8 hourly ( $\geq$ 70 kg)
Co-amoxiclav	Is there a narrow spectrum alternative? (e.g. Amoxicillin 500 mg - 1 g 8 hourly) otherwise Co-amoxiclav 625 mg 8 hourly
Co-trimoxazole	Co-trimoxazole 960 mg 12 hourly (unless PCP or multi-resistant infections in which case seek advice from microbiology / infectious diseases unit). Use trimethoprim if a sensitive organism is isolated.
Flucloxacillin	Flucloxacillin 500 mg - 1 g 6 hourly
Gentamicin	Stop after a maximum of 3 - 4 days unless there is a clear clinical and microbiological need. If required for longer, seek microbiology / infectious diseases unit advice. Monitor for signs of oto and vestibular toxicity (see page 258). Consider: <ul style="list-style-type: none"> <li>• Is gram negative cover still required? If not stop</li> <li>• Is there any positive microbiology? If so simplify</li> <li>• See above / below for intra-abdominal / urinary sepsis switches.</li> </ul>
Gentamicin + Amoxicillin + Metronidazole (intra-abdominal sepsis)	Co-amoxiclav 625 mg 8 hourly
Metronidazole	Metronidazole 400 mg 8 hourly
Vancomycin	Contact microbiology / infectious diseases unit for advice
Vancomycin + Gentamicin + Metronidazole (intra-abdominal sepsis)	Ciprofloxacin 500 mg 12 hourly + Metronidazole 400 mg 8 hourly

Most infections will require  $\leq$  7 days **total** antibiotic therapy (IV and oral).



# Alert Antibiotic Policy

(The full version of the Alert Antibiotic Policy and the Alert Antibiotic Form are available on StaffNet.)

- The policy has been developed to limit the use of specific, valuable antibiotics which should be reserved for special circumstances (e.g. resistant organisms). These agents are rarely justifiable in community acquired infection.
- The agents are identified by virtue of their broad spectrum of activity, potential toxicity and/or expense. In most hospital infections, first-line antibiotic therapy is appropriate, with “Alert Antibiotics” reserved for complex infections caused by organisms that are resistant to first-line antibiotic therapy.
- Table 2 on the following pages lists the alert antibiotics and their permitted indications. These antibiotics will only be issued from pharmacy on receipt of a completed Alert Antibiotic form.

## Process for authorising an “alert agent”

- During weekday working hours (0900 – 1700 hours):
  - To obtain a supply the “Alert Antibiotics Form” must be completed and sent to pharmacy with the indent.
  - The form should be completed by medical staff, stating the indication (see next page for list). Clinical pharmacists can complete the form in conjunction with prescribers.
  - If an alert agent is being prescribed out with the permitted indications, the choice must be discussed with a microbiologist or infectious diseases physician. The reason for use and the name of the microbiologist or infectious disease physician must be recorded on the form and medical notes.
- Out-of-hours (including weekends and public holidays):
  - The prescriber should complete the “Alert Antibiotic form”. Do not delay treatment if unable to complete the form; obtain an emergency supply and complete the form as soon as possible.
  - A 24 – 72 hour emergency supply can be obtained from pharmacy (may need to contact the on-call pharmacist via the hospital coordinator).

*Continues on next page*

Table 1 – Alert Antibiotics

Alert Antibiotic	Permitted Indications
<b>Amikacin IV</b>	<ol style="list-style-type: none"> <li>1. Gentamicin resistant Gram-negative infections.</li> <li>2. In combination therapy for tuberculosis when oral therapy is not possible or drug resistance is suspected.</li> <li>3. Severe neutropenic sepsis in accordance with haematology or oncology unit's sepsis protocol.</li> </ol>
<b>Ciprofloxacin IV</b>	<ol style="list-style-type: none"> <li>1. If oral route is compromised and ciprofloxacin prescribed in line with the Infection Management Guideline.</li> <li>2. Proven <i>Legionella</i> pneumonia</li> <li>3. Treatment of spontaneous bacterial peritonitis for 2 days only then oral for 5 days (in line with Infection Management Guidelines, page 234).</li> <li>4. Neutropenic patient with fever and true penicillin allergy (in line with Infection Management Guidelines, page 213 ).</li> </ol>
<b>Ceftazidime IV</b>	<ol style="list-style-type: none"> <li>1. Febrile neutropenia, in accordance with haematology or oncology unit's sepsis protocol.</li> <li>2. Empiric therapy for CAPD associated peritonitis.</li> <li>3. Exacerbation of bronchiectasis / cystic fibrosis if evidence of colonisation with <i>Pseudomonas</i> or resistant Gram-negative organism.</li> </ol>
<b>Ceftriaxone IV</b>	<ol style="list-style-type: none"> <li>1. Bacterial meningitis</li> <li>2. Enteric fever (typhoid or paratyphoid)</li> <li>3. Brain abscess</li> <li>4. Acute severe pelvic inflammatory disease.</li> </ol>
<b>Clindamycin IV</b>	<ol style="list-style-type: none"> <li>1. Suspected necrotising fasciitis or severe or rapidly progressive soft tissue infection</li> <li>2. Suspected streptococcal or staphylococcal toxic shock syndrome</li> <li>3. Second-line therapy for PCP e.g. in HIV infection</li> <li>4. Severe pharyngitis.</li> </ol>
<b>Colistin IV</b>	Only on the advice of a microbiologist or infectious diseases physician.
<b>Daptomycin IV</b>	<p>Only on the advice of a microbiologist or infectious diseases physician (N.B. not for pneumonia) for:</p> <ol style="list-style-type: none"> <li>1. Vancomycin-resistant enterococci (VRE), vancomycin-intermediate <i>Staphylococcus Aureus</i> (VISA), vancomycin-resistant <i>Staphylococcus aureus</i> (VRSA)</li> <li>2. Non-response or allergy / intolerance to glycopeptides (not including those who develop 'red man syndrome' because vancomycin has been infused too quickly).</li> </ol>
<b>Ertapenem IV</b>	<ol style="list-style-type: none"> <li>1. Proven extended spectrum beta-lactamase (ESBL) infections requiring IV therapy</li> </ol>

Table continues on next page



Table 1 – Alert Antibiotics continued from previous page	
Alert Antibiotic	Permitted Indications
<b>Levofloxacin (IV or Oral)</b>	Second-line for suspected atypical pneumonia
<b>Linezolid (IV or Oral)</b>	Only on the advice of a microbiologist or infectious diseases physician for: <ol style="list-style-type: none"><li>1. VRE, VISA, VRSA</li><li>2. Non-response or allergy / intolerance to glycopeptides (not including those who develop 'red man syndrome' because vancomycin has been infused too quickly)</li></ol>
<b>Meropenem / Imipenem / Doripenem IV</b>	<ol style="list-style-type: none"><li>1. Exacerbation of bronchiectasis / cystic fibrosis if evidence of colonisation with <i>Pseudomonas</i> / resistant Gram-negative organism.</li><li>2. Febrile neutropenia as second- line therapy in accordance with haematology or oncology unit's sepsis protocol.</li><li>3. Infections due to multi-resistant (including ertapenem-resistant) organisms</li><li>4. Severe sepsis unresponsive to piperacillin / tazobactam and gentamicin on the advice of a microbiologist / infectious diseases physician.</li><li>5. In stem cell transplant / solid organ transplant or patients receiving chemotherapy for acute leukaemia who are neutropenic or on high dose steroids (<math>\geq 1</math> mg/kg prednisolone) for Graft Versus Host Disease or rejection and having ongoing shock that is unresponsive (within 1 hour) to appropriate fluid resuscitation measures.</li></ol>
<b>Moxifloxacin (IV or Oral)</b>	Drug resistant mycobacterial infections. <b>N.B.</b> Due to toxicity risks (hepatotoxicity and QT interval prolongation) only on the advice of a microbiologist / infectious diseases physician
<b>Piperacillin and tazobactam</b>	<ol style="list-style-type: none"><li>1. Febrile neutropenia in line with Infection Management Guidelines (page 213)</li><li>2. Second-line therapy for intra-abdominal sepsis not responding to amoxicillin + gentamicin + metronidazole</li><li>3. Second-line therapy for severe hospital acquired pneumonia</li><li>4. Exacerbation of bronchiectasis / cystic fibrosis if evidence of colonisation with <i>Pseudomonas</i> / resistant Gram-negative organisms.</li><li>5. Sepsis in decompensated liver disease with associated ascites</li></ol>
<b>Tigecycline</b>	On the advice of a microbiologist or infectious diseases physician only



# Infection Management Guidelines

## Severe systemic infections

### Definition of Sepsis

- Sepsis: clinical symptoms of infection (fever, sweats, chills or rigors, malaise, etc.) or proven infection and **at least two** of the following:
  - Temperature  $< 36^{\circ}\text{C}$  or  $> 38^{\circ}\text{C}$ ; tachycardia HR  $> 90$  bpm;  
tachypnoea RR  $> 20$  breaths/minute; WCC  $< 4$  or  $> 12 \times 10^9 /\text{L}$ .
- Serious or severe sepsis: sepsis with any of the following:
  - SIRS 3 - 4
  - Organ dysfunction / hypoperfusion (lactic acidosis, oliguria, or confusion)
  - Hypotension (systolic BP  $< 90$  mmHg or a reduction of 40 mmHg from baseline)

**N.B.** Signs of sepsis may be masked in: immunosuppression, the elderly and in the presence of anti-inflammatory drugs or beta-blockers. CRP does not reflect the severity of infection and may remain elevated even when infection is resolving; it cannot be used in isolation to assess the severity of infection and hence the need for IV therapy.

Mortality from sepsis and severe sepsis increases with each hour of delay in initiating IV antibiotic therapy. In patients with sepsis, aim to complete the “**Sepsis 6**” within 1 hour:

1. Oxygen therapy (target saturation 94 - 98% or 88 - 92% for those with chronic obstructive pulmonary disease).
2. IV fluids (at least 500 ml sodium chloride 0.9% in first hour)
3. Blood cultures
4. Administer IV antibiotics according to guidelines
5. Measure lactate
6. Assess urine output (consider catheterisation in some patients)

Record first dose of antibiotic in the 'one-off' section of the kardex and communicate with the member of staff who is responsible for administration of IV antibiotic therapy to ensure it is administered immediately. *Administer the antibiotic in the clinical area where infection has been recognised and do not delay until arrival at the destination ward.*

*Management of Sepsis Source Unknown continues on next page*

## Sepsis Source Unknown (not immunocompromised or neutropenic patients)

Indication	Antibiotic therapy	Notes / Comments
Community acquired sepsis or severe sepsis where the source is unknown	<p>Benzylpenicillin IV 1.2 - 2.4 g 6 hourly</p> <p><b>and</b></p> <p>Flucloxacillin IV 2 g 6 hourly</p> <p><b>and</b></p> <p>Gentamicin IV (dosing info page 258 )</p> <p><i>If true penicillin / beta-lactam allergy or MRSA suspected:</i></p> <p>Vancomycin IV (dosing info page 260)</p> <p><b>and</b></p> <p>Gentamicin IV (dosing info page 258)</p>	<p><i>E. coli</i>, <i>S. aureus</i> and <i>pneumococcus</i> are commonest community blood culture isolates.</p> <p>Consider meningococcal infection and <i>S. pyogenes</i> (e.g. pharyngitis, erythroderma or hypotension).</p> <p>Consider infective endocarditis in IVDU; line-related sepsis; recent dental extraction (see page 215).</p>
Suspected severe streptococcal infection (e.g. toxic shock, rapidly progressive soft tissue infection)	<p><i>As for Community acquired sepsis or severe sepsis where the source is unknown</i> <b>and add in:</b></p> <p>Clindamycin* IV 600 mg 6 hourly (up to 1200 mg 6 hourly)</p>	<p>*Alert Antibiotic - complete Alert Form</p> <p>Seek advice from microbiology / infectious diseases unit (Appendix 6 for contact details).</p>
Proven <i>S. aureus</i> bacteraemia	<p>Flucloxacillin IV 2 g 4 hourly</p> <p><i>If true beta-lactam allergy or MRSA suspected then:</i></p> <p>Vancomycin IV (dosing info on page 260)</p>	<p>Replace intravascular device if source of infection.</p> <p>All patients require echo and investigation for possible underlying source.</p> <p>Continue IV therapy until underlying source excluded.</p> <p>Discuss management (including duration of therapy) with microbiology / infectious diseases unit.</p> <p>Repeat blood cultures after 3 - 4 days of effective therapy.</p>
Table continues on next page		

Sepsis Source Unknown (not immunocompromised or neutropenic) continued from previous page		
Indication	Antibiotic therapy	Notes / Comments
Healthcare-associated sepsis or severe sepsis where the source is unknown	Vancomycin IV (dosing info page 260) <b>and</b> Gentamicin IV (dosing info page 258)	Consider MRSA infection – sepsis arising > 48 hours post admission, recent hospital discharge, post operative wound or line-related sepsis or sepsis in previous or current MRSA carrier.
Sepsis syndrome secondary to suspected urinary source (includes pyelonephritis with sepsis)	See pages 218 (non-pregnant women), 219 (pregnant women) and 221 (in men)	

# Immunocompromised patients with fever

Immunocompromised patient can include the following:

- Received chemotherapy within the previous 3 weeks
- On high dose steroids e.g. prednisolone > 15 mg/day for > 2 weeks\*
- On other immunosuppressive agent e.g. anti-TNF, cyclophosphamide
- Transplant patient (solid organ or bone marrow)

## Neutropenic Sepsis Definition\*:

Neutrophils either < 0.5 or < 1 X 10<sup>9</sup>/L and falling, **and**

Temperature > 38°C or hypothermic (< 36°C) on 2 occasions, at least 30 minutes apart.

If stem cell transplant recipient, refer to Beatson Oncology protocol poster (see StaffNet)

\*Patients on high dose steroids or severely immunocompromised may not have an increased temperature, but present with symptoms which may include sweats, chills, rigors, malaise, respiratory rate > 20 breaths/minute, tachycardia (> 90 bpm) or hypotension. Note that patients may appear well perfused despite hypotension.

Ensure prompt IV antibiotic administration in sepsis – see note on page 210.

Immunocompromised patient with fever	Antibiotic Therapy	Notes / Comments
Neutropenia	<p>Piperacillin + Tazobactam* IV 4.5 g 6 hourly  <b>and</b>  Gentamicin** IV (dosing info page 258)  <i>If suspected staphylococcal infection (e.g. line-related sepsis or soft tissue infection)</i>  <b>to the above add in:</b>  Vancomycin IV (dosing info page 260)  <i>If true penicillin / beta-lactam allergy:</i>  Contact microbiology / infectious diseases unit (Appendix 6 for contact details). Give:  Vancomycin IV (dosing info page 260)  <b>and</b>  Gentamicin** IV (dosing info page 258)  <b>and</b>  Ciprofloxacin* IV 400 mg 12 hourly</p>	<p>Investigate for source of sepsis.  Review treatment daily.  *Piperacillin+Tazobactam / Ciprofloxacin:</p> <ul style="list-style-type: none"> <li>• Reduce dose in renal impairment (see BNF).</li> <li>• Alert antibiotic, please complete Alert Form.</li> </ul> <p>**Gentamicin:</p> <ul style="list-style-type: none"> <li>• Do not prescribe in myeloma patients unless discussed with relevant haematologist.</li> </ul> <p>Discuss treatment with appropriate specialist and seek microbiology / infectious diseases unit for advice (Appendix 6 for contact details).</p>

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Table continued from previous page		
Immunocompromised patient with fever	Antibiotic Therapy	Notes / Comments
<p>In stem cell transplant / solid organ transplant or patients receiving chemotherapy for acute leukaemia</p> <p><b>and</b></p> <p>neutropenic or on high dose steroids (<math>\geq 1</math> mg/kg prednisolone) for Graft Versus Host Disease or rejection</p> <p><b>and</b></p> <p>shocked**</p>	<p>Meropenem* IV 1 g 8 hourly</p> <p><b>and</b></p> <p>Amikacin* IV (dosing info page 257)</p>	<p>Consider multi-resistant organisms.</p> <p>* Alert antibiotic – please complete form.</p> <p>** Shocked = requiring inotropic support or systolic BP &lt; 90 mmHg, unresponsive (within 1 hour) to appropriate fluid resuscitation measures.</p>
<p>Immunocompromised (excluding stem cell transplant patients) with fever <b>and no neutropenia</b></p>	<p>Manage as per infection management guidelines based on anatomical source.</p>	<p>Consider additional serious fungal or viral infection. Discuss with appropriate specialist and seek microbiology / infectious diseases unit for advice (Appendix 6 for contact details)</p>
<p>HIV positive patient with fever</p>	<p>Manage as per infection management guidelines based on anatomical source.</p>	<p>Contact infectious diseases consultant on call (Appendix 6 for contact details)</p>



# Endocarditis

- Take three sets of blood cultures. For each set send blood culture in aerobic and anaerobic bottles.
- Seek senior specialist advice, refer to cardiology and consider early cardiothoracic input, particularly in Staphylococcal infections and infections involving a prosthetic valve.
- Use **synergistic dosing** of gentamicin:
  - IV 80 mg 12 hourly, administer as a bolus over 3 - 5 minutes.
  - Measure concentration 1 hour after dose administration and immediately before the next dose.

Seek dosing and monitoring advice from pharmacy within 24 hours of starting.

- Duration is dependent on the organism; seek advice from microbiology / infectious diseases unit.
- Monitor renal function daily and gentamicin concentrations at least every 2 - 3 days.
- Monitor for oto / vestibular toxicity (see page 258).
- Discuss all suspected endocarditis cases with microbiology or infectious diseases unit and with cardiology.
- Consider OPAT referral after at least first week of inpatient therapy.

Endocarditis Empirical therapy	Antibiotic Therapy	Notes / Comments
Native heart valves ( <i>Streptococcus viridans</i> , <i>Staphylococcus aureus</i> , coagulase negative staphylococci, enterococcal species) <i>Streptococcus pyogenes</i> may also be implicated in IVDU	Amoxicillin IV 2 g 4 hourly <b>and</b> Flucloxacillin IV 2 g 4 hourly <b>and</b> Gentamicin* IV (synergistic dosing)  <i>If true penicillin / beta-lactam allergy / penicillin resistance / suspected MRSA infection:</i> Vancomycin IV (dosing info page 260) <b>and</b> Gentamicin* IV (synergistic dosing)	Discuss ongoing therapy in all cases with microbiology / infectious diseases unit. Acute or rapidly progressive infection is suggestive of <i>S. aureus</i> infection Gentamicin* synergistic dosing – contact pharmacists for dosing advice. Monitor gentamicin concentrations at least every 2 - 3 days. Aim for peak concentration (1 hour post- dose) of 3 – 5 mg/L and a trough (pre-dose) of < 1 mg/L. Gentamicin course durations as per microbiology / infectious diseases unit / cardiology advice. Usually: <ul style="list-style-type: none"> <li>• <i>Staphylococcus aureus</i> infection: 3 - 5 days</li> <li>• Enterococcal infection: 4 - 6 weeks</li> <li>• Penicillin sensitive Streptococcal infections – gentamicin not required.</li> </ul>
Table continues on next page		

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Endocarditis Empirical therapy	Antibiotic Therapy	Notes / Comments
Prosthetic heart valve Infections are usually: <ul style="list-style-type: none"> <li>• Staphylococcal (Coagulase negative / MSSA / MRSA)</li> <li>• Enterococcal</li> </ul>	Vancomycin IV (dosing info page 260) <b>and</b> Gentamicin* IV (synergistic dosing) for first 2 weeks <b>and</b> Rifampicin** oral $\leq 70$ kg 450 mg 12 hourly $> 70$ kg 600 mg 12 hourly <i>Or in place of rifampicin add:</i> Sodium Fusidate** oral 500 mg 8 hourly (or if suspension then fusidic acid** oral 750 mg 8 hourly)	Discuss all cases with microbiology / infectious diseases unit. If Meticillin Sensitive <i>Staphylococcus aureus</i> (MSSA) isolated, switch from vancomycin to flucloxacillin. *Gentamicin synergistic dosing – contact pharmacists for dosing advice. Gentamicin concentrations - aim for peak concentration (1 hour post-dose) of 3 – 5 mg/L and a trough (pre-dose) of $< 1$ mg/L. **Rifampicin / Sodium Fusidate (fusidic acid) <ul style="list-style-type: none"> <li>• Check for drug interactions (BNF Appendix 1)</li> <li>• Caution if pre-existing liver disease</li> <li>• Must not be used as monotherapy</li> </ul>

### Further management

Discuss further management with microbiology or infectious diseases unit.

# Urinary tract infections (UTIs)

- Antibiotics are overused in the elderly particularly in patients with urinary catheters or suspected UTIs. Consider delaying antibiotic therapy pending culture.
- Do not treat asymptomatic bacteriuria, except in pregnancy.
- If antibiotic therapy appropriate, only prescribe after urine cultures have been taken, unless sepsis when blood cultures should be taken and antibiotic therapy not delayed.

UTI in non-pregnant women	Antibiotic Therapy	Notes / Comments
Uncomplicated lower UTI i.e. no fever or flank pain <i>(Coliforms especially E. coli, Enterococci, Staphylococcus saprophyticus)</i>	Prescribe only if urinary symptoms:  Trimethoprim oral 200 mg 12 hourly  <b>or</b>  Nitrofurantoin oral 50 mg 6 hourly (avoid if CrCl < 20 ml/minute, or G6PD deficiency)  Total course duration: 3 days.	Urinary symptoms:  Cystitis, dysuria, frequency.
Upper UTI <b>without sepsis</b>	Trimethoprim oral 200 mg 12 hourly  (if a sensitive organism is suspected)* for 14 days  <b>or if resistant organism suspected:</b>  Co-amoxiclav oral 625 mg 8 hourly for 14 days  <b>or if true penicillin / beta-lactam allergy:</b>  Ciprofloxacin oral 500 mg 12 hourly for 7 days	Symptoms:  Loin pain, flank tenderness, dysuria  For manifestations of sepsis (see page 210).  * Sensitive organism suggested by no previous resistant isolates, no history of recurrent UTIs, no history of antibiotic exposure in prior 3 months and no pre – existing renal tract abnormality (including stones) or device (e.g. stent).
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UTI in non-pregnant women	Antibiotic Therapy	Notes / Comments
Upper UTI <b>with sepsis</b> (includes pyelonephritis with sepsis) (Coliforms, <i>P. aeruginosa</i> in chronic disease)	Amoxicillin IV 1 g 8 hourly <b>and</b> Gentamicin* IV (dosing info page 258) for 2 doses then simplify according to sensitivities <b>or if true penicillin / beta-lactam allergy:</b> Gentamicin* IV monotherapy (dosing info page 258) Total course duration (IV and oral) 14 days	IV antibiotic administration in sepsis – see note on page 210. Adjust antibiotic therapy when culture results are available *Do not use gentamicin beyond 3 - 4 days. Discuss alternatives with microbiology / infectious diseases unit. Amoxicillin PLUS gentamicin is the preferred regime for urosepsis. Where IV therapy is required and a trimethoprim-sensitive organism has been isolated IV co-trimoxazole 960 mg 12 hourly may be used.
UTI in pregnant women	Antibiotic Therapy	Notes / Comments
Asymptomatic bacteriuria	Treat according to culture results. Total course duration: 3 - 7 days.	<ul style="list-style-type: none"> <li>• Culture prior to treatment.</li> <li>• Treat asymptomatic bacteriuria in pregnancy.</li> <li>• Re-culture 7 days after completion of course.</li> <li>• Refer to BNF for information on the use of antibiotics in pregnancy.</li> </ul>
Lower UTI <b>without sepsis</b>	1st / 2nd trimester – Nitrofurantoin oral 50 mg 6 hourly (avoid if CrCl < 20 ml/minute, or G6PD deficiency; contact microbiology / infectious diseases unit for an alternative) 3rd trimester – Trimethoprim oral 200 mg 12 hourly Total course duration: 7 days	Trimethoprim in first trimester – ensure folic acid supplement is given
Upper UTI <b>without sepsis</b>	Co-amoxiclav oral 625 mg 8 hourly <b>If true penicillin / beta-lactam allergy:</b> Trimethoprim oral 200 mg 12 hourly Total course duration: 14 days	Table continues on next page

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UTI in pregnant women	Antibiotic Therapy	Notes / Comments
Upper UTI / pyelonephritis <b>with sepsis</b>	<p>Co-amoxiclav IV 1.2 g 8 hourly</p> <p>Total course duration 14 days (IV and oral)</p> <p><i>If true penicillin / beta-lactam allergy:</i></p> <p>Gentamicin* IV (dosing info page 258).</p> <p>Contact microbiology for oral or alternative IV options. Do <b>not</b> continue gentamicin beyond 96 hours.</p>	<p>IV antibiotic administration in sepsis – see note on page 210.</p> <p>Co-amoxiclav – IV to oral switch see page 206.</p> <p>Culture prior to treatment.</p> <p>Re-culture 7 days after completion of course.</p> <p>*Gentamicin - If pre-pregnant BMI &gt; 30 then 5 mg/kg of non- pregnant weight. Maximum gentamicin dose of 600 mg. Measure concentration 1 hour post dose and a second sample 6 - 14 hours post dose and seek advice from pharmacy.</p>
Table continues on next page – Therapy for MEN		

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UTI in men	Antibiotic Therapy	Notes / Comments
Cystitis / lower UTI in men <i>i.e. without sepsis or suspected prostatitis or epididymitis</i>	Trimethoprim oral 200 mg 12 hourly <b>or</b> Nitrofurantoin oral 50 mg 6 hourly (avoid if CrCl < 20 ml/minute or if G6PD deficiency) Total course duration 7 days.	Symptoms: dysuria, urgency, frequency, polyuria, suprapubic tenderness
Acute prostatitis ( <i>E. coli</i> , <i>Klebsiella</i> , <i>Proteus</i> )	Trimethoprim oral 200 mg 12 hourly <b>or</b> if resistant organism or failure to improve with above: Ciprofloxacin oral 500 mg 12 hourly Total course duration 14 days and review response.*	Refer to Urology. Modify antibiotic therapy depending on urinary culture results and clinical response.  *Longer courses of 4 - 6 weeks may be required if continued symptoms or if culture positive.
Epididymitis / orchitis	Ofloxacin oral 200 mg 12 hourly for 14 days.  If risk of <i>N.gonorrhoeae</i> / <i>C. trachomatis</i> :  Refer to GUM (see Appendix 6 under Sandyford for contact details).	Exclude testicular torsion.  Consider mumps in young adults when associated with parotitis (antibiotics not required).  Perform MSSU and send a further 1st void urine sample to virology (white top universal) for Nucleic Acid Amplification Tests (NAAT) for Chlamydia and Gonococcus. Urethral swab if discharge.  If age < 35 years, sexually active or urethral discharge refer to GUM.
Table continues on next page – Therapy for MEN		



Table continued from previous page – Therapy for MEN		
UTI in men	Antibiotic Therapy	Notes / Comments
Upper UTI <b>without sepsis</b>	Trimethoprim oral 200 mg 12 hourly (if a sensitive organism is suspected)* for 14 days <b>or</b> if resistant organism suspected: Co-amoxiclav oral 625 mg 8 hourly for 14 days <b>or if true penicillin / beta-lactam allergy:</b> Ciprofloxacin oral 500 mg 12 hourly for 7 days.	Symptoms: Loin pain, flank tenderness, dysuria  For manifestations of sepsis (see page 210)  *Sensitive organism suggested by no previous resistant isolates, no history of recurrent UTIs, no history of antibiotic exposure in prior 3 months and no pre – existing renal tract abnormality (including stones) or device (e.g. stent).
Upper UTI <b>with sepsis</b> (includes pyelonephritis with sepsis) (Coliforms, <i>P. aeruginosa</i> in chronic disease)	Amoxicillin IV 1 g 8 hourly <b>and</b> Gentamicin* IV (dosing info page 258) for 2 doses then simplify according to sensitivities <b>or if true penicillin / beta-lactam allergy:</b> Gentamicin* IV monotherapy (dosing info page 258) Total course duration (IV and oral) 14 days	IV antibiotic administration in sepsis – see note on page 210.  Adjust antibiotic therapy when culture results are available.  *Do not use gentamicin beyond 3 - 4 days. Discuss alternatives with microbiology / infectious diseases unit.  Amoxicillin PLUS gentamicin is the preferred regime for urosepsis.  Where IV therapy is required and a trimethoprim sensitive organism has been isolated IV co-trimoxazole 960 mg 12 hourly may be used.

UTI treatment continues on next page

## UTI treatment continued

Catheter-related UTI	Antibiotic Therapy	Notes / Comments
Asymptomatic bacteriuria	Antibiotic therapy not recommended	
Symptomatic bacteriuria <b>without sepsis</b>	Remove / replace catheter – culture urine. Give a <b>single</b> dose of gentamicin IV (dosing info page 258).	Symptoms: <ul style="list-style-type: none"> <li>• Fever</li> <li>• Flank or suprapubic discomfort</li> <li>• Nausea / vomiting</li> <li>• New onset confusion</li> <li>• Cloudy or offensive urine</li> </ul>
Symptomatic bacteriuria <b>with sepsis</b>	<ul style="list-style-type: none"> <li>• Remove / replace catheter – culture urine.</li> <li>• Give a single dose of gentamicin IV (dosing info page 258).</li> <li>• Prescribe according to culture results. If not available prescribe as per pyelonephritis on previous page.</li> </ul> Total course duration 7 days (IV and oral).	IV antibiotic administration in sepsis and for definition of sepsis see page 210. Adjust antibiotic therapy when culture results are available. Do not use gentamicin beyond 3 - 4 days. Discuss alternatives with microbiology / infectious diseases unit. Where IV therapy is required and a trimethoprim sensitive organism has been isolated IV co-trimoxazole 960mg 12 hourly may be used.

*UTI treatment continues on next page*



UTI treatment continued

Prophylaxis of UTI	Antibiotic Therapy	Notes / Comments
Recurrent UTI in women ≥ 3 episodes / year	Cranberry products* Nitrofurantoin** oral 50 mg every 24 hours at night (avoid if CrCl < 20 ml/minute or G6PD deficiency) <b>or</b> Trimethoprim oral 100 mg every 24 hours at night	*Cranberry products reduce frequency of UTI recurrence but the dose and frequency are not defined ( <b>N.B.</b> interaction with warfarin and not available from pharmacy)  **Nitrofurantoin has long been associated with significant lung toxicity. Review use regularly.  Chronic lung toxicity is more commonly seen in the elderly and in women. Pulmonary toxicity should be considered when treatment is extended for 6 months or more, especially in the elderly. Patients should be made aware of the possibility and advised to report dyspnoea or persistent cough. If pulmonary reactions occur, nitrofurantoin should be stopped immediately. Although cessation of nitrofurantoin may be followed by regression of symptoms, the resolution of pulmonary injury may be incomplete. Patients who have experienced nitrofurantoin pulmonary toxicity should not be re-exposed to this medicine.



# Upper respiratory tract infections



Upper respiratory tract infection	Antibiotic Therapy	Notes / Comments
Tonsillitis	Viral (common cause) – not routinely recommended. Bacterial – mild infection and patient able to swallow: Phenoxymethylpenicillin* oral 500 mg 6 hourly or 1 g 12 hourly for 10 days in total <i>If true penicillin / beta-lactam allergy:</i> Clarithromycin** oral 500 mg 12 hourly for 5 days	Bacterial cause commonly <i>Streptococcus pyogenes</i> . *Give IV only in severe cases (prescribe as per pharyngitis). **Clarithromycin – serious drug interactions see BNF (Appendix 1)
Pharyngitis (suspected Streptococcal pharyngitis and unable to swallow)	Benzylpenicillin IV 1.8 g 6 hourly for total of 10 days (IV and oral) <i>If true penicillin / beta-lactam allergy:</i> Clarithromycin* IV 500 mg 12 hourly for total of 5 days (IV and oral)	<i>If severe swallowing problems or suspected quinsy refer urgently to ENT.</i> *Clarithromycin – serious drug interactions see BNF (Appendix 1)
Severe pharyngitis (severe sepsis, including hypotension or erythroderma)	Benzylpenicillin IV 1.8 g 4 hourly <b>and</b> Clindamycin* IV 600 mg 6 hourly <i>If true penicillin / beta-lactam allergy:</i> Vancomycin IV (dosing info page 260) <b>and</b> Clindamycin* IV 600 mg 6 hourly Total course duration (IV and oral) 10 days.	* Alert antibiotic - complete Alert Form.
Table continues on next page		

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Upper respiratory tract infection	Antibiotic Therapy	Notes / Comments
Otitis media	<p>Antibiotics not usually required.</p> <p>Amoxicillin oral 500 mg - 1g 8 hourly</p> <p><b>or if true penicillin / beta-lactam allergy:</b></p> <p>Clarithromycin* oral 500 mg 12 hourly</p> <p>Total duration 5 days.</p>	<p>Usually viral or self limiting – discuss with microbiology.</p> <p>Poor outcome unlikely if no vomiting or temperature &lt; 38.5°C. Use non-steroidal anti-inflammatory drugs or paracetamol. Antibiotics do not reduce pain in first 24 hours, subsequent attacks or deafness.</p> <p><i>Haemophilus</i> is an extracellular pathogen, thus macrolides, which concentrate intracellularly, are less effective treatment.</p> <p>Antibiotic therapy if persistent or progressive symptoms despite symptomatic therapy.</p> <p>*Clarithromycin – serious drug interactions – see BNF (Appendix 1)</p>

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Table continued from previous page		
Upper respiratory tract infection	Antibiotic Therapy	Notes / Comments
Otitis Externa	<p>Only if infection / cellulitis present:</p> <p>Local measures important*</p> <p>Neomycin / Betamethasone drops (Betnesol N®) 2 - 3 drops 3 - 4 times daily</p> <p><b>or</b></p> <p>Neomycin / Dexamethasone spray (Otomize®) 1 puff three times a day</p> <p><b>or</b></p> <p>Gentamicin / Hydrocortisone (Gentisone HC®) 2 - 3 drops, 3 - 4 times daily and at night.</p> <p>Total duration 7 days</p>	<p>Many cases recover after thorough cleansing of external ear canal, by suction or dry mopping.</p> <p>*1. Treat inflammation and infection</p> <p>2. Control pain</p> <p>3. Avoid promoting factors <i>i.e. cotton buds, shampoo, water, swimming, leave hearing aid out if used.</i></p> <p>4. Follow up and culture recalcitrant cases.</p> <p><b>N.B.</b> If there is local expertise, thorough cleaning of the ear canal is recommended to ensure an optimal response - syringe the ear with water at 37 degrees to remove all debris.</p> <p>Refer to local ENT early if diabetic, immunocompromised, cellulitis or disease extending outside ear canal, recent ear surgery, systemic upset, severe infection / canal stenosis with excess debris.</p>
Conjunctivitis	<p>Chloramphenicol topical 0.5% eye drops, 1 drop 2 hourly. Reduce to 6 hourly with clinical improvement</p> <p><b>and</b></p> <p>Chloramphenicol 1% eye ointment apply at night</p> <p>Duration: 48 hours after resolution</p>	<p>Most bacterial infections are self-limiting (65% resolve on placebo). They are usually unilateral with yellow-white mucopurulent discharge.</p> <p>Refer to ophthalmology if not resolving or if visual disturbance.</p>
Table continues on next page		

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Upper respiratory tract infection	Antibiotic Therapy	Notes / Comments
Acute Sinusitis	<p>Consider:</p> <p>Xylometazoline 0.1% nasal spray 1 spray into each nostril up to 8 hourly (maximum duration 7 days as longer duration can cause rebound congestion).</p> <p>If antibiotic therapy indicated*:</p> <p>Amoxicillin oral 500 mg 8 hourly (1 g 8 hourly if severe)</p> <p><b>or</b></p> <p>Doxycycline oral 200 mg as a one-off single dose followed by 100 mg every 24 hours</p> <p>Total duration 7 days</p>	<p><b>Symptomatic benefit of antibiotics is small</b></p> <p>69% resolve in 7 - 10 days without antibiotics; and 80% resolve in 14 days without antibiotics.</p> <p>*Reserve antibiotics for severe or persistent symptoms (&gt; 10 days).</p>



## Lower respiratory tract infections (LRTI)

(Also see page 132 for management of acute COPD exacerbation.)

Lower respiratory tract infections (not pneumonia)	Antibiotic Therapy	Notes / Comments
Infective exacerbation of COPD Purulent bronchitis LRTI and pre-existing lung disease	Amoxicillin oral 500 mg 8 hourly <b>or</b> Doxycycline oral 200 mg as one-off single dose followed by 100 mg daily <b>or</b> Clarithromycin* oral 500 mg 12 hourly Total course duration 5 days.	IV administration in sepsis – see note on page 210. Likely organisms: <i>Pneumococcus, Haemophilus influenzae, Moraxella catarrhalis.</i> Antibiotic: <ul style="list-style-type: none"><li>• Prescribe antibiotic only if purulent sputum.</li><li>• Antibiotic choice depends on previous antibiotic therapy or if true penicillin / beta-lactam allergy.</li></ul>
Severe / complicated exacerbation: <ul style="list-style-type: none"><li>• Ventilation required or</li><li>• Sepsis or</li><li>• Other indication for IV route</li></ul>	Amoxicillin IV 1 g 8 hourly <b>or</b> Clarithromycin* IV 500 mg 12 hourly Review IV therapy daily. Total course duration 7 days (IV and oral).	*Clarithromycin activity vs <i>Haemophilus</i> is reduced compared to other agents Clarithromycin – serious drug interactions see BNF (Appendix 1).

*Lower respiratory tract infections continue on next page*

# Pneumonia

(Also see page 143 for management of community acquired pneumonia – CAP)

## CURB-65 Calculation\* (for community acquired pneumonia)

- New **C**onfusion (Abbreviated Mental Test score  $\leq 8$  – see table below);
- **U**rea  $> 7$  mmol/L;
- **R**espiratory **R**ate  $\geq 30$  breaths/minute;
- **B**P - systolic  $< 90$  mmHg or, diastolic  $\leq 60$  mmHg;
- age  $\geq 65$  years

Score 1 point for each feature present.

Adapted by permission from BMJ Publishing Group Limited. Thorax, W S Lim, M M van der Eerden, R Laing, W G Boersma, N Karalus, G I Town, S A Lewis, J T Macfarlane, 58: 377 - 382, 2003.

\*Clinical judgement is essential when deciding on the management of all patients with CAP and calculating a CURB-65 score does not replace this. Each patient must be managed individually and the interpretation of the CURB-65 score is best refined through clinical judgement that takes into account all the clinical information available at the time. **For example:** a young patient with a respiratory rate of  $> 40$  breaths/minute may warrant hospital supervised management despite a CURB-65 score of 1. Clinical judgement is especially important in patients at high risk of death (CURB-65 scores 3, 4 and 5) in whom decisions regarding intravenous administration of antibiotics or transfer to critical care facilities need to be made.

**N.B.** CURB-65 should not be used to assess the severity of conditions other than pneumonia.

### The Abbreviated Mental Test:

A score of 8 or less has been used to define mental confusion in the CURB-65 severity score.

Each question scores 1 mark - total 10 marks.

1. Age	6. Recognition of two persons ( doctor, nurse etc)
2. Date of birth	7. Recall address (e.g. 42 West Street)
3. Time (to nearest hour)	8. Date of First World War
4. Year	9. Name of present Monarch
5. Name of hospital	10. Count backwards (20-1)

H M Hodkinson. Evaluation of a mental test score for assessment of mental impairment in the elderly, Age Ageing (1972) 1(4): 233-238, by permission of Oxford University Press.

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## Pneumonia (continued from previous page)



Community Acquired Pneumonia – CAP	Antibiotic Therapy	Notes / Comments
<b>Non-severe CAP:</b> CURB-65 score 0 - 1 and admitted to hospital <b>and no sepsis syndrome</b> (< 3% mortality)	Amoxicillin oral 500 mg 8 hourly <b>or</b> Clarithromycin* oral 500 mg 12 hourly <b>or</b> Doxycycline oral 200 mg as one-off single dose followed by 100 mg once daily Total course duration 7 days.	Likely organisms: <i>Strep. pneumoniae</i> , <i>Haemophilus influenzae</i> , <i>Moraxella catarrhalis</i> . *Clarithromycin – serious drug interactions see BNF (Appendix 1).
<b>Moderate CAP:</b> CURB-65 = 2 <b>and no sepsis syndrome</b> (9% mortality)	Amoxicillin oral 500 mg 8 hourly <b>and</b> Clarithromycin* oral 500 mg 12 hourly Total course duration 7 days.	Sepsis criteria – see page 210. *Clarithromycin – serious drug interactions see BNF (Appendix 1)
<b>Severe CAP:</b> CURB-65 score $\geq 3$ (17 - 57% mortality) <b>or</b> CAP with any CURB-65 score <b>and sepsis syndrome</b>	Clarithromycin* oral or IV** 500 mg 12 hourly <b>and either:</b> Amoxicillin IV 1 g 8 hourly ( <i>if not previously received any prior treatment</i> ) <b>or</b> #Co-amoxiclav IV 1.2 g 8 hourly ( <i>if previously received treatment in the community</i> ) <i>If true penicillin / beta-lactam allergy:</i> Clarithromycin* IV** 500 mg 12 hourly <b>and</b> Vancomycin IV (dosing info page 260) Total course duration (IV and oral) 7 - 10 days (14 days if atypical suspected or bacteraemia, 21 days if <i>Legionella</i> ).	IV administration in sepsis – see note on page 210. Review IV therapy daily, see IVOST policy (page 205). **Clarithromycin - use oral preparation if not critically unwell and high probability of pneumococcal disease unless true penicillin / beta-lactam allergy when IV route is preferred. *Clarithromycin – serious drug interactions see BNF (Appendix 1) # Consider co-amoxiclav if non-responsive to previous amoxicillin treatment. <b>If</b> critically unwell: Discuss with microbiology / infectious diseases consultant / respiratory physicians.

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## Pneumonia (continued from previous page)

CURB-65 see page 229 and SIRS criteria see page 210.

Hospital Acquired Pneumonia – HAP	Antibiotic Therapy	Notes / Comments
HAP: within 4 days of hospital admission	Assess CURB-65 score / Sepsis criteria and treat as per CAP (page 230) Total course duration 7 days.	
HAP: within 7 days of discharge from a hospital or $\geq 5$ days hospital admission <b>and</b> CURB-65 score $\leq 2$ <b>and no sepsis</b>	Doxycycline oral 100 mg 12 hourly Total course duration 7 days.	Organisms: Coliforms; diverse.
HAP: within 7 days of discharge from a hospital or $\geq 5$ days hospital admission <b>and</b> CURB-65 score $\geq 3$ or sepsis syndrome	Co-amoxiclav IV 1.2 g 8 hourly <b>and</b> Gentamicin IV (dosing info page 258) <i>If true penicillin / beta-lactam allergy:</i> Vancomycin IV (dosing info page 260) <b>and</b> Gentamicin IV (dosing info page 258) <i>If MRSA suspected add in:</i> Vancomycin IV (dosing info page 260) <i>If hospital acquired Legionella suspected add in</i> Clarithromycin* IV 500 mg 12 hourly Total course duration (IV and oral) 7 - 10 days (14 days if atypical suspected or bacteraemia, 21 days if <i>Legionella</i> ).	IV administration in sepsis – see note on page 210. *Clarithromycin – serious drug interactions see BNF (Appendix 1)

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## Pneumonia (continued from previous page)

Pneumonia	Antibiotic Therapy	Notes / Comments
Suspected <i>Staphylococcus aureus</i> pneumonia (post influenza, or chicken pox or severe bilateral / cavitatory changes)	Treat as per severe CAP (page 230) <b>and add in:</b> Flucloxacillin IV 2 g 6 hourly <i>If true penicillin / beta-lactam allergy or MRSA suspected:</i> Vancomycin IV (dosing info page 260) <b>and</b> Clarithromycin* IV 500 mg 12 hourly Total course duration 10 days (IV and oral)	<i>Staphylococcus aureus</i> pneumonia is severe and life-threatening and requires admission to high dependency / ITU.  Discuss further management with microbiology / infectious diseases consultant and respiratory physicians.  *Clarithromycin – serious drug interactions see BNF (Appendix 1)
Suspected aspiration pneumonia	Metronidazole IV 500 mg 8 hourly <b>With either:</b> Amoxicillin IV 1 g 8 hourly <b>or</b> Clarithromycin* IV 500 mg 12 hourly Total course duration (IV and oral) 7 days.	Consider aspiration pneumonia if: <ul style="list-style-type: none"><li>- history of impaired swallowing or</li><li>- vomiting with possible aspiration 48 hours before.</li></ul> Infection is indicated by change in sputum quality to purulent or mucopurulent or fever and new chest x-ray changes.  Aspiration pneumonitis does not require antimicrobial therapy.  *Clarithromycin – serious drug interactions see BNF (Appendix 1)

# Intra-abdominal or hepatobiliary infections

Infection	Antibiotic Therapy	Notes / Comments
Peritonitis (For spontaneous bacterial peritonitis see next page)	<p>Gentamicin IV (dosing info, page 258)  <b>and</b>  Amoxicillin IV 1 g 8 hourly  <b>and</b>  Metronidazole IV 500 mg 8 hourly</p> <p><i>If true penicillin / beta-lactam allergy:</i>  Gentamicin IV (dosing info, page 258)  <b>and</b>  Vancomycin IV (dosing info page 260)  <b>and</b>  Metronidazole IV 500 mg 8 hourly</p> <p>Total course duration up to 7 days but dependent on clinical review.</p>	<p>Organisms associated with intra-abdominal sepsis: <i>Enterobacteriaceae</i>, <i>Haemophilus influenzae</i>, <i>Escherichia coli</i>, <i>Enterococcus</i> and <i>Streptococcus pneumoniae</i>.</p> <p>Anaerobes are rare in biliary tract infection but are associated with a more severe clinical illness.</p> <p>Gentamicin is essential in empirical management.</p> <p>If antibiotic therapy is required for <math>\geq 4</math> days:</p> <ul style="list-style-type: none"> <li>Refer to IVOST (page 205) if suitable for oral therapy.</li> <li>If IV therapy still required and no beta-lactam allergy switch to IV co-amoxiclav and consider IV to oral switch daily.</li> <li>If IV therapy required and true beta-lactam allergy please contact microbiology / infectious diseases unit (Appendix 6 for contact details).</li> </ul>
Biliary tract infection (Cholangitis, cholecystitis)	<p>Gentamicin IV (dosing info page 258)  <b>and</b>  Amoxicillin IV 1 g 8 hourly  <b>and if severe add in:</b>  Metronidazole IV 500 mg 8 hourly</p> <p><i>If true penicillin / beta-lactam allergy:</i>  Gentamicin IV (dosing info page 258)  <b>and</b>  Vancomycin IV (dosing info page 260)  <b>and if severe add in:</b>  Metronidazole IV 500 mg 8 hourly</p> <p>Total course duration up to 7 days but dependent on clinical review.</p>	<p>Gentamicin is essential in empirical management.</p> <p>If antibiotic therapy is required for <math>\geq 4</math> days:</p> <ul style="list-style-type: none"> <li>Refer to IVOST (page 205) if suitable for oral therapy.</li> <li>If IV therapy still required and no beta-lactam allergy switch to IV co-amoxiclav and consider IV to oral switch daily.</li> <li>If IV therapy required and true beta-lactam allergy please contact microbiology / infectious diseases unit (Appendix 6 for contact details).</li> </ul>

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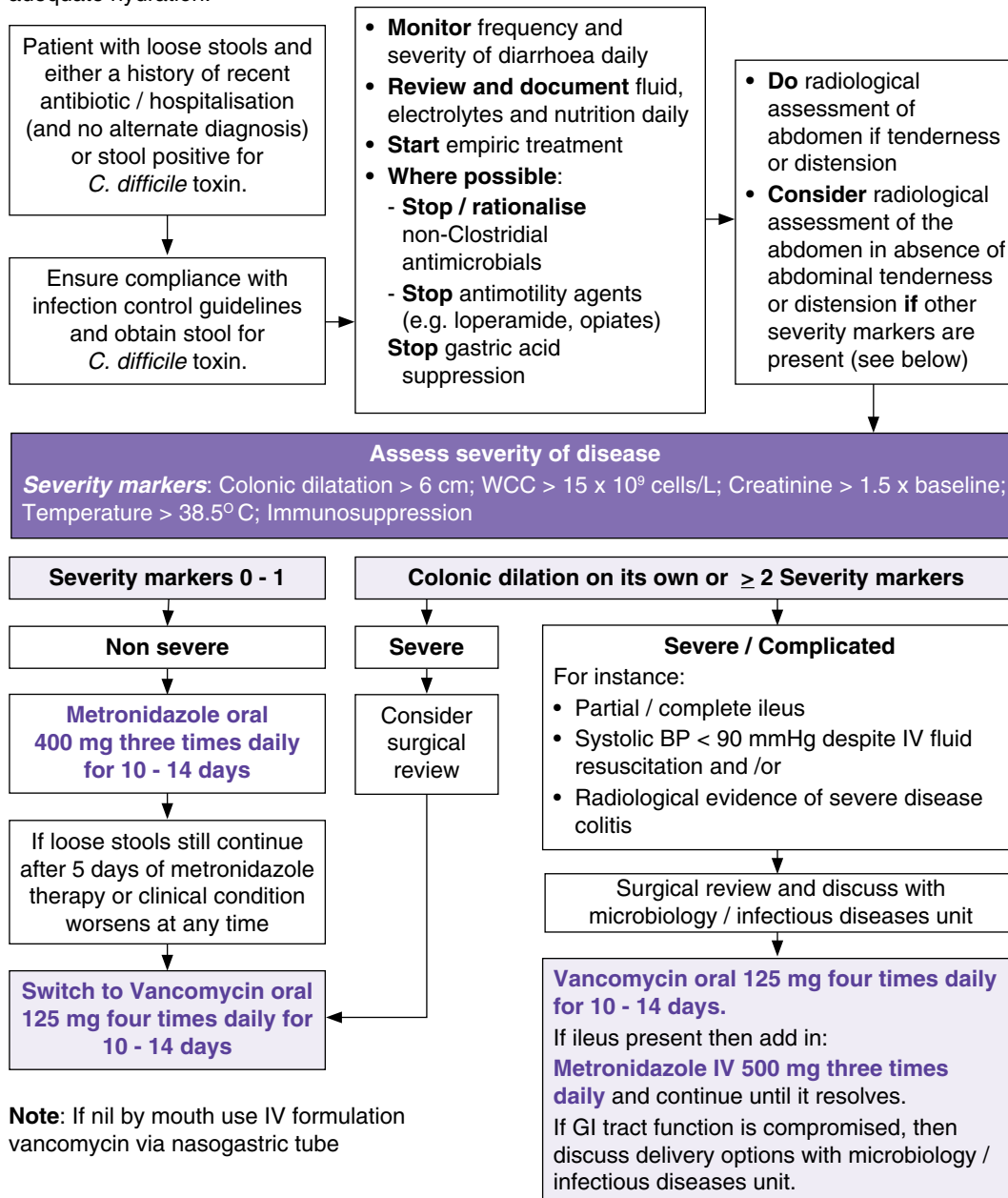
Table continued from previous page		
Infection	Antibiotic Therapy	Notes / Comments
Pancreatitis	Antibiotic therapy not required unless complicated by gallstones.	
<i>Clostridium difficile</i> infection	See flowchart page 235	
Gastroenteritis ( <i>Campylobacter spp.</i> , <i>Salmonella spp.</i> , <i>Shigella spp.</i> , viruses)	Antibiotic therapy if invasive salmonella suspected (seek advice).  No antibiotics for <i>E coli</i> O157 (potentially harmful) or <i>Campylobacter</i> (no benefit).	Contact infectious diseases unit or microbiology for advice (Appendix 6 for contact details).  Avoid anti-motility agents (e.g. loperamide, opiates etc).
Spontaneous bacterial peritonitis  Chronic liver disease and ascites and peritoneal white cell count > 500/mm <sup>3</sup> or > 250 neutrophils/mm <sup>3</sup> .	Co-amoxiclav IV 1.2 g 8 hourly <i>If true penicillin / beta-lactam allergy:</i> Ciprofloxacin IV 400 mg 12 hourly or oral 500 mg 12 hourly  <b>and</b> Vancomycin IV (dosing info page 260) <i>Mild disease or oral continuation of treatment:</i> Co-amoxiclav oral 625 mg 8 hourly  <b>or if penicillin / beta-lactam allergy:</b> contact microbiology / infectious diseases unit.  Total course duration 7 - 10 days (IV and oral).	See management of ascites page 56.  Send peritoneal aspirate in both blood culture bottles and universal container to microbiology.  If SBP and on prophylactic quinolone and beta-lactam allergy discuss with microbiology / infectious diseases unit.

See next page for Management of suspected *Clostridium difficile* infection (CDI)

# Management of suspected *Clostridium difficile* infection (CDI)

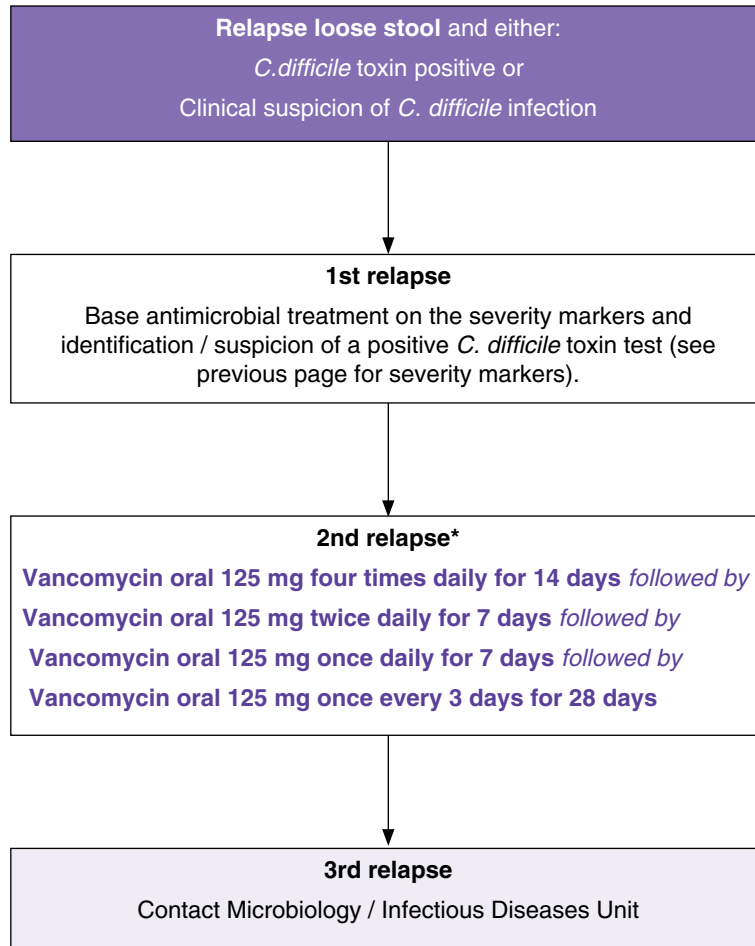
See next page for treatment of relapse.

Early (empirical) management of CDI may be life-saving. Management of CDI includes ensuring adequate hydration.



**Note:** If nil by mouth use IV formulation vancomycin via nasogastric tube

## Treatment of *Clostridium difficile* relapse



\* Metronidazole to be avoided in second relapse in view of cumulative risk of peripheral neuropathy.

# Skin and soft tissue infections

- Likely organisms: *Streptococcus pyogenes* and *Staphylococcus aureus*
- Assess severity of infection. Document in patient's notes presence of:
  - Heat / erythema / induration / swelling (indicates severe infection if any 2 of these signs present).
  - Systemic Inflammatory Response Syndrome (SIRS) score (see page 210) indicates severe infection if SIRS  $\geq 2$ .

Infection	Antibiotic Therapy	Notes / Comments
Mild cellulitis / erysipelas	Flucloxacillin oral 1 g 6 hourly <b>or</b> <i>If true penicillin / beta-lactam allergy:</i> Clarithromycin* oral 500 mg 12 hourly <b>or</b> Doxycycline oral 100 mg 12 hourly Total course duration 7 days.	If clinically clear cut or microbiologically proven Beta haemolytic Streptococcal infection (erysipelas) then treatment with oral Penicillin V 500mg 6 hourly (monotherapy) is acceptable but review clinical response.  *Clarithromycin – serious drug interactions see BNF (Appendix 1).
Moderate to severe cellulitis / erysipelas	Flucloxacillin IV 1- 2 g 6 hourly <b>+ / -</b> Gentamicin* IV (dosing info page 258) <i>If true penicillin / beta-lactam allergy:</i> Vancomycin IV (dosing info page 260) <b>+ / -</b> Gentamicin* IV (dosing info page 258) Total course duration usually 10 days (IV and oral).	If clinically clear cut or microbiologically proven Beta haemolytic Streptococcal infection (erysipelas) then treatment with Benzylpenicillin IV 1.2 g 6 hourly (monotherapy) is acceptable but review clinical response. *Add in gentamicin if severe infection (SIRS $\geq 2$ ) or 2 or more of heat / erythema / induration / swelling. IV administration in sepsis – see note on page 210. See IVOST protocol page 205 for appropriate time to change to oral therapy and switch options. If using Vancomycin or Gentamicin contact microbiology / infectious diseases unit for oral switch guidelines. Consider referral to OPAT (see Appendix 6 for contact details).

Table continues on next page

Skin and soft tissue infections (continued from previous page)		
Infection	Antibiotic Therapy	Notes / Comments
Leg ulcers	<p>Treat only if additional evidence of clinical infection* is present.</p> <p>If antibiotic therapy is required treat as cellulitis and refer for specialist opinion following clinical review and if judged to be severe.</p>	<p>*Signs of clinical infection are: Inflammation / redness / cellulitis with at least one of:</p> <ul style="list-style-type: none"> <li>- Increased pain;</li> <li>- Purulent exudate;</li> <li>- Rapid deterioration of ulcer; or</li> <li>- Pyrexia.</li> </ul> <p>If no signs of clinical infection, antibiotics do not improve healing. Bacteria will always be present.</p> <p>Diabetic foot ulcers require specialist podiatry / diabetes team assessment for evidence of deep seated (bone) infection (management of infection see page 240).</p>
Suspected necrotising fasciitis or streptococcal toxic shock	<p>Flucloxacillin IV 2 g 6 hourly <b>and</b></p> <p>Gentamicin* IV (dosing info page 258) <b>and</b></p> <p>Clindamycin* IV 600 mg 6 hourly (up to 1200 mg 6 hourly)</p> <p>If hospital acquired (post-operative wound) consider MRSA. Treat as above <b>and add in:</b></p> <p>Vancomycin IV (dosing info page 260)</p> <p>If necrotising fasciitis in intravenous drug user or diabetic or if involving abdominal wound or perineum <b>add in:</b></p> <p>Metronidazole IV 500 mg 8 hourly</p> <p>Total course duration 10 - 14 days**.</p>	<p>Seek urgent surgical / orthopaedic review.</p> <p>*Clindamycin is an alert antibiotic. Complete alert form to obtain supply.</p> <p>**Consult microbiology / infectious diseases unit before discontinuing or switching from IV to oral.</p>
Table continues on next page		



Skin and soft tissue infections (continued from previous page)		
Infection	Antibiotic Therapy	Notes / Comments
Mild human or animal bite* or peri-anal soft tissue infection	<p>Co-amoxiclav oral 625 mg 8 hourly</p> <p><i>If true penicillin / beta-lactam allergy:</i></p> <p>Doxycycline oral 100 mg 12 hourly</p> <p><b>and</b></p> <p>Metronidazole oral 400 mg 8 hourly</p> <p>Total course duration 7 days.</p>	<p>Mixed organisms likely.</p> <p>Only treat human bites if clinical signs of infection following skin puncture or if tendon / joint involvement.</p> <p>*Antibiotic therapy is required if skin punctured in (non-human) animal bites even if no evidence of acute infection.</p>
Severe infected human or animal bite or peri-anal infection	<p>Co-amoxiclav IV 1.2 g 8 hourly</p> <p><i>If true penicillin / beta-lactam allergy:</i></p> <p>Metronidazole IV 500 mg 8 hourly</p> <p><b>and</b></p> <p>Clarithromycin* IV 500 mg 12 hourly</p> <p><b>and</b></p> <p>Gentamicin** IV (dosing info page 258)</p> <p>Total course duration 10 days.</p>	<p>Mixed organisms likely.</p> <p>*Clarithromycin - serious drug interactions see BNF (Appendix 1).</p> <p>**Do not continue Gentamicin beyond 3 - 4 days unless on the advice of microbiology / infectious diseases unit.</p>



# Bone and joint infection

- Discuss with on-call orthopaedic surgeon if underlying metal work or recent surgery.
- Assess for risk factors for MRSA.
- Where possible obtain synovial fluid / deep tissue for culture.

Infection	Antibiotic Therapy	Notes / Comments
Native joint septic arthritis / Osteomyelitis	<p>Flucloxacillin IV 2 g 6 hourly <b>and</b> Gentamicin IV (dosing info page 258) <i>If true penicillin / beta-lactam allergy:</i> Vancomycin IV (dosing info page 260) <b>and</b> Gentamicin IV (dosing info page 258) Total course duration (IV/ oral) dependent on surgical intervention. Usually 6 weeks but discuss with microbiology / infectious diseases unit.</p>	<p>Obtain cultures (blood and synovial fluid) prior to antibiotics.</p> <p>Infections usually due to Gram-positive organisms.</p> <p>Do not continue Gentamicin beyond 3 - 4 days unless on the advice of an infection specialist.</p> <p>Rationalise therapy following culture results and following discussion with microbiology / infectious diseases unit.</p>
Suspected prosthetic joint infection	<p>Vancomycin IV (dosing info page 260) <b>and</b> Gentamicin* IV (dosing info page 258) <b>and</b> Rifampicin** oral ≤ 70 kg 450 mg 12 hourly &gt; 70 kg 600 mg 12 hourly <i>Or in place of rifampicin add:</i> Sodium Fusidate oral 500 mg 8 hourly (or if suspension then fusidic acid oral 750 mg 8 hourly). Seek advice from microbiology within 48 hours. Total course duration variable, discuss with microbiology / infectious disease unit.</p>	<p>Commence antibiotic therapy following intra-operative specimens.</p> <p>Rationalise therapy following culture results and following discussion with microbiology / infectious diseases unit.</p> <p>*Do not continue Gentamicin beyond 3 - 4 days unless on advice of an infection specialist.</p> <p>**Rifampicin / Sodium Fusidate (fusidic acid)</p> <ul style="list-style-type: none"> <li>• Check for drug interactions (BNF Appendix 1)</li> <li>• Caution if pre-existing liver disease</li> <li>• Must not be used as monotherapy</li> </ul>
Table continues on next page		

Bone and joint infections (continued from previous page)		
Infection	Antibiotic Therapy	Notes / Comments
Diabetic foot osteomyelitis	<p>Treatment as for septic arthritis / osteomyelitis on previous page <b>and add in:</b></p> <p>Metronidazole oral 400 mg 8 hourly</p> <p>Total course duration (IV / oral) dependent on surgical intervention. Usually 6 weeks but discuss with microbiology / infectious diseases unit.</p>	<p>See note on previous page regarding gentamicin. Assess vascularity and signs of neuropathy.</p> <p>Refer to local diabetes team for general foot management.</p>

# Central nervous system infections

## Bacterial meningitis

- Always seek urgent advice from infectious diseases unit / microbiology. Discuss further management with infectious diseases unit on call at the Brownlee Centre, Gartnavel General (see Appendix 6 for contact details).
- Administer IV antibiotic therapy **urgently** on arrival in hospital and after blood cultures.
- Perform CT scan before lumbar puncture if: age > 60 years; seizures; reduced Glasgow Coma Scale or abnormal level of consciousness; CNS signs; immunosuppression.
- Duration of therapy dependent on aetiology: *N. meningitides* **7 days**; *S. pneumoniae* **14 days**; *L. monocytogenes* **21 days**.

**For treatment see table on next page**

Bacterial meningitis continued

Bacterial meningitis	Treatment	Notes / Comments
Age < 50 years and <i>Listeria</i> <b>not</b> suspected***	Ceftriaxone* IV 2 g 12 hourly <b>and</b> Dexamethasone** IV 10 mg 6 hourly (for 4 days) Total course duration: Dependent on aetiology (see previous page).	*Ceftriaxone: <ul style="list-style-type: none"> <li>Alert antibiotic – complete Alert Form.</li> <li>Must not be mixed with calcium-containing solutions, and must not be given to any patient simultaneously with calcium-containing solutions – even via different infusion lines.</li> </ul>
Age ≥ 50 years or if <i>Listeria</i> meningitis*** suspected	Ceftriaxone* IV 2 g 12 hourly <b>and</b> Dexamethasone** IV 10 mg 6 hourly (for 4 days) <b>and</b> Amoxicillin IV 2 g 4 hourly Total course duration: Dependent on aetiology (see previous page).	**Dexamethasone – stop if meningitis is non-bacterial. *** <i>Listeria</i> meningitis suspected in patients: <ul style="list-style-type: none"> <li>&gt; 50 years</li> </ul>
If penicillin resistant <i>Pneumococcus</i> suspected	Ceftriaxone* IV 2 g 12 hourly <b>and</b> Dexamethasone** IV 10 mg 6 hourly (for 4 days) <b>and</b> Vancomycin IV (dosing info page 260) Total course duration 14 days	<ul style="list-style-type: none"> <li>Immunosuppressed</li> <li>Pregnant</li> </ul>
<i>If true, life-threatening penicillin / beta-lactam allergy</i>	Chloramphenicol IV 1 g 6 hourly <b>and</b> seek urgent advice from microbiology / infectious diseases unit <b>and</b> Dexamethasone** IV 10 mg 6 hourly (for 4 days) Total course duration: Dependent on aetiology (see previous page).	

Continues on next page

## Meningitis Contacts

- All suspected cases of meningococcal disease are notified to the NHSGGC Board, Public Health Protection Unit (see Appendix 6 for contact detail)
- Specialists in Communicable Disease will identify close family and friends of the patient who may require antibiotic prophylaxis.
- This should be given as soon as possible (ideally within 24 hours) after diagnosis of the index case.

Meningitis Contact Prophylaxis	Antibiotic Therapy	Notes / Comments
Oral therapy (whenever possible)	Ciprofloxacin oral 500 mg as a single dose	Ciprofloxacin has an unpredictable effect on epilepsy but is preferred to rifampicin if the patient is on phenytoin. Ciprofloxacin is also the recommended option in pregnancy  Ciprofloxacin is unlicensed for this purpose.  See BNF for children's doses.
When oral therapy not appropriate	Ceftriaxone* 250 mg IM as a single dose	*Ceftriaxone: <ul style="list-style-type: none"> <li>• Is an Alert antibiotic – complete Alert Form.</li> <li>• It must not be mixed with calcium-containing solutions, and must not be given to any patient simultaneously with calcium-containing solutions – even via different infusion lines.</li> </ul>

*Continues on next page*

# Brain abscess

- Perform blood cultures.
- Discuss treatment and duration with neurosurgery and microbiology / infectious diseases unit.

## Potential source:

- Sinus (*Strep milleri*, *Pneumococcus*, *H. influenzae*)
- Middle ear (mixed aerobes and anaerobes)
- Post traumatic (*Staph aureus* or mixed infections)
- Blood stream, endocarditis (*Staph* and *Strep* species)

Infection	Antibiotic Therapy	Notes / Comments
Upper respiratory tract source (sinus and middle ear)	<p>Ceftriaxone* IV 2 g 12 hourly <b>and</b> Metronidazole IV 500 mg 8 hourly <b>+ / -</b> Gentamicin IV (dosing info page 258) Total course duration – discuss with neurology or microbiology / infectious diseases unit. <i>If true penicillin / beta-lactam allergy: contact microbiology / infectious diseases unit for advice (Appendix 6 for contact details).</i></p>	<p>*Ceftriaxone:</p> <ul style="list-style-type: none"> <li>• Is an Alert antibiotic - complete Alert Form.</li> <li>• Must not be mixed with calcium-containing solutions, and must not be given to any patient simultaneously with calcium-containing solutions – even via different infusion lines.</li> </ul>
Post traumatic or blood stream source	<p>Flucloxacillin IV 2 g 4 hourly <b>and</b> Gentamicin IV (dosing info page 258) <i>If true penicillin / beta-lactam allergy:</i> Vancomycin IV (dosing info page 260) <b>and</b> Gentamicin IV (dosing info page 258) Total course duration – discuss with neurology or microbiology / infectious diseases unit.</p>	
Table continues on next page		

Brain abscess (continued from previous page)		
Infection	Antibiotic Therapy	Notes / Comments
Possible viral encephalitis	Aciclovir IV 10 mg/kg 8 hourly. Adjust dose in renal impairment – see comments section. Total course duration 14 - 21 days (IV only).	Renal impairment dosing (CrCl equation on page 256) : CrCl 25 - 50 ml/minute: 10 mg/kg 12 hourly CrCl 10 - 25 ml/minute: 10 mg/kg 24 hourly CrCl <10 ml/minute: See Summary of Product Characteristics ( <a href="http://www.medicines.org.uk">www.medicines.org.uk</a> )



# Viral infections

Infections	Treatment	Notes / Comments
Suspected viral encephalitis		See previous page
Herpes simplex	<p>Aciclovir oral 200 mg five times daily</p> <p>In some patients*:</p> <p>Aciclovir oral 400 mg five times daily or consider IV administration 5 mg/kg 8 hourly</p> <p>Adjust dose in renal impairment – see BNF for details.</p> <p>Total course duration 5 days.</p>	<p>*Consider higher dose or IV administration if:</p> <ul style="list-style-type: none"> <li>severely immunocompromised or</li> <li>there is reduced enteral absorption.</li> </ul>
Varicella / herpes zoster	<p>If &lt; 48 hours after the onset of a rash:</p> <p>Aciclovir oral 800 mg five times daily or Aciclovir IV* 10 mg/kg 8 hourly</p> <p><b>or</b></p> <p>Valaciclovir oral 1 g 8 hourly</p> <p>For both agents adjust dose in renal impairment – see BNF for details.</p> <p>Total course duration 7 days.</p>	<p>*Consider IV administration if:</p> <ul style="list-style-type: none"> <li>severely immunocompromised patient or</li> <li>there is reduced enteral absorption.</li> </ul>

# Genito-urinary (GU) infections

**Note:** For specialist advice and contact tracing following the diagnosis / suspicion of a sexually transmitted infection call **0141 211 8646** (Mon - Fri 09:00 - 16.30). Refer to any Sandyford hub on a "walk in" basis if: acute symptomatic suspected STI including genital and rectal discharge or pain or male dysuria, acute genital ulceration, pelvic pain, acute symptomatic syphilis. Consultant GUM referral at Sandyford Central / Sandyford Renfrewshire for on-going management if: recurrent vaginal discharge / candida, recurrent herpes, non-responding warts, positive syphilis serology. *Any sexually transmitted disease occurring in pregnancy requires specialist referral. Tetracyclines and quinolones are contraindicated in pregnancy.*

Infections	Treatment	Notes / Comments
Sexually transmitted infections (non-severe)	Contact GU medicines, Sandyford Initiative (Appendix 6 for contact details) for management advice and partner notification	Infections include: chlamydia, gonorrhoea, genital herpes, <i>Trichomonas</i> , vaginosis, genital warts, non-severe pelvic inflammatory disease.
Gonorrhoea	Refer to Sandyford for specialist assessment, parenteral management and partner notification. Test and treat partners also.	Usually presents with genital or rectal discharge. May cause epididymitis; > 50% now quinolone resistant and oral cefixime no longer recommended due to fall in susceptibility.
Non-gonococcal urethritis	Treat as per Chlamydia (below)	Characterised in men by dysuria and mucoid / mucopurulent urethral discharge
<i>Chlamydia trachomatis</i>	Azithromycin oral 1 g stat (1 hour before or 2 hours after food) as a single dose  <b>or</b> Doxycycline oral 100 mg 12 hourly for 7 days.	Samples should be taken before treatment. Patients with symptoms, i.e. pelvic pain in women, scrotal pain or urethral discharge in men, refer within 2 - 3 days. Test and treat partners.
Genital Herpes	Aciclovir oral 200 mg five times daily for 5 days.	
Table continues on next page		

Genito-urinary infections (continued from previous page)		
Infections	Treatment	Notes / Comments
Acute severe Pelvic Inflammatory Disease (PID)	<p>Ceftriaxone* IV 2 g single dose</p> <p><b>Followed by:</b></p> <p>Doxycycline oral 100 mg 12 hourly</p> <p><b>and</b></p> <p>Metronidazole oral 400 mg 12 hourly</p> <p><b>or an alternative regimen is:</b></p> <p>Ofloxacin oral 400 mg 12 hourly</p> <p><b>and</b></p> <p>Metronidazole oral 400 mg 12 hourly</p> <p>Total course duration is 14 days</p>	<p>*Ceftriaxone:</p> <ul style="list-style-type: none"> <li>Is an Alert antibiotic – complete Alert Form.</li> <li>Must not be mixed with calcium-containing solutions and must not be given to any patient simultaneously with calcium-containing solutions – even via different infusion lines.</li> </ul>
Syphilis	<p>Refer all positive blood tests indicating “syphilis” to Sandyford Clinic (Appendix 6 for contact details).</p> <p>Refer to the Brownlee centre if inpatient management required.</p>	Recent resurgence of syphilis in Glasgow. Consider if new genital lesion(s) or widespread skin rash (usually including palms).
Vaginal candidiasis	<p>Clotrimazole insert one 500 mg pessary at night as a single dose</p> <p><b>or</b></p> <p>Fluconazole oral 150 mg as a single dose.</p>	<p>Consider genital Herpes before making diagnosis of Candida infection. All topical and oral azoles give 80 - 95% cure. In pregnancy avoid oral azoles.</p> <p>Refer to Sandyford if multiple attacks or not improving.</p>
Bacterial vaginosis	<p>Metronidazole oral 400 mg every 12 hours for 7 days</p> <p><b>or</b></p> <p>Metronidazole 0.75% vaginal gel insert applicatorful (5 g) at night for 5 days.</p>	If few symptoms do not require treatment. Metronidazole 7 day treatment is slightly more effective than 2 g stat (BNF dose). Avoid 2 g stat dose in pregnancy. Topical treatment gives similar cure rates but is more expensive.
Table continues on next page		

Genito-urinary infections (continued from previous page)		
Infections	Treatment	Notes / Comments
Trichomoniasis	Metronidazole oral 400 mg every 12 hours for 5 days <b>or</b> Metronidazole oral 2 g as a single dose <b>or</b> Clotrimazole pessary 100 mg insert each night for 6 days.	Refer to GUM. Treat partners. In pregnancy avoid 2 g single dose metronidazole. Clotrimazole gives symptomatic relief, not cure.
Proctitis		Rectal discharge, pain, constipation and tenesmus following unprotected receptive anal sex. Exclude gonorrhoea and lymphogranuloma venereum. Refer to Sandyford for proctoscopy.
Balanitis		Usually settles with simple salt water bathing / avoidance of irritants. Consider HSV and syphilis
Genital warts	Podophyllotoxin 0.15% cream self-applied 12 hourly 3 consecutive days per week for 4 - 6 weeks.	Avoid in pregnancy.

## Invasive candidiasis in non-haemato-oncology adult patients

See guideline in:

StaffNet / Info Centre / Policies, Procedures and Guideline Documents /NHSGGC Clinical Guideline Electronic Resource Directory.

# HIV infection in hospital

- Contact Brownlee Centre, Gartnavel General Hospital (see Appendix 6 for contact details) if HIV is suspected in an inpatient or patient is known HIV positive.
- Ensure uninterrupted supply of anti-retroviral therapy. The patient should have their own supply of anti-retroviral therapy. Otherwise contact Gartnavel General Hospital Pharmacy (see Appendix 6 for contact details).
- Drug Interactions are common. Please contact HIV pharmacist (see Appendix 6 for contact details).

## Post-exposure Prophylaxis (PEP)

See guideline in: StaffNet / Info Centre / Policies, Procedures and Guideline Documents / NHSGGC Clinical Guideline Electronic Resource Directory.

Assess recipients of blood borne virus exposure urgently, as soon as possible after injury. Ideally PEP should be given within 2 hours of injury but is still beneficial beyond this time.

### General management:

- Assess the injury.
- Administer first aid.
- Assess the source risk and need for blood borne virus testing in conjunction with the index patients clinical team.
- Check for potential drug interactions. Contact pharmacy (see Appendix 6 for contact details).
- Contact the Brownlee Centre, Gartnavel General Hospital (see Appendix 6 for contact details) for all patients who are assessed as requiring PEP or if there is uncertainty.
- Obtain post-exposure prophylaxis medication (PEP packs) through A&E or pharmacy.
- For patients with sexual exposure to HIV, contact the Sexual Health Service at the Sandyford Centre (see Appendix 6 for contact details).
- HIV counselling and testing is provided at the Brownlee Centre, Sandyford Central and multiple Sandyford Hubs in NHSGGC (see [www.sandyford.org](http://www.sandyford.org) for details).
- Refer all incidents to occupational health.

# Patients with absent or non-functioning spleen

- A non-functioning spleen may be due to blood dyscrasia, coeliac disease, inflammatory bowel disease, bone marrow or stem cell transplant, dermatitis herpetiformis or may be congenital.
- Patients with absent or non-functioning spleen are at increased risk of overwhelming infection (particularly with *Streptococcus pneumoniae*, *Haemophilus influenzae*, *Neisseria meningitidis*, influenza and malaria in travellers).

## General Management

Check immunisation history with patient, administer vaccinations appropriately (Table 2) and inform patient's GP.

**Table 1 – Vaccination schedules for splenectomy patients**

Procedure	Time schedule for vaccinations
Planned splenectomy	*4 - 6 weeks pre-operatively. If this is not possible, then 2 weeks pre-operatively.
Unplanned splenectomy	2 weeks post-operatively (antibody response may be better).
Completion of radio- or chemotherapy	Delay vaccination for at least 3 months.
Bone marrow transplant	9 - 12 months post transplant.

**Table 2 – Vaccinations**

Vaccinations	Notes / Comments
Haemophilus influenzae type b (Hib)	Adults who have been fully immunised with Hib /MenC as part of routine vaccination programme give:  Single one off dose (combined Hib/MenC vaccine) and followed 4 weeks later by MenACWY conjugate vaccine.
Meningococcal Group C conjugate (MenC)	
Influenza vaccine	Recommended yearly to all adult patients.
Pneumococcal vaccine	Give at same time as Hib/MenC vaccine. For all patients re-immunisation is recommended every 5 years

If immunisation unknown / cannot be clarified or for \*further information see the Green Book via [www.dh.gov.uk](http://www.dh.gov.uk) or British Committee for Standards in Haematology ([www.bcsghguidelines.com](http://www.bcsghguidelines.com)) or contact the immunology department.

## Antibiotic prophylaxis

**Amoxicillin oral 500 mg every 24 hours.**

*If true penicillin/beta-lactam allergy:*

**Erythromycin oral 500 mg every 24 hours.**

All patients with an absent or dysfunctional spleen should receive prophylactic antibiotics for at least 2 years, but ideally for life. Prophylactic antibiotics should be started immediately post surgery.

# Outpatient Parenteral Antibiotic Therapy (OPAT)

The OPAT service can provide IV antimicrobial therapy on an out-patient basis or at home for patients who require short or long-term IV therapy and who are otherwise suitable for home treatment. Patients may be considered from throughout Greater Glasgow and Clyde. Infections commonly managed via OPAT are shown below but any infections may be discussed and considered.

## **Skin and soft tissue infection**

Includes: cellulitis / wound infections / bursitis / infected bites / facial erysipelas. May be referred from emergency department or ward.

## **Other complex infections**

Usually inpatients are referred in conjunction with microbiology advice. Up to date U&Es, LFTs, FBC, CRP and microbiology results are required for all referrals:

- Osteomyelitis
- Septic arthritis
- Diabetic foot infections
- Infective endocarditis
- Meningitis
- Other infections can be discussed as required

The specialist team will assess patient suitability for OPAT and will agree a treatment regimen.

See Appendix 6 under Gartnavel General Hospital for OPAT contact details.

# MRSA Eradication Policy

- In newly recognised MRSA colonisation (MRSA isolated from the skin or mucous membrane), prescribe as follows (rule out any allergies first):
  - **NASAL mupirocin 2% applied to both nostrils 3 times daily for 5 days.** (Do not prescribe in pregnancy or lactation unless considered essential by the physician.)
  - **Clinisan Advance® used as soap in bath or shower daily for 5 days. Use also as shampoo 2 days out of 5.**
- Re-test patient at least two days after the end of the decolonisation regimen. The patient should no longer be considered colonised with MRSA when 2 repeat screens, taken every 3 days starting two days after the end of the decolonisation regimen, are negative.
- Contact infection control or microbiology if:
  - Patient has received two previous courses of the decolonisation regimen and is still testing positive.
  - MRSA is isolated from multiple sites, or those in whom colonisation is persistent or recurring.
  - Mupirocin resistant MRSA is isolated.



# Surgical Antibiotic Prophylaxis



The policy is based on SIGN 104 (July 2008) which outlines those surgical procedures requiring prophylactic antibiotics and how and when they should be administered.

Refer to surgical speciality guidelines at StaffNet / Info Centre / Policies, Procedures and Guideline Documents / NHSGGC Clinical Guideline Electronic Resource Directory / Infection section for specific agent(s) and regimens, including gentamicin prophylaxis guideline.

## General antibiotic prophylaxis prescribing guidance

- Check whether indication is appropriate. See tables on StaffNet for indication and antibiotic choice. Always discuss any complex individual prophylaxis issues with microbiology pre-operatively.
- Record antibiotic in the “once only” section of drug prescription form, not in the anaesthetic record.
- Administer a single dose of antibiotic(s). Optimum time is  $\leq 60$  minutes prior to skin incision (usually in anaesthetic room at induction of anaesthesia). If  $> 1$  hour has elapsed, cover will be sub-optimal.
- In some circumstances a second dose may be required. If so always document the reason which may be:
  - $> 1.5$  litre intra-operative blood loss in which case following fluid replacement, re-dose giving same dose for all agents except gentamicin (give only half the recommended prophylaxis dose) and teicoplanin (do not redose).
  - If surgery is prolonged then re-dose as per specific prophylaxis guideline
- MRSA: decolonise prior to procedure as per NHSGGC infection control guidelines and discuss with microbiology regarding antibiotic choice.
- Prophylactic gentamicin dosing is based on patient height and approximates to 3 mg/kg/ideal body weight, capped at 300 mg (see StaffNet for dosing table). This allows bolus administration in anaesthetic room. Avoid prophylactic gentamicin if  $\text{eGFR} < 10\text{ml/minute}/1.73\text{m}^2$ : seek advice on an alternative from microbiology.

## Post-operative infection management

- Follow the infection management guidelines, page 210 to 250.
- For gentamicin, do the following:
  - Give a treatment dose (calculate using either dosing calculator on StaffNet or page 258) 8 - 12 hours after the prophylactic dose. In patients with renal impairment, seek advice from antimicrobial pharmacist (see Appendix 6 for contact details) before giving a treatment dose.
  - Check concentration 6 - 14 hours post-dose.



# Dosage regimens for antibiotics with narrow therapeutic ranges

Height and weight conversion and maximum body weight for creatinine clearance estimation (MBW)

Maximum body weight table			
Height (feet/ inches)	Height (cm)	MBW (kg) (male)	MBW (kg) (female)
4' 8"	142	49	43
4' 9"	145	52	47
4' 10"	147	54	49
4' 11"	150	58	52
5' 0"	152	60	55
5' 1"	155	62	58
5' 2"	158	66	60
5' 3"	160	68	62
5' 4"	163	71	66
5' 5"	165	74	68
5' 6"	168	77	71
5' 7"	170	79	74
5' 8"	173	82	77
5' 9"	175	85	79
5' 10"	178	88	82
5' 11"	180	90	85
6' 0"	183	94	88
6' 1"	185	96	90
6' 2"	188	98	94
6' 3"	191	101	97
6' 4"	193	104	99
6' 5"	195	107	101
6' 6"	198	109	105
6' 7"	201	113	108
6' 8"	203	115	110

Weight conversion table		
Stones	lb	kg
5	0	32
5	7	35
6	0	38
6	7	41
7	0	45
7	7	48
8	0	51
8	7	54
9	0	57
9	7	60
10	0	64
10	7	67
11	0	70
11	7	73
12	0	76
12	7	80
13	0	83
13	7	86
14	0	89
14	7	92
15	0	95
15	7	99
16	0	102
16	7	105
17	0	108
18	0	115
19	0	121

## Estimation of creatinine clearance

The following 'Cockcroft Gault' equation can be used to estimate creatinine clearance (CrCl).

$$\text{CrCl} = \frac{[140 - \text{age (years)}] \times \text{weight (kg)}}{\text{serum creatinine (micromol/L)}} \times 1.23 \text{ (male) OR } \times 1.04 \text{ (female)}$$

(ml/minute)

## Cautions!

- Use actual body weight (ABW) or maximum body weight (MBW), whichever is lower.
- Use 60 micromol/L if the creatinine concentration is < 60 micromol/L.
- This equation may overestimate CrCl in elderly or malnourished patients.
- **DO NOT USE eGFR.**



## Amikacin dosing guidelines *(For patients aged $\geq 16$ years)*

**N.B.** See previous page for creatinine clearance (CrCl) and maximum body weight calculations.

CrCl (ml/minute)	Dose	Alternative
20 - 29	5.5 mg/kg 24 hourly	None
30 - 49	6 mg/kg 24 hourly	None
50 - 70	6 mg/kg 12 hourly	12 mg/kg 24 hourly
> 70	7.5 mg/kg 12 hourly	15 mg/kg 24 hourly

### Target Concentrations

- Peak (1 hour post dose) 15 - 30 mg/L
- Trough (pre-dose) < 5 mg/L

### Alternative dosing:

- Peak (1 hour post dose) > 35 mg/L
- Trough (pre-dose) < 2 mg/L

### Sampling Guidelines

- Check peaks (1 hour post dose) and troughs (end of dosage interval) within the first 48 hours of therapy and every 2 - 3 days thereafter.
- Dose requirements will change if renal function alters – check creatinine concentration and eGFR daily.
- **Please** record the **exact times** of all **doses and samples** on the request form and the sample times on the sample tubes.
- Seek advice from pharmacy or microbiology if you are unsure how to interpret the result.

## Tobramycin dosing guidelines *(For patients aged $\geq 16$ years)*

### Patients with Cystic Fibrosis (CF)

Check the ward list for the patient's normal dose (Gartnavel General Hospital) and check a peak (1 hour after dose) and a trough (end of dosage interval) within the first 24 - 36 hours of therapy. The target peak is 8 -12 mg/L and trough < 1 mg/L.

**Or**

for **new** CF patients, use the ward guidelines to calculate the initial dosage regimen. Sampling guidelines as above. Seek advice from pharmacy or microbiology if you are unsure how to interpret the result.

### Non-CF patients

To calculate tobramycin dose use the gentamicin dosing guideline on the next page.



## Gentamicin dosing guidelines (For patients aged $\geq 16$ years)

- **The initial dosage regimen can be determined using the NHSGGC Intranet calculator at:** StaffNet / Info Centre / Policies, Procedures and Guideline Documents / NHSGGC Clinical Guideline Electronic Resource Directory
- The guidelines are also shown in the table below. The dose amount and dosage interval are based on estimated creatinine clearance (see page 256) and actual body weight (ABW).
- **Use of eGFR is not recommended.**
- If Cr unknown, give 5 mg/kg (max 400 mg) or, if known CKD 5 give 2.5 mg/kg (max 180 mg).
- *Please follow Renal Unit protocols for patients on haemodialysis.*

**Table of initial GENTAMICIN doses and dose intervals**

Weight Creat Cl (ml/minute)	40 - 49 kg	50 - 59 kg	60 - 69 kg	70 - 80 kg	> 80 kg
< 21	2.5 mg/kg (max 180 mg) then take a sample after 24 hours				
21 - 30	180 mg 48 hourly	200 mg 48 hourly	240 mg 48 hourly	240 mg 48 hourly	260 mg 48 hourly
31 - 40	200 mg 48 hourly	240 mg 48 hourly	280 mg 48 hourly	300 mg 48 hourly	320 mg 48 hourly
41 - 50	240 mg 48 hourly	280 mg 48 hourly	320 mg 48 hourly	360 mg 48 hourly	400 mg 48 hourly
51 - 60	200 mg 24 hourly	240 mg 24 hourly	280 mg 24 hourly	300 mg 24 hourly	320 mg 24 hourly
> 60	240 mg 24 hourly	280 mg 24 hourly	320 mg 24 hourly	360 mg 24 hourly	400 mg 24 hourly

### Cautions

- If the patient weighs less than 40 kg and creatinine clearance is  $> 20$  ml/minute, give a single dose of 5 mg/kg then take a sample 6 - 14 hours after the dose and plot on the graph
- Dose requirements will change if renal function alters: monitor serum creatinine and eGFR daily.
- In surgical patients who have had gentamicin prophylaxis and now require treatment, a treatment gentamicin dose can be given 8 – 12 hours after a prophylactic dose, if needed. In patients with renal impairment, seek advice from antimicrobial pharmacist (see Appendix 6 for contact details) *before giving a treatment dose.*
- Review antimicrobial therapy daily. Stop after a maximum of 3 - 4 days unless there is a clear clinical and microbiological need; seek advice from microbiology or infectious diseases if gentamicin is required  $> 3 - 4$  days.
- Gentamicin may be associated with oto or vestibular toxicity irrespective of concentration. Stop and contact microbiology or infectious diseases if the following signs of toxicity are observed: dizziness; unsteadiness; oscillating vision; tinnitus; hearing loss; or vomiting. Assess for toxicity daily. Refer to audiology for hearing test if gentamicin continues for  $> 7$  days.
- Gentamicin should be avoided in patients with decompensated liver disease (jaundice, ascites, encephalopathy, variceal bleeding, or hepatorenal syndrome).
- Seek advice from pharmacy if you are unsure what to do.

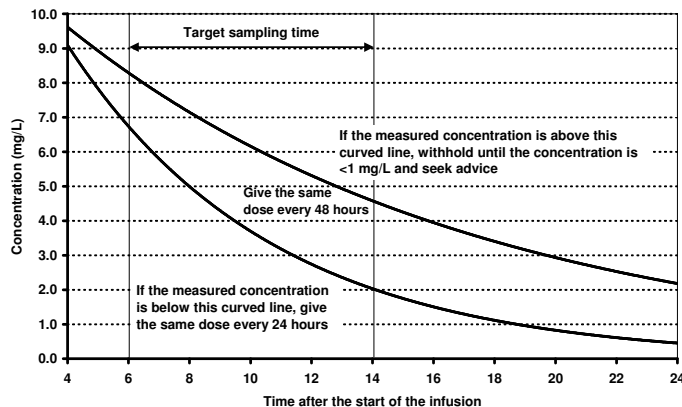
*Continues on next page.*

## Synergistic use

Lower doses are sometimes used for synergy e.g. in the treatment of endocarditis see page 215.  
Seek advice from microbiology / pharmacy.

## Monitoring of gentamicin concentrations

- Concentrations are meaningless unless the dose and sample time are recorded accurately.
- Use the NHSGGC prescription form to record **all** dosage and sampling details.
- If creatinine clearance is  $< 21$  ml/minute and therapy is to continue, give a further dose once the measured concentration is  $< 1$  mg/L. For other patients, take a sample 6 - 14 hours post dose. Record the time of the dose and the blood sample on the request form and sample time on the sample tube
- Plot the concentration measurement on the graph. This will indicate one of 3 options: 1) continue the present dosage regimen, 2) adjust the dosage interval or 3) withhold and resample after 24 hours.
- Seek advice from pharmacy or microbiology if you are unsure how to interpret the result or if concentrations are very low. Doses up to 600 mg daily may be required for some patients.
- Take a further sample 6 - 14 hours post dose, every 2 - 3 days.
- If the *concentration is unexpectedly high, or if renal function alters*, daily sampling may be necessary.



## Cautions

If the measured concentration is unexpectedly HIGH	If the measured concentration is unexpectedly LOW
Were dose and sample times recorded accurately?	Were dose and sample times recorded accurately?
Was the correct dose administered?	Was the correct dose administered?
Was the sample taken from the line used to administer the drug?	Has renal function improved?
Was the sample taken during drug administration?	Does the patient have oedema or ascites?
Has renal function declined?	
Does the patient have oedema or ascites?	

If in doubt, take another sample before modifying the dosage regimen or contact pharmacy for advice.

## Vancomycin dosing guidelines *(For patients aged $\geq 16$ years)*



### A. Pulsed Infusion (if continuous infusion is not practical)

- The initial dosage regimen can be determined using the NHSGGC Intranet calculator at: StaffNet / Info Centre / Policies, Procedures and Guideline Documents / NHSGGC Clinical Guideline Electronic Resource Directory.
- The guidelines are also shown in the tables below. The dose amount and dosage interval are based on estimated creatinine clearance (see page 256) and actual body weight (ABW).
- **Use of eGFR is not recommended.**

#### 1. Loading infusion

Actual body weight	Dose	Volume of sodium chloride 0.9%	Duration of infusion
< 40 kg	750 mg	250 ml	90 minutes
40 - 59 kg	1000 mg	250 ml	2 hours
60 - 90 kg	1500 mg	500 ml	3 hours
> 90 kg	2000 mg	500 ml	4 hours

#### 2. Maintenance pulsed infusion

- Dilute doses up to 1250 mg in 250 ml sodium chloride 0.9% and doses above 1250 mg and up to 2500 mg in 500 ml sodium chloride 0.9%. Maximum rate 10 mg/minute (1000 mg over 2 hours).
- **Give the first maintenance infusion 12, 24 or 48 hours after the loading infusion according to the table below.**

Vancomycin pulsed infusion - initial dosage guidelines		
CrCl (ml/minute)	Dose amount	Dose Interval
< 20	500 mg over 1 hour	48 hours
20 - 29	500 mg over 1 hour	24 hours
30 - 39	750 mg over 1.5 hours	24 hours
40 - 54	500 mg over 1 hour	12 hours
55 - 74	750 mg over 1.5 hours	12 hours
75 - 89	1000 mg over 2 hours	12 hours
90 - 110	1250 mg over 2.5 hours	12 hours
>110	1500 mg over 3 hours	12 hours

**N.B.** The daily dose can be split into 3 equal doses and given 8 hourly. This approach is especially useful for patients who require high doses. In the above table, 1500 mg 12 hourly could be given as 1000 mg 8 hourly and 750 mg 12 hourly could be given as 500 mg 8 hourly.

*Continues on next page*

Monitoring of vancomycin concentrations – pulsed infusion

- Concentrations are meaningless unless the dose and sample time are recorded accurately.
- Take a trough sample at the end of the dosage interval after 24 - 48 hours of therapy then every 2 - 3 days or daily if the patient has unstable renal function. Monitor creatinine and eGFR daily.
- Use the NHSGGC monitoring form to record **all** dosage and sampling details.
- Record the time of the last dose and the blood sample time on the request form and the blood sample time on the sample tube.

Target trough concentration range: 10 - 20 mg/L

Adjustment of vancomycin doses – pulsed infusion

- Always check that the dosage history and sampling time are appropriate before interpreting the result
- Seek advice from pharmacy or microbiology if you need help to interpret the result.

Vancomycin trough concentration	Suggested dose change
< 10 mg/L	Increase dose by 50% or seek advice
10 - 20 mg/L	Maintain the present dose
> 20 mg/L	Stop until < 20 mg/L and seek advice

Cautions

If the measured concentration is unexpectedly HIGH	If the measured concentration is unexpectedly LOW
Were dose and sample times recorded accurately?	Were dose and sample times recorded accurately?
Was the correct dose administered?	Was the correct dose administered?
Was the sample taken from the line used to administer the drug?	Has renal function improved?
Was the sample taken during drug administration?	Does the patient have oedema or ascites?
Has renal function declined?	
Does the patient have oedema or ascites?	

If in doubt, take another sample before modifying the dosage regimen or contact pharmacy for advice.

Guidance on vancomycin administration by continuous infusion on next page

## B. Vancomycin continuous Infusion

- The initial dosage regimen can be determined using the NHSGGC Intranet calculator at: StaffNet / Info Centre / Policies, Procedures and Guideline Documents / NHSGGC Clinical Guideline Electronic Resource Directory.
- The guidelines are also shown in the tables below. The dose amount and dosage interval are based on estimated creatinine clearance (see page 256) and actual body weight (ABW).
- **Use of eGFR is not recommended.**

### 1. Loading infusion

Actual body weight	Dose	Volume of sodium chloride 0.9%	Duration of infusion
< 40 kg	750 mg	250 ml	90 minutes
40 - 59 kg	1000 mg	250 ml	2 hours
60 - 90 kg	1500 mg	500 ml	3 hours
> 90 kg	2000 mg	500 ml	4 hours

### 2. Maintenance continuous infusion

- Continuous infusion of vancomycin is preferred, when practical, for patients with severe or deep-seated infections (e.g. pneumonia, endocarditis, bone and joint infections).
- Start the continuous infusion immediately after the loading infusion is complete.

Vancomycin continuous infusion – initial dosage guidelines		
CrCl (ml/minute)	Daily dose	Dose for continuous infusion over 12 hours
< 20	Use pulsed infusion or follow Renal Unit guidelines	
20 – 29	500 mg	250 mg
30 – 39	750 mg	375 mg
40 – 54	1000 mg	500 mg
55 - 74	1500 mg	750 mg
75 - 89	2000 mg	1000 mg
90 - 110	2500 mg	1250 mg
>110	3000 mg	1500 mg

*Continues on next page*



## Monitoring of vancomycin concentrations – continuous infusion

- Concentrations are meaningless unless the dose and sample time are recorded accurately.
- Use the NHSGGC monitoring form to record **all** dosage and sampling details.
- Take a sample after 12 - 24 hours of starting the continuous infusion then every 2 - 3 days or daily if the patient has unstable renal function. Monitor creatinine daily.
- Record the time of the blood sample on the request form and the sample tube.
- Seek advice from pharmacy or microbiology if you need help to interpret the result.

**Target concentration range: 15 - 25 mg/L**

## Adjustment of vancomycin doses – continuous infusion

Vancomycin concentration	Suggested continuous infusion dosage change
< 15 mg/L	Increase the 12 hourly dose by 250 mg
15 – 25 mg/L	No change
26 – 30 mg/L	Decrease the 12 hourly dose by 250 mg
> 30 mg/L	Stop until < 25 mg/L then restart at a lower dose

## Cautions

If the measured concentration is unexpectedly HIGH	If the measured concentration is unexpectedly LOW
Were dose and sample times recorded accurately?	Were dose and sample times recorded accurately?
Was the correct dose administered?	Was the correct dose administered?
Was the sample taken from the line used to administer the drug?	Has renal function improved?
Was the sample taken during drug administration?	Does the patient have oedema or ascites?
Has renal function declined?	
Does the patient have oedema or ascites?	

If in doubt, take another sample before modifying the dosage regimen or contact pharmacy for advice.



## Teicoplanin dosing guidelines (For patients aged $\geq 16$ years)

Use vancomycin in renal replacement therapy.

### Teicoplanin dosing

Renal Function (CrCl)	Weight (kg)	Teicoplanin Dose (IV / IM)
> 60 ml/minute	< 85	400 mg 12 hourly for 3 doses, <i>then</i> 400 mg once daily
	> 85	6 mg/kg 12 hourly for 3 doses, <i>then</i> 6 mg/kg once daily
40 - 60 ml/minute	< 85	400 mg 12 hourly for 3 doses, <i>then</i> 400 mg once daily for 2 days, <i>then</i> 200 mg once daily or 400 mg on alternate days
	> 85	6 mg/kg 12 hourly for 3 doses, <i>then</i> 6 mg/kg once daily for 2 days, <i>then</i> 3 mg/kg once daily or 6 mg/kg on alternate days
< 40 ml/minute	< 85	400 mg 12 hourly for 3 doses, <i>then</i> 400 mg once daily for 2 days, <i>then</i> 400 mg every third day
	> 85	6 mg/kg 12 hourly for 3 doses, <i>then</i> 6 mg/kg once daily for 2 days, <i>then</i> 6 mg/kg every third day

**N.B.** In deep-seated infections (e.g. endocarditis, bone and joint infections) seek advice from microbiology or infectious diseases department. Aim for a trough concentration of 20 - 30 mg/L.

## Section 9

# Endocrine System



# Management of Diabetic Ketoacidosis (DKA)

**Aim:** To improve the acute management of DKA in adults aged 16 years and over within the first 4 hours of presentation (for paediatric management go to [www.bsped.org.uk](http://www.bsped.org.uk) )

**Definition:** Severe uncontrolled diabetes with ketonaemia / ketonuria, metabolic acidosis, usually with hyperglycaemia.

**Severe DKA =**  $\text{pH} < 7.1$  or  $\text{HCO}_3^- < 5 \text{ mmol/L}$  or  $\text{H}^+ > 80 \text{ mEq/L}$

*Ideally patients with DKA should be managed in a MHDU setting.*

Consultant / Senior physician should be called immediately if:

- Cerebral Oedema
- Severe DKA
- Hypokalaemia on admission
- Reduced conscious level

The new national protocol for the emergency management of DKA should be used for all eligible patients (for paediatric management go to [www.bsped.org.uk](http://www.bsped.org.uk)) and is briefly outlined in this guideline. It is currently being rolled out on all acute sites (**N.B.** If your site has not adopted the new protocol yet, then follow your own in-house guideline until it is).

With the new national protocol please ensure care pathways for 0 - 4 hours and 4 hours - discharge are completed for each DKA episode. These provide instruction on appropriate fluid, insulin and potassium replacement. National audits have highlighted that the most common errors in managing DKA are delay in starting fluids and/or insulin and inadequate monitoring of potassium.

The care pathways for the new DKA protocol are available within relevant departments or online at:

## Care Pathway 0 - 4 hours –

[www.diabetesinscotland.org.uk/Publications/DKA%20Care%20Pathway%201%20v10.pdf](http://www.diabetesinscotland.org.uk/Publications/DKA%20Care%20Pathway%201%20v10.pdf)

## Care Pathway 4 hours - discharge –

[www.diabetesinscotland.org.uk/Publications/DKA%20Care%20Pathway%202%20v12.pdf](http://www.diabetesinscotland.org.uk/Publications/DKA%20Care%20Pathway%202%20v12.pdf)

## Additional supporting guidance for care pathway 4 hours - discharge at:

StaffNet / Info Centre / Policies, Procedures and Guideline Documents / NHS GGC Clinical Guideline Electronic Resource Directory

## General: from 4 hours

- Review blood glucose (BG) and U&Es
- Prescribe usual long-acting insulin at usual time.
- Check blood glucose, U&Es and bicarbonate 4 hourly.
- Continue 0.9% sodium chloride with KCl at 250 ml/hour until blood glucose < 14 mmol/L.

## Fluids and insulin: when blood glucose < 14 mmol/L

- Start 10% glucose with 20 mmol KCl at 100 ml/hour (do not stop this unless advised by consultant or diabetes specialist).

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- 0.9% sodium chloride rate reduced to 150 ml/hour (with 10 mmol/L KCl if potassium 3.5 - 5 mmol/L, or 20 mmol/L KCl if potassium < 3.5 mmol/L)
- Reduce insulin infusion rate to 3 units/hour

**Insulin infusion rate: on hourly blood glucose check**

- If > 14 mmol/L, increase insulin rate by 1 unit/hour
- If < 9 mmol/L, decrease insulin rate by 1 unit/hour
- If < 3.5 mmol/L, stop insulin for an hour, restart at 1 unit/hour if > 3.5 mmol/L
- If persistently above 14 mmol/L, despite increasing insulin to 6 units/hour, ask for medical review and check pump devices, IV lines and IV cannulae to ensure patient is getting prescribed insulin dose.

**Consider introducing SC insulin (and stopping IV insulin)**

- When venous bicarbonate normal, and patient eating normally
- Stop IV fluids and IV insulin 30 minutes after injection of usual pre-meal SC insulin
- In cases where unsure what insulin to start or what dose to use contact diabetes specialist

## Key steps in the management of DKA

1. Ensure all paediatric / adolescent patients are managed using a paediatric protocol.
2. Confirm the diagnosis ( $H^+$  > 45 mEq/L or  $HCO_3^-$  < 18 mmol/L or pH < 7.3 on venous gas with ketonaemia or ketonuria).
3. Initiation of IV fluids within 30 minutes of arrival.
4. Initiation of IV insulin within 1 hour of arrival.
5. Regular monitoring of  $K^+$  level and appropriate replacement.
6. Commence IV glucose infusion once BG < 14 mmol/L.
7. Convert back to usual mealtime SC insulin regimen when  $HCO_3^-$  within normal reference range and patient is eating normally (stop IV fluids and IV insulin 30 minutes after usual injection of pre-meal SC insulin).

## Supplementary notes as per Care Pathway 0 - 4 hours

1. **Guidance on bicarbonate:** Do not use bicarbonate.
2. **Potassium replacement:** administer at rate < 20 mmol/hour of KCl.
3. **WBC count:** This is often raised in DKA. Only give antibiotics if there is clear evidence of infection.
4. **Blood glucose >14 mmol/L:** If this rises > 14 mmol/L do not stop glucose, adjust insulin to maintain level between 9 and 14 mmol/L. See guidance above regarding insulin dose adjustment.  
*Do not stop glucose once started.*

*Continues on next page*

5. **Signs of cerebral oedema:** Children and adolescents are at the highest risk. Consider if: headaches, or reduced conscious level. Monitoring for signs of cerebral oedema should start from the time of admission and should continue until up to at least 12 hours after admission. If there is a suspicion of cerebral oedema or the patient is not improving as expected, within 4 hours of admission, call the consultant. Consider ITU (check arterial blood gases). Administer: **Mannitol IV (100 ml of 20% over 20 minutes) or dexamethasone IV 8 mg (discuss with Consultant)** and undertake CT scan to confirm findings.
6. **Laboratory blood glucose testing:** It is reasonable to use a point-of-care blood glucose meter to monitor BG level if the previous laboratory BG value is < 20 mmol/L.
7. **Insulin management:** Insulin should be prescribed, beginning at 6 units/hour. Rate will generally be reduced with time depending on clinical circumstances, presence of long-acting insulin and to avoid a fall of > 5 mmol/L per hour as rapid falls in blood glucose may be associated with cerebral oedema.
8. **Assessment of response to insulin:** Sensitivity to insulin can vary markedly with time and between patients. If BG level is not falling, always check pump devices, IV lines and IV cannulae to ensure patients are getting prescribed insulin dose. Consider other causes that could be contributing: sepsis, steroid therapy, obesity or liver disease.

## Supplementary notes as per Care Pathway 4 hours – discharge

1. **Consider precipitating factors:** Common causes include:  
Omissions of insulin, infection, newly diagnosed diabetes, myocardial infarction or a combination of these factors.  
Some or all of the following may have contributed to the DKA episode:  
Errors in insulin administration, faulty equipment, practical problems.
2. **Refer for specialist diabetes review:** Whenever possible, all patients should be notified to the diabetes team within 12 hours of admission.

*Ensure insulin is prescribed before patient leaves hospital. This must include the specific type of insulin, dose and appropriate device.*



# Management of Hyperglycaemic Hyperosmolar State / Hyperosmolar Non-Ketotic Coma (HONC)

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This condition carries a significant mortality and close monitoring within a well staffed clinical area is essential. The following regimen is a guide only; because of the co-morbidities associated with this condition each case must be treated on an individual basis.

## Introduction

Diagnostic criteria include:

- Severe hyperglycaemia (blood glucose > 30 mmol/L)
- Total osmolality > 340 mosmol/kg
- Serum bicarbonate > 15 mmol/L (not acidotic)
- Urinary ketones  $\leq$  + plus

Clinical features include:

- Insidious onset
- Severe dehydration
- Impaired level of consciousness (degree correlates with plasma osmolality).
- May have concurrent illness e.g. MI, stroke or pneumonia.

This condition occurs in patients with type 2 diabetes mellitus (which may or may not have been previously diagnosed). There is marked hyperglycaemia and dehydration without significant ketosis and acidosis. The condition usually develops over a period of days, often made worse by diuretics and consumption of glucose rich drinks.

The aim should be for a **gradual** restoration of blood biochemistry avoiding a rapid reduction in plasma osmolality (which can precipitate cerebral oedema). These patients commonly have co-existing medical problems and mortality is much higher than for DKA. There is also a significant risk of thromboembolism and thromboprophylaxis should always be used in the absence of contraindication.

## Key steps in the management of HHS / HONC

- Establish correct diagnosis
- Monitor closely in a well staffed clinical area
- Aim to reduce blood glucose gradually
- Appropriate fluid resuscitation must be guided by clinical assessment, hydration status and co-morbidity.
- Regular monitoring of potassium level must guide appropriate replacement
- Consider and treat the underlying cause.

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## Assessment / monitoring

- Glucose – often exceeds 40 mmol/L
- U&Es – patient is dehydrated and can be hypernatraemic
- Venous blood gases – are relatively normal (not acidotic as seen in diabetic ketoacidosis (DKA))
- Osmolality – is calculated by  $[2 \times (\text{Na}^+ + \text{K}^+) + \text{urea} + \text{glucose}]$ . It is usually  $> 350 \text{ mosmol/kg}$
- FBC – increase in Hb and WCC may indicate dehydration and infection
- ECG – may show ischaemia or infarction
- Chest x-ray
- Urinalysis
- MSSU / blood cultures

## General management and drug therapy

IV insulin and IV fluid replacement are the mainstays of treatment but both should be used more cautiously compared to DKA (see below).

- Give oxygen therapy.
- Central venous pressure (CVP) monitoring may be required to guide fluid replacement.
- Insert nasogastric tube if consciousness level is reduced or protracted vomiting.
- Insert urinary catheter.
- Give thromboprophylaxis SC, if no contraindications.

**Enoxaparin SC 40 mg once daily (or 20 mg once daily if the eGFR is  $< 30 \text{ ml/minute/1.73m}^2$ ).**

### IV Fluids

Administer: **Sodium chloride IV 0.9%:**

**Give 1st litre over 1 hour,  
2nd litre over 2 hours  
3rd litre over 4 hours  
4th litre over 6 hours and  
5th litre over 8 hours**

- Faster rehydration is inappropriate in hyperosmolar coma. The above regimen is a guide and should be reviewed in the elderly or patients with cardiac disease according to clinical assessment of hydration and taking into account co-morbidities.
- If the corrected sodium concentration is high ( $> 155 \text{ mmol/L}$ ) after the initial 1 - 2 litres of sodium chloride, then 0.45% sodium chloride should be considered after discussion with the consultant on-call or diabetes team. Serum electrolytes should be monitored closely.
- When blood glucose (BG) level falls below  $14 \text{ mmol/L}$  add in 10% glucose at a rate of  $100 \text{ ml/hour}$ .
- Review the patient closely to determine hydration status and consider the need for, and rate of rehydration with sodium chloride 0.9% solution.

**Continues on next page**



## General management and drug therapy continued from previous page

### IV Insulin (soluble insulin e.g. Actrapid® or Humulin S®)

Preparation: Add 50 units of soluble insulin (Actrapid® or Humulin S®), drawn up using an insulin syringe, to 50 ml of 0.9% sodium chloride in a 50 ml syringe (1 unit/ml infusion). Infuse intravenously using a syringe pump.

A starting infusion rate similar to the one used in DKA can be used. Start at 6 units/hour of insulin. Aim for a target blood glucose of between 9 and 14 mmol/L. The additional supporting guidance from Diabetes Ketoacidosis care pathway 4 hours - discharge on page 266 can be used to adjust insulin dose when blood glucose has fallen to < 14 mmol/L.

#### Remember:

- Aim for a gradual reduction in blood sugar in order to prevent sudden osmotic shifts.
- Aim for a fall in BG at a rate of 2 - 3 mmol/hour. It may be necessary to adjust the infusion rate to achieve this. If the fall in BG is too rapid with 6 units/hour of insulin then consider reducing the rate to 3 units/hour.
- When BG falls below 14 mmol/L add in 10% glucose 100 ml/hour.
- Be prepared to adjust insulin infusion rate to maintain BG within the target range.
- If BG level is not falling, **always** check pump devices, IV lines and IV cannulae to ensure patients are getting prescribed insulin dose. Consider other causes that could be contributing: sepsis, steroid therapy, obesity or liver disease.

#### Potassium monitoring and replacement

- The initial serum potassium can be normal or elevated but the potassium level may fall in response to the patient being treated with insulin. It is therefore essential that Urea and electrolytes are checked on admission, and at 2 hours and at 4 hours into admission to guide appropriate potassium replacement.
- Aim for a serum potassium of 4 – 5 mmol/L. IV fluids containing potassium (unless patient anuric) can be used to maintain potassium within this range.

Serum Potassium (mmol/L)	Potassium chloride to be given (mmol/L) (N.B. Potassium bags are available as 20 mmol/500ml)
> 5	0
3.5 - 5	20 <sup>#</sup>
< 3.5	40

<sup>#</sup> To give potassium chloride 20 mmol/L give one 500 ml bag of fluid containing potassium chloride 20 mmol and then run through a bag of 500 ml fluid not containing any potassium.

- The usual maximum rate of potassium administration is 10 mmol/hour. Faster rates can be given but ensure ECG monitoring is done.

**N.B.** Do not administer potassium chloride at a rate > 20 mmol/hour under any circumstances.

*Continues on next page*

**Important points**

1. This regimen is a guide and should be modified according to response to therapy.
2. Urea and electrolytes should be checked at least four times daily to guide potassium administration but may need to be more frequent depending on clinical scenario.
3. Continue IV fluids and insulin until normal biochemistry is restored and patient is eating and drinking normally. This may take up to 48 – 72 hours.
4. Recommence insulin or oral hypoglycaemics in patients previously treated. Many patients who were previously undiagnosed can be managed on diet therapy alone. Some will require oral hypoglycaemics (see page 281 for information on types of drugs).
5. Discuss with a member of the Diabetes Team pre-discharge.

*If you are unsure of how to review or how to adjust any of these parameters please contact a member of your local Diabetes Team.*

# Management of Diabetes for People Receiving Enteral Feeding in Hospital



## Introduction

When patients with diabetes mellitus are being artificially fed via the enteral route (e.g. nasogastric, gastrostomy or jejunostomy) *glycaemic control can prove difficult*. This may complicate their medical condition and delay recovery. To maintain optimal glycaemic control while ill and receiving enteral nutrition, patients may require alteration of their usual diabetes treatment. It is imperative that there is good communication between the Diabetes Team, the Nutrition Support Dietitian, and the extended medical teams.

**This guideline is aimed at patients who:**

1. Are currently on 24 hour feeding and IV insulin being transferred to SC insulin.
2. Have pre-existing diabetes and require enteral feeding.
3. Develop hyperglycaemia while being enterally fed.

## Target glycaemic control

For patients being enterally fed, the extremes of glycaemic control should be avoided. A target blood glucose reading should be between 6 and 12 mmol/L. These targets should be adjusted according to individual patient requirements.

## Diabetes therapy

The majority of patients with diabetes will experience a rise in their blood glucose levels when they commence enteral nutrition. There are often other factors such as infection and recent surgery that will affect glycaemic control. The following principles should be adhered to:

- Oral hypoglycaemic agents may not provide adequate glycaemic control. In this instance the patient should usually be converted to insulin and the oral hypoglycaemic agent should be discontinued
- The usual therapy of choice is insulin, initially via an IV sliding scale, see Table 1 on next page.
- Frequently re-evaluate the sliding scale regimens as the insulin dose may need to be adjusted to achieve target glycaemic control.
- Once the patient's blood glucose is stabilised and feeding has been established, he / she should be converted to SC insulin injections.
- Discontinue the IV infusion once the initial SC injection has been administered.
- SC insulin dose can be calculated as follows:
  1. Take an average of the patients 24 hour insulin requirements on the intravenous sliding scale.
  2. Subtract 25% from this value and this will be their **total daily insulin dose**.
  3. This will usually be split into 2 or more injections (see section on feeding regimens).

*Continues on next page*

*Diabetes therapy continued*

- Retrospective treatment with corrective doses of SC insulin should be avoided, instead the insulin doses should be increased prospectively i.e. **avoid boluses of short-acting insulin.**

**Table 1 – Insulin IV sliding scale regimen**

**Add 50 units of soluble insulin (Actrapid® or Humulin S®) to 50 ml of 0.9% sodium chloride in a 50 ml syringe. Infuse IV using a pump and adjust according to sliding scale:**

Blood Glucose (mmol/L)	Infusion Rate ( units/hour)
< 5	0
5.1 - 10	1
10.1 - 15	2
15.1 - 20	3
> 20.1	<b>4 and call a doctor</b>

Check capillary blood glucose hourly initially then 2 hourly.

**N.B.** *If blood glucose regularly outwith range of 6 – 12 mmol/L, insulin doses should be reassessed.*

**Maintaining glycaemic control**

- If the feed stops unexpectedly, blood glucose levels should be closely monitored, as patients are at risk of hypoglycaemia. If necessary, an IV glucose infusion should be commenced until feeding can be resumed.
- If feed is stopped electively the patient may require to recommence IV insulin and glucose, depending on length of fast.

**Enteral feeding regimens**

For inpatients with diabetes, the enteral feeding regimen will be recommended by the dietitian to meet the individual's nutritional requirements. To maximise glycaemic control, we suggest using the following feeding regimens:

**Intermittent feeding –**

1. **May be commenced at varying times and be of variable duration (minimum 12 hours, maximum 20 hours).**
2. **Calculate total daily insulin SC dose – average 24 hour IV requirements minus 25%.**
3. **Administer 2/3 of the dose as pre-mixed 30 / 70 insulin SC ( Humulin M3®) at the start of the feed. Discontinue IV insulin after the first SC dose has been administered.**
4. **Administer the remaining 1/3 of the insulin SC dose as isophane (either Insulatard® or Humulin I®) at 12 hours.**

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### **Bolus feeding –**

1. The feed is divided into at least 4 boluses, ensuring the carbohydrate intake is evenly distributed throughout the day, to mimic breakfast, lunch, dinner, supper and between meal snacks.
2. Calculate total daily insulin SC dose as above. (i.e. average 24 hour IV requirements minus 25%).
3. Administer 2/3 of the dose as pre-mixed 30 / 70 insulin SC (Humulin M3®) before the breakfast bolus feed. Discontinue IV insulin after the first subcutaneous dose has been administered.
4. Administer the remaining 1/3 of the dose as pre-mixed 30 / 70 insulin SC (Humulin M3®) around 9 - 10 hours later but before the dinner bolus feed.

Glycaemic control should be closely monitored and insulin doses should be adjusted accordingly, if advice on insulin adjustment is required, contact the Diabetes Team.

### **Key points**

- *Hypoglycaemia is a medical emergency and should be treated urgently.* If the patient is on IV insulin, stop the pump immediately. To treat hypoglycaemia give:

**20 g quick-acting carbohydrate via enteral tube: e.g. 50 - 70 ml of Ensure Plus® Juce or 100 mls of original Lucozade®, then flush.** Check blood glucose after 10 - 15 minutes. Repeat treatment up to three times until glucose > 4 mmol/L. Refer to full hypoglycaemia guideline on page 278.

You must always follow up with another feed bolus or by recommencing the feed to prevent the blood glucose falling again. If the tube has been dislodged or the patient is unconscious you will need to gain IV access and bolus IV glucose (see page 279).

- For patients receiving enteral nutrition, extremes of glycaemia should be avoided and target blood glucose levels should be between 6 and 12 mmol/L. All patients with type 1 diabetes must have their urine checked for ketones daily.
- Patients with diabetes who are commenced on enteral feed will usually require an increase in their diabetes medication or conversion into insulin.
- If a patient on enteral nutrition becomes hyperglycaemic, then the diabetes therapy needs adjusting, rather than a reduction in nutrition. This usually requires an increase in the insulin dose.
- Communication between the Diabetes Team and all of the healthcare professionals looking after the patient is vital, and the targets for blood glucose control should be established for the individual patient, avoiding hypoglycaemia.
- As the patient's clinical condition improves and activity level increases, insulin requirements may reduce significantly. If the patient comes off enteral feeding and returns to normal eating, they should usually return to their pre-illness diabetes regimen.



# Insulin Sliding Scale (Not for use in DKA, HHS / HONC patients)

This sliding scale should NOT be used to treat people with Diabetic Ketoacidosis (DKA) or Hyperglycaemic Hyperosmolar State (HHS) / Hyperosmolar Non-Ketotic Coma (HONC). See individual guidelines on page 266 and 269.

This sliding scale can be used to manage glucose levels in people with diabetes mellitus. It can be used in surgical patients with diabetes mellitus undergoing operations (local anaesthetic departments may have their own scales. Prior to using discuss with local anaesthetists that they are happy for it to be used.) and in medical patients with diabetes mellitus in whom regulation of glucose is deemed important. The principles of the sliding scale are:

- Desired glucose control is achieved and maintained
- Avoidance of hypoglycaemia
- Avoidance of ketosis by providing adequate carbohydrate and insulin
- Maintenance of fluid and electrolyte balance.

Before starting on the sliding scale it is important to specify the target glucose level and whether intravenous fluids are to be given with insulin. Urea and electrolytes should be checked before starting the sliding scale to guide potassium administration.

## Insulin

Preparation: **Add 50 units of soluble insulin (Actrapid® or Humulin S®), drawn up using an insulin syringe, to 50 ml of 0.9% sodium chloride in a 50 ml syringe.** Infuse IV using a syringe pump and adjust according to sliding scale below, which is an initial guide. Please review insulin rate and blood glucose response on a regular basis (see supplementary notes on next page) and amend if need be to achieve target blood glucose.

**Table 1 – Insulin sliding scale (initial guide)**

Blood glucose (mmol/L)	Insulin Infusion Rate (units/hour)
< 5	0
5.1 - 10	1
10.1 - 15	2
15.1 - 20	3
>20.1	#4 and call a doctor (see below)

# See also supplementary notes on next page

## Intravenous Fluids (if being given)

The fluid regimen used with this sliding scale is NOT appropriate for fluid resuscitation. If intravenous fluids are to be given consider using the following regimen (see notes on next page) regarding potassium supplementation).

1. 500 ml bag of 5% glucose containing 20 mmol KCl (potassium chloride) over 5 hours THEN
2. 500 ml bag of 5% glucose containing 20 mmol KCl over 5 hours THEN
3. 500 ml bag of 5% glucose containing 20 mmol KCl over 5 hours THEN
4. 500 ml bag of 5% glucose / 0.9% sodium chloride over 5 hours THEN repeat the process, beginning at number 1.

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## **Potassium Supplementation**

Aim for a serum potassium of 4 - 5 mmol/L.

Be guided on potassium replacement by U&Es:

- If baseline potassium is > 5 mmol/L omit potassium replacement but continue to monitor potassium and re-check U&Es in 4 hours.
- Be prepared to vary the potassium chloride content of the IV fluids according to plasma potassium levels.
- In patients with renal failure, chronic kidney disease or oliguria seek advice from a member of the Renal or Diabetes Team or Senior Medical Staff on potassium replacement.

## **Supplementary Notes**

- Check capillary blood glucose hourly except when it is < 5 mmol/L and the sliding scale is stopped. In this instance check the capillary blood glucose every 30 minutes. When blood glucose levels are stable capillary blood glucose levels can be checked every two hours.
- When blood glucose levels are > 20.1 mmol/L it is important to assess the following:
  - Check pump devices, IV lines and IV cannulae to ensure patients are getting the prescribed insulin dose
  - Consider other causes that could be contributing: sepsis, steroid therapy, obesity.

Review the following at least twice daily (may need to be more frequent depending on the clinical scenario):

- Sliding scale and blood glucose response
- Rate of infusion and type of fluid used
- Potassium level and potassium supplementation.

*If you are unsure of how to review or how to adjust any of these parameters please contact a member of your local Diabetes Team. In patients with type 1 diabetes the sliding scale should only be discontinued once SC insulin (containing a long-acting insulin, such as a premixed or background insulin) has been restarted.*



# Management of Hypoglycaemia

## Introduction

Hypoglycaemia is a serious condition and should be treated as an emergency regardless of the patient's level of consciousness. All documented blood glucose values  $< 4$  mmol/L can be considered a hypoglycaemic event and should not be tolerated in any patient on a regular basis. The signs and symptoms of hypoglycaemia can be variable and a high index of suspicion is often required. Some patients experience hypoglycaemic symptoms where the blood glucose level is not  $< 4$  mmol/L. If this happens a small carbohydrate snack can be given for symptom relief.

**Table 1 – Symptoms of hypoglycaemia**

Autonomic	Neuroglycopaenic
Trembling	Difficulty concentrating
Sweating	Confusion
Anxiety	Weakness
Hunger	Drowsiness
Palpitations	Visual change
Nausea	Difficulty speaking
Tingling	Headache
	Dizziness
	Tiredness

By far the commonest cause of hypoglycaemia is treatment with insulin or sulphonylurea drugs in patients known to have diabetes. This may be accidental or deliberate. Patients taking sulphonylurea drugs who have a hypoglycaemic episode should be admitted for at least 24 hours for monitoring.

## Assessment / monitoring

- Send blood glucose to the lab for a level. Glucostix® can be inaccurate at low blood glucose concentrations. Waiting for the result should not delay giving appropriate treatment.
- Assess whether hypoglycaemic episode is:
  - Mild** – autonomic symptoms may be a feature (see table above).
  - Moderate / severe** – autonomic and neuroglycopaenic symptoms may be a feature. Plasma glucose is typically  $< 2.8$  mmol/L and can result in coma if left untreated.
- Once patient is stabilised (see general management and drug therapy section on the next page on how to do this), investigate:
  - Likely cause of the episode (missed meal, dosage error, increased exercise, alcohol excess, deliberate overdose).
  - Establish the presence of hypoglycaemic 'warning symptoms' i.e. sweating, tremor, and tachycardia. These may be impaired in patients with longstanding diabetes.

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## General management and drug therapy

For further information see the full guideline “The Hospital Management of Hypoglycaemia in Adults with Diabetes Mellitus” at [www.diabetes.nhs.uk](http://www.diabetes.nhs.uk)

**Mild Hypoglycaemia** – Patient is conscious, orientated and able to swallow. Treat with **15 - 20 g of quick-acting carbohydrate** such as:

**Dextrosol® 5 - 7 tablets or Glucotabs® 4 - 5 or**

**Original Lucozade® 90 - 120 ml or**

**Pure fruit juice\* 150 - 200 ml**

Test blood glucose level after 15 minutes, and if still < 4 mmol/L, repeat above treatment options up to 3 times. If still hypoglycaemic call a doctor and consider **glucose IV (as per severe hypoglycaemia section below) or Glucagon\*\* IM 1 mg (only give once).**

Blood glucose level should now be > 4 mmol/L. Give **20 g of long-acting carbohydrate e.g. two biscuits / slice of bread / milk 200 - 300 ml / next meal containing carbohydrate (give 40 g of long-acting carbohydrate if IM Glucagon has been used).**

**Moderate Hypoglycaemia** – Patient is conscious and able to swallow, but confused, disorientated or aggressive. If capable and cooperative treat as for mild hypoglycaemia above. If not capable and cooperative but can swallow give 1.5 - 2 tubes of GlucoGel® (squeezed into mouth between teeth and gums). If ineffective use Glucagon\*\* IM 1 mg (only give once).

Test blood glucose level after 15 minutes, and if still < 4 mmol/L, repeat steps above up to 3 times. If still hypoglycaemic call a doctor and consider **IV glucose (as per severe hypoglycaemic section).**

Blood glucose level should now be above 4mmol/L. Give **20 g of long-acting carbohydrate e.g. two biscuits / slice of bread / milk 200 - 300 ml / next meal containing carbohydrate (give 40 g of long-acting carbohydrate if IM Glucagon has been used).**

**Severe Hypoglycaemia** – Patient is unconscious / fitting or very aggressive or nil-by-mouth (NBM). Check ABC, stop insulin (if on IV) and contact doctor urgently. Give:

**Glucose IV over 10 minutes as: 20% glucose 75 ml or**

**10% glucose 150 ml or**

**50% glucose 30 ml or**

**Glucagon\*\* IM 1 mg (only give once)**

**N.B.** There is risk of extravasation injury with glucose 50%, only use if 10% or 20% not available.

Re-check glucose after 10 minutes and if blood glucose still < 4mmol/L repeat IV glucose above. If glucose now > 4mmol/L and conscious and swallow safe give **20 g of long-acting carbohydrate e.g. two biscuits / slice of bread / milk 200 - 300 ml / next meal containing carbohydrate (give 40 g of long-acting carbohydrate if IM Glucagon has been used).** If NBM, once glucose > 4 mmol/L give glucose 10% infusion at a rate of 100ml/hour\* until no longer NBM or reviewed by doctor.

\* In patients with renal / cardiac disease use intravenous fluids with caution. Avoid fruit juice in renal failure.

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**\*\*Glucagon** may take up to 15 minutes to work and may be ineffective in undernourished patients, in severe liver disease and in repeated hypoglycaemia. Do not use in oral hypoglycaemia agent induced hypoglycaemia. Patients may experience abdominal discomfort and vomiting after glucagon administration.

## Supplementary notes

- The volumes of IV glucose suggested are less than the total volume of the bag therefore care should be taken not to over-infuse. The method of administration should be governed by the clinical urgency.
- 50% glucose is irritant to blood vessels and should only be used when alternative solutions are not readily available. 10% AND 20% glucose are less likely to be irritant to veins.
- After a severe hypoglycaemic episode patients will often have a high glucose for several hours due to the counter regulatory hormonal response and as a result of the exogenous glucose administration.
- Long-acting insulins and oral hypoglycaemic drugs e.g. gliclazide, may be associated with prolonged hypoglycaemia requiring IV glucose infusion (for 24 hours or more) and regular (at least hourly) blood glucose monitoring.
- Once patient is stabilised each episode of hypoglycaemia should be investigated:
  - Likely cause of the episode (missed meal, dosage error, increased exercise, alcohol excess, deliberate overdose).
  - Establish the presence of hypoglycaemic 'warning symptoms' i.e. sweating, tremor, and tachycardia. These may be impaired in patients with longstanding diabetes.

## Other information

Review educational and emotional support needs before discharge (liaise with the diabetes team). All patients with diabetes and their relatives and carers should receive information about diabetic emergencies. Key points to address include:

- The potential consequences of diabetic emergencies
- How diabetic emergencies can be prevented
- Be able to identify the early signs of diabetic emergencies and know what action they should take
- Know what action to take during intercurrent illness i.e. 'sick day rules'

# Types of Antidiabetic Drugs

## Injectable therapies

### Insulins

For all patients starting insulin for the first time please contact a diabetic nurse specialist (most patients are started on twice daily mixed insulin). When prescribing insulin please specify the type and dose on both the drug kardex and insulin prescription chart.

#### Short-acting insulin

- Humalog® (insulin lispro)
- NovoRapid® (insulin aspart)
- Humulin S®
- Actrapid®

#### Intermediate- and Long-acting insulin (basal)

- Humulin I®
- Insulatard®
- Insulin glargine (Lantus®)
- Insulin detemir (Levemir®)

#### Mixture of short- and intermediate-acting: Mixed insulin

- Humulin M3®
- Humalog® Mix25
- Humalog® Mix50
- Novomix® 30

The list above reflects the majority of types of insulin used locally. For a complete reference of all insulins, refer to BNF.

**N.B. Do not** give hyperglycaemic patients boluses of SC insulin on an 'as required' basis, adjust their regular therapy instead. Check urine for ketones. If ketones found then follow local guidelines, which may necessitate starting an insulin sliding scale.

**Glucagon-like peptide 1 (GLP-1) agonists** – *only initiate on specialist advice*. This class includes:

- Exenatide (Byetta®)
- Liraglutide (Victoza®)
- Exenatide LAR (Bydureon®)

See BNF for dosing details and contraindications. See GGC Formulary for restrictions on use.

## Oral antidiabetic drugs

### Biguanides

- **Metformin 500 mg once daily for 1 week with evening meal, then 500 mg twice daily for at least 1 week, then 500 mg three times daily for at least 1 week, then 1000 mg twice daily.**

**N.B.** Avoid metformin if eGFR is  $< 45$  ml/minute/1.73m<sup>2</sup>.

Patients can experience some gastrointestinal upset with metformin. By starting at a low dose with food this is less likely. Normally these symptoms will resolve so it is worthwhile advising patients to persevere with it. Contact the diabetes team if in doubt and if further advice is needed.

*Continues on next page*

*Oral antidiabetic drugs continued*

### **Sulphonylureas**

- **Gliclazide: initially 40 - 80 mg daily, at mealtime, adjusted according to response. Maximum 320 mg daily.** Alternative to gliclazide is glipizide (see BNF for details).

**Glitazones** – *only initiate on specialist advice.*

- **Pioglitazone initially 15 - 30 mg daily once increased to 45 mg daily according to response.**

Follow BNF instructions regarding monitoring LFTs after initiation of therapy.

**Dipeptidyl peptidase IV inhibitors** – *only initiate on specialist advice.* This class includes:

- Sitagliptin
- Vildagliptin
- Saxagliptin
- Linagliptin

See BNF for dosing details and contraindications. See GGC Formulary for restrictions on use.

Contact the diabetes team if in doubt when prescribing oral antidiabetic drugs and if further advice is needed.

# Management of Adrenal Insufficiency

## Introduction

The adrenal cortex is responsible for producing glucocorticoids, mineralocorticoids and androgens. When there is insufficiency it can either be primary related (e.g. there is structural damage to the gland) or secondary related (e.g. suppression of hypothalamic-pituitary axis by various factors).

This guideline advises on the general management of adrenal insufficiency in an acute situation and the diagnosis of it in the non-acute.

## Assessment / monitoring

**If patient has suspected acute adrenal insufficiency:**

- Establish venous access and draw blood for electrolytes, glucose, cortisol and ACTH. Then see General management and drug therapy section below.

**To diagnose adrenal insufficiency:**

- In stable patients in whom hypothalamic-pituitary-adrenal failure is suspected, perform a short Synacthen® (Tetracosactide acetate, ACTH) test:
  - Synacthen® 250 micrograms IM or IV
  - Sample cortisol at baseline and 30 minutes after Synacthen®.

Then see General management and drug therapy section below.

## General management and drug therapy

### Acute adrenal insufficiency

- **Give hydrocortisone IV 100 mg immediately then every six hours.**
- **Fluid resuscitate with 0.9% sodium chloride.** Continue IV fluids for the next 24 - 48 hours, depending on the severity of illness and co-morbidity.
- If hypoglycaemic (blood glucose value < 4 mmol/L) give **125 ml of 20% glucose or 250 ml of 10% glucose IV.**
- Once patient is stable and eating / drinking convert patient over to an oral glucocorticoid. If the precipitating illness is resolving, then reduce the maintenance dose over 72 hours e.g. **Convert IV hydrocortisone dose to oral 50 mg twice daily then over 72 hours reduce to 15 - 20 mg orally at 8 am and 5 - 10 mg orally at 5 pm.**

### Adrenal insufficiency – non acute situation

- Contact the Endocrine Team to arrange education, a Medic information bracelet and an emergency information card.
- Additional fludrocortisone is likely to be required in primary hypoadrenalism.

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## Other Information

### General advice on long-term use of corticosteroids

To prevent acute insufficiency in a patient on long-term steroids with an intercurrent illness, e.g. infection then:

1. Double the steroid dose.
2. If unwell / unable to take oral therapy, change to **hydrocortisone IV 100 mg three to four times daily.**
3. Patients on maintenance corticosteroids must be given steroid cover across any surgical procedure. See BNF for details.
4. Surgical procedures involving a general anaesthetic – consult with the anaesthetist.
5. Seek advice on adjustment of corticosteroid doses for patients with acute or severe intercurrent illness.

### Corticosteroid dose equivalences

Prednisolone 5 mg is approximately equivalent to:

- Hydrocortisone 20 mg
- Dexamethasone 750 micrograms
- Methylprednisolone 4 mg

**N.B.** An equivalent dose is not always appropriate. When converting between different corticosteroids consider whether a dose increase (e.g. to cover intercurrent illness, as above) or a dose decrease (when tapering dose down) is appropriate.

## Section 9

# Electrolyte Disturbances

# Management of Hyperkalaemia (plasma $K^+$ > 5.5 mmol/L)

## Assessment / monitoring

- Plasma potassium
- ECG monitoring

## General management

- **Exclude spurious hyperkalaemia and check for ECG changes.**
- Identify and treat underlying cause where possible:
  - Potassium supplements, ACE inhibitors, potassium-sparing diuretics and spironolactone should be discontinued.
  - Renal failure – consider referral to renal unit.
  - Hypovolaemia – consider volume expansion with IV sodium chloride 0.9%.
  - Severe acidosis (often associated with renal failure).
  - Hypoaldosteronism, e.g. Addison's disease.
- If hyperkalaemia remains unexplained, more specialised investigation may be appropriate. Advice may be obtained from your local Biochemistry Department.

## Drug therapy / treatment options

### 1. Confirmed plasma $K^+$ 5.5 - 6.5 mmol/L

**Calcium Resonium® oral 15 g three times daily (in water not fruit juice).**

- Calcium Resonium will not lower potassium acutely. It is only licensed for hyperkalaemia due to anuria or oliguria.
- Resonium A can be used if there is a risk of hypercalcaemia.
- Monitor plasma  $K^+$  daily until  $K^+ < 5.5$  mmol/L.

### 2. Confirmed plasma $K^+ > 6.5$ mmol/L and/or ECG changes

(Although treatment should not be delayed, result should be confirmed):

**10 ml calcium gluconate 10% - slow IV injection over 5 - 10 minutes (to antagonise the effect of potassium on the heart).**

**10 units soluble insulin (Actrapid®) in 50 ml glucose 50% IV over 30 minutes (to move potassium into the cells). This may be repeated once and/or followed by an infusion of the same mixture at 5 - 10 ml/hour.**

*and/or*

**5 - 10 mg nebulised salbutamol**

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## Notes

- Calcium gluconate may be repeated after 5 minutes if ECG changes persist.
- Check plasma  $K^+$  and glucose one hour after glucose / insulin infusion.
- Glucose / insulin infusions should be repeated until plasma  $K^+ < 6.5$  mmol/L.
- Hyperosmolal glucose infusions should not be used in diabetic ketoacidosis.

# Management of Hypokalaemia (plasma $K^+$ < 3.5 mmol/L)

## Assessment / monitoring

- Plasma potassium

## General management

- Replace potassium losses
- Identify and treat underlying cause where possible:
  - Loop / thiazide diuretics – consider combination with a potassium-sparing diuretic
  - Vomiting and diarrhoea
  - Intracellular potassium shifts, e.g. post-operation, coronary ischaemia, critical illness
  - Re-feeding
  - Hypomagnesaemia

**N.B.** If hypokalaemia remains unexplained, more specialised investigations may be appropriate. Advice may be obtained from your local Biochemistry Department.

## Drug therapy / treatment options

### General notes

- Oral potassium chloride is the treatment of choice for most patients.  
Effervescent tablets (Sando-K®), which each contain 12 mmol of potassium and 8 mmol of chloride, are preferable as modified release tablets (Slow-K®) may cause gastrointestinal ulceration.
- The dosage and duration of treatment depends on existing potassium deficit and whether there is continuing potassium loss.
- Larger doses may be required especially in patients with digitoxicity or diabetic ketoacidosis. Advice is available from your local Biochemistry Department.
- *Potassium supplements should not be given in severe renal impairment or if plasma  $K^+$  > 5.0 mmol/L.*
- **Caution** should be used in patients with renal insufficiency or when ACE inhibitors or potassium-sparing diuretics are being administered concomitantly.

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## Drug therapy / treatment options continued

### Suggested starting doses (but see notes on previous page)

#### Oral potassium supplementation

1. For plasma  $K^+$  3.0 - 3.5 mmol/L (approximate potassium deficit 200 mmol):

**Sando-K® 2 tablets 3 times daily**

#### Notes

- Monitor plasma  $K^+$  twice weekly until stable.
- Once plasma  $K^+$  stable or if plasma  $K^+$  > 4.5 mmol/L, reassess requirement for supplementation.

2. Plasma  $K^+$  2.5 - 2.9 mmol/L (approximate potassium deficit 200 - 400 mmol):

**Sando-K® 3 tablets 3 times daily**

#### Note

- Monitor plasma  $K^+$  daily until plasma  $K^+$  > 2.9 mmol/L and then manage as above.

3. Plasma  $K^+$  < 2.5 mmol/L or cardiac arrhythmia (approximate deficit > 400 mmol):

***Intravenous supplementation is usually required.***

#### Intravenous potassium supplementation

- Intravenous supplements are indicated if patients cannot eat, are unlikely to absorb oral potassium or have profound hypokalaemia.
- Where possible use pre-prepared infusion bags. These are available as:
  - **20 mmol KCl in 500 ml sodium chloride 0.9% or glucose 5%**
  - **40 mmol KCl in 500ml sodium chloride 0.9% or glucose 5%**
- ***The rate of infusion should not normally exceed 10 mmol/hour.***
- 10 ml ampoules of strong potassium chloride containing 20 mmol potassium per ampoule are only available in intensive care areas and should not be used in ward areas unless in exceptional circumstances and under close supervision. These must be ordered in the controlled drug requisition book.
- If concentrations other than those mentioned above are required, contact your clinical pharmacist or Medicines Information for advice (see Appendix 6 for details).

# Management of Hypomagnesaemia

---

**N.B.** Use of magnesium for other indications e.g. eclampsia is outside the scope of this guideline.

The reference range for serum magnesium is 0.7 - 1 mmol/L.

Serum concentrations should be used in conjunction with presenting signs and symptoms to diagnose hypomagnesaemia (see notes below).

## 1. Adults with normal renal function

**Magnesium levels should be monitored daily, and the dose adjusted as necessary.**

See flow diagram on next page.

## 2. Adults with renal impairment

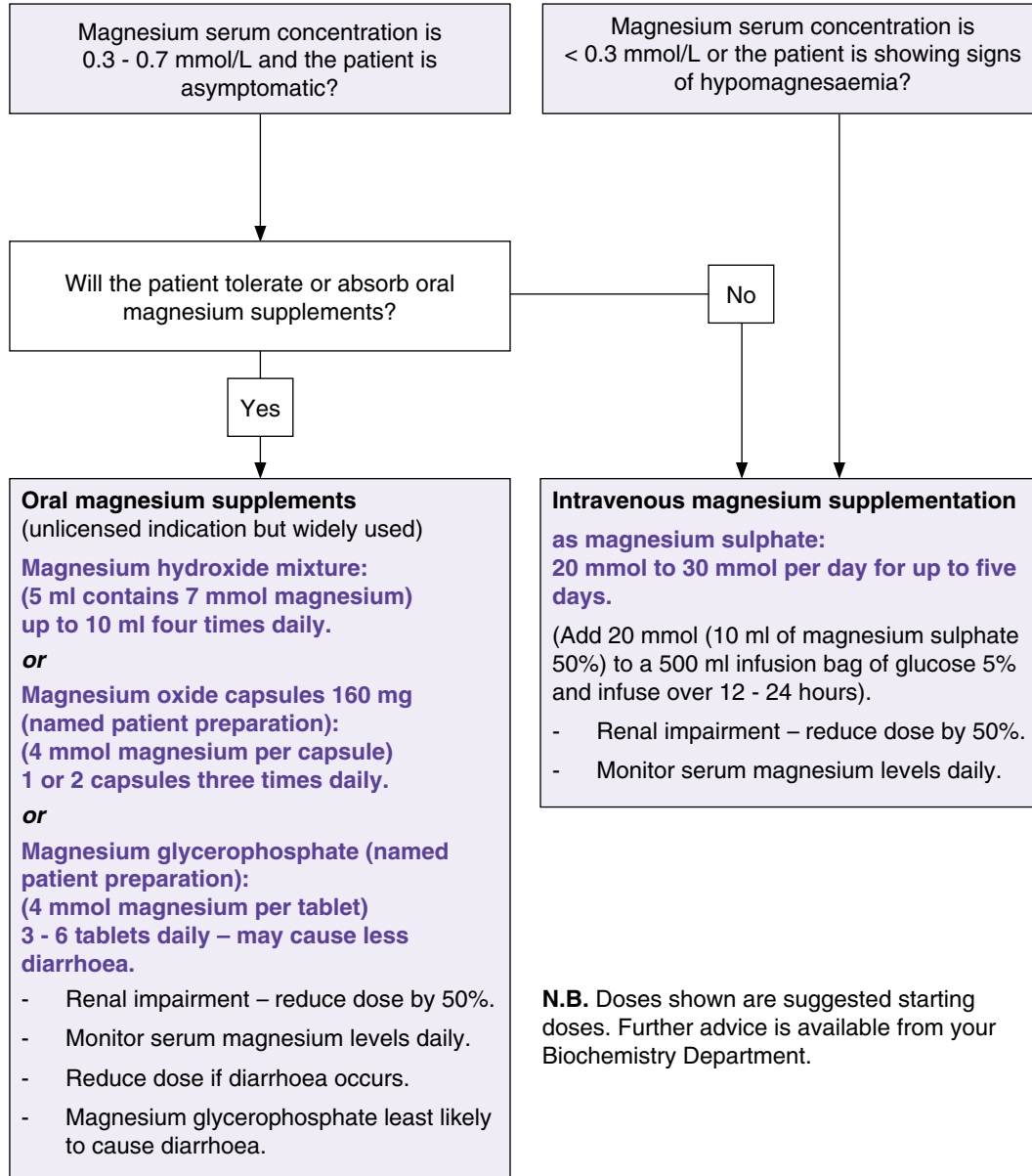
Patients with renal impairment should have the doses of magnesium halved as reduced urinary magnesium excretion puts the patient at risk of hypermagnesaemia.

### Additional information

- Magnesium is mainly an intracellular ion, so serum concentrations are not an exact measurement of total body stores.
- Magnesium depletion is often associated with other electrolyte abnormalities – reduced  $K^+$ ,  $Ca^{2+}$ ,  $PO_4^{3-}$  or  $Na^+$  levels may co-exist with a low  $Mg^{2+}$ .
- Possible symptoms include agitation, confusion, convulsions, weakness, tremors, ECG changes, nausea and vomiting.
- Establish and correct cause if possible.

*Continues on next page*

## Management of hypomagnesaemia in adults with normal renal function



# Management of Hypophosphataemia

## Introduction

Hypophosphataemia may be asymptomatic, but clinical symptoms usually become apparent when plasma phosphate concentrations fall below 0.3 mmol/L. Possible symptoms include: weakness, anorexia, malaise, tremor, paraesthesia, seizures, acute respiratory failure, arrhythmias, altered mental status and hypotension,

## Assessment / monitoring

- Serum phosphate (reference range 0.7 - 1.4 mmol/L)
- Symptoms as above

## Drug therapy / treatment options

Suggested starting doses:

### Mild Hypophosphataemia (0.6 - 0.69 mmol/L):

No treatment required.

### Moderate Hypophosphataemia (0.3 - 0.59 mmol/L):

**Phosphate Sandoz® 1 - 2 tablets orally three times daily** (each tablet contains 16 mmol phosphate, 3 mmol potassium and 20 mmol sodium.)

Oral replacement is usually sufficient but consider intravenous replacement if patient has phosphate level 0.3 - 0.5 mmol/L and is symptomatic or nil by mouth or unlikely to absorb oral phosphate.

### **Glycophos® IV 20 mmol (20 ml) in 500 ml glucose 5% over 12 hours**

Glycophos® solution (20 ml) contains 20 mmol phosphate (1 mmol/ml) and 40 mmol sodium (2 mmol/L.)

### Notes:

- The dose should be reviewed daily according to phosphate levels.
- Diarrhoea is a common side effect of oral phosphate therapy and may necessitate a reduction in dose. Give in at least 120 ml of water to reduce risk of diarrhoea.

### Severe Hypophosphataemia (< 0.3 mmol/L)

1. Phosphate level < 0.3 mmol/L and patient has impaired renal function:

**Glycophos® IV 20 mmol (20 ml) in 500 ml glucose 5% over 12 hours.**

**Continues on next page**

### Drug therapy / treatment options continued

2. Phosphate level < 0.3 mmol/L and patient has normal renal function:

**Glycophos® IV 40 mmol given as 2 x 12 hour infusions,  
i.e. 20 mmol (20 ml) in 500 ml glucose 5% over 12 hours x 2.**

- Considering that the normal adult intake of phosphate is about 35 mmol per day, a reasonable typical IV replacement is 20 - 40 mmol per day.
- For intravenous replacement Glycophos® has replaced Addiphos® as treatment of choice for hypophosphataemia as it contains no potassium and therefore removes associated risks.

#### Notes:

- Serum phosphate, potassium, calcium and magnesium levels should be monitored every 12 - 24 hours during IV phosphate administration.
- Monitor renal function regularly.
- Repeat the dose within 24 hours if an adequate level (> 0.64 mmol/L) has not been achieved.
- Hypotension, hyperphosphataemia, hypocalcaemia, hypernatraemia, dehydration and metastatic calcification are possible adverse effects of intravenous phosphate therapy.

# Management of Hypercalcaemia

For the guidance on bisphosphonate use in cancer patients see [www.intranet.woscan.scot.nhs.uk/](http://www.intranet.woscan.scot.nhs.uk/) / Systemic anti-cancer therapy protocols / Supportive care

## Introduction

The reference range for adjusted serum calcium is 2.1 - 2.6 mmol/L.

**N.B.** In patients presenting with hypercalcaemia in an emergency setting always consider occult malignancy. Low serum albumin is another pointer to this being the cause.

## Assessment / monitoring

- Serum calcium should be monitored daily.
- U&Es to assess hydration status.

## Drug therapy / treatment options

If hypercalcaemia is life threatening (adjusted calcium > 4 mmol/L), start:

**Sodium chloride 0.9% IV 1 litre over 4 hours and contact senior medical staff for advice immediately. Dialysis may be needed.**

Otherwise carefully rehydrate with:

**Sodium chloride 0.9% IV infusion 2 - 3 L over 24 hours to maintain urine output and promote calcium excretion.**

- More cautious rehydration will be necessary if the patient has a history of heart failure, renal failure or is elderly.
- Ensure thiazide diuretics are discontinued.
- After 24 - 48 hours of rehydration, consider intravenous pamidronate if the condition remains unresolved (see Table 1).

**Table 1 – IV Pamidronate dosing**

Initial serum calcium (adjusted) mmol/L	Recommended total dose (mg) for tumour-induced hypercalcaemia
Up to 3 mmol/L	15 - 30
3 - 3.5 mmol/L	30 - 60
3.5 - 4 mmol/L	60 - 90
> 4 mmol/L	90

Continues on next page



### **Drug therapy / treatment options continued**

Give as a single infusion of pamidronate or in divided doses (infusions) over 2 - 4 consecutive days.

- The infusion rate should never exceed 20 mg/hour.
- The concentration of pamidronate in the infusion solution should not exceed 60 mg/250 ml.
- Pamidronate should not be used if CrCl < 30 ml/minute.
- Full effect of pamidronate may take 3 - 7 days.
- If corrected serum calcium continues to rise or has not returned to the reference range within 5 days zoledronic acid may be considered but its use is currently restricted within NHSGGC to "consultants treating tumour-induced hypercalcaemia and by specialist oncologists for the prevention of skeletal-related events in patients with breast cancer and multiple myeloma".

# Management of Hypocalcaemia

## Introduction

The reference range for adjusted serum calcium is 2.1 - 2.6 mmol/L. Hypocalcaemia may be due to deficiencies of calcium homeostatic mechanisms, secondary to high phosphate levels or other causes.

## Assessment / monitoring

- Plasma calcium level
- Establish cause of hypocalcaemia and seek senior advice if necessary
- Assess whether patient is symptomatic (e.g. tetany)

## Drug therapy / treatment options

Recommended daily dose of elemental calcium is 1 - 3 g (2.25 - 6.75 mmol) daily.

### Oral

Calcium salts – up to 50 mmol daily in 2 - 3 divided doses, for example:

Sandocal-400 – 1 - 4 tablets (10 - 40 mmol) in water

*or*

Sandocal-1000 – 1 - 2 tablets (25 - 50 mmol) in water (other preparations are available)

*If oral replacement is ineffective after 2 - 3 days in asymptomatic patients, add:*

Alfacalcidol oral 1 microgram daily (elderly 500 nanograms).

### Intravenous – for hypocalcaemic tetany

Initial:

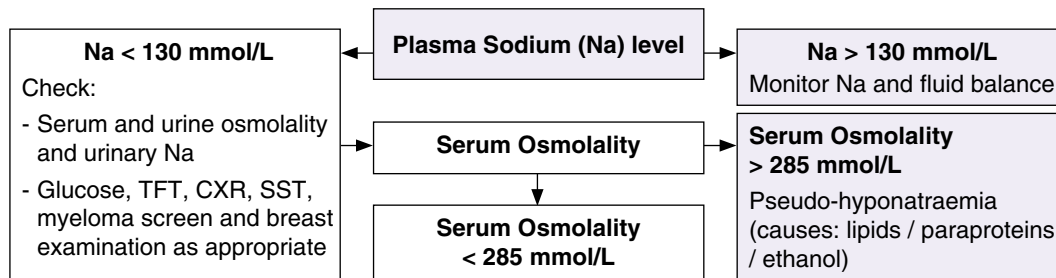
Calcium gluconate 10% 10 ml (2.2 mmol calcium) over at least 10 minutes with cardiac monitoring.

Then:

Start a continuous infusion of 40 ml (8.8 mmol) of calcium gluconate 10% in 1 litre of sodium chloride 0.9% or glucose 5% over 24 hours.

# Management of Hyponatraemia

- Early symptoms include: anorexia, lethargy, and nausea. Late symptoms include: agitation, seizures, focal neurology, and coma. Symptom severity depends on speed of onset.
- Initial assessment should include:
  - Presenting complaint and past medical history: GI losses, heart / liver failure, malignancy, endocrine causes.
  - Clinical assessment of fluid status: is patient fluid overloaded or fluid depleted?
  - Medication review e.g. diuretics, ACE inhibitors, antidepressants, anti-convulsants, and review others in BNF.



Potential causes of serum osmolality < 285 mmol/L (depending on urinary Na and fluid status)			
	Hypovolaemic	Euvolaemic	Hypervolaemic
Urinary Na < 20 mmol/L	GI loss Fluid shift (e.g. pancreatitis) Burns	Acute water overload Malnutrition	Liver cirrhosis Cardiac failure Nephrotic syndrome
Urinary Na > 20 mmol/L	Diuretics Adrenal Insufficiency (mineralocorticoid) Salt-wasting Nephropathy Cerebral salt-wasting	Drugs (e.g. antidepressants) Renal failure Hypothyroidism Pituitary insufficiency SIADH*	

Restore volume with **isotonic sodium chloride IV 0.9%.**<sup>#</sup>  
**Only use hypertonic sodium chloride on the advice of the consultant.**

**Note: \*SIADH:** serum osmolality < 285 mmol/L, with inappropriately high urinary sodium and osmolality; renal / adrenal / pituitary / cardiac causes excluded and not dehydration or medication-related.

<sup>#</sup>Rate of Na correction should not exceed 2 mmol/L/hr or 12 mmol/L in 24 hours, to avoid central pontine myelinolysis.

With senior's advice:

- Stop relevant medications
- Fluid restrict to 1.5 L/day
- Treat underlying cause
- Consider sodium chloride IV if symptomatic<sup>#</sup>
- Consider demeclocycline / vasopressin antagonists (only on consultant advice)

**If stable and asymptomatic, no action may be required.**

# Management of Hypernatraemia

Serum Na  $>145$  mmol/L can be caused by reduced water intake (dehydration), or where water losses are greater than sodium losses (e.g. watery diarrhoea).

## Assessment / Monitoring

- There are no specific clinical features of hypernatraemia. It is usually diagnosed incidentally on serum testing. Also check other biochemical indices such as renal failure, hyperglycaemia and hypercalcaemia.
- Identify underlying cause of hypernatraemia. Consider measuring urine osmolality.
  - Urine osmolality  $<$  plasma osmolality – look for diabetes insipidus
  - Urine osmolality  $>$  plasma osmolality – look for osmotic diuresis / heatstroke, etc.
- If patient is also hypovolaemic, then monitor urinary output and renal function.

## General Management

- Treat underlying cause once identified. This is as important as treatment of hypernatraemia.
- Mild cases of hypernatraemia – replace missing body water with oral water (not electrolyte drinks) or glucose 5% IV.
- Severe cases of hypernatraemia (e.g. Na  $> 170$  mmol/L) - give glucose 5% IV unless the patient is volume depleted and hypotensive, in which case give sodium chloride 0.9% IV. It is important that the rate of reduction of serum Na does not occur more rapidly than about 10 mmol/L per day.
  - Reassess and record patient's blood results and clinical conditions every 8 hours. Recheck serum Na after 2 L of fluid replacement, or after 8 hours at the latest.
  - Patients should be handed over to the next shift to clarify monitoring and fluid requirements.
- If diabetes is simultaneously present, then BM monitoring is required and if the blood glucose is  $> 30$  mmol/L then follow HONC guideline (page 269).
- In complex cases, the free water deficit can be calculated and advice can be sought from Biochemistry physicians, to guide the rate of water replacement.

## Section 10

# Musculoskeletal and Joint Disease

# Management of Gout

## Introduction

Gout is a common condition encountered in both hospital inpatients and primary care particularly in men. It is due to the deposition of uric acid in the joints and periarticular tissues.

First attacks of gout commonly present as monoarthritis, but polyarticular presentations and chronic tophaceous gout may also be encountered.

Risk factors for gout include: hyperuricaemia (note: most people with hyperuricaemia never suffer an attack of gout), obesity, excess alcohol (especially beer), renal impairment, metabolic syndrome (hypertension, hyperlipidaemia, diabetes mellitus (type 2)).

More information can be found at:

[www.rheumatology.org.uk/resources/guidelines/bsr\\_guidelines.aspx](http://www.rheumatology.org.uk/resources/guidelines/bsr_guidelines.aspx)

## Assessment / Monitoring

The differential diagnosis can be septic arthritis or pseudo-gout (pyrophosphate arthritis). Check:

- Urate level. This can sometimes fall during an acute attack, so if the level is normal, then repeat once the acute attack has resolved.
- U&Es / LFTs, consider glucose / lipids
- Joint aspiration (large joints) for gram stain, culture and microscopy for urate crystals. This is not needed if diagnosis has previously been established and there is no suspicion of septic arthritis.
- X-ray feet. In > ¾ of patients first attack is in the first metatarsophalangeal joint, and this joint is involved at some stage in 90% of cases.

## General management

### Lifestyle Modifications

Patients should be advised to:

- Reduce alcohol consumption
- Modify diet to achieve ideal body weight
- Address cardiovascular risk factors

*Continues on next page*

## Treatment options

### Management of acute attack

- **Non-Steroidal Anti-Inflammatory Drug (NSAID)** (see page 302 for details)  
**or**
- **Colchicine oral 500 micrograms 2 - 3 times daily (stop if diarrhoea develops)**. Courses exceeding 6 mg in total are unlicensed but may be appropriate. Seek specialist advice.  
**or**
- **Prednisolone oral 7.5 mg - 15 mg each day for 3 - 5 days only and discuss with rheumatology.**  
**or**
- Intra-articular steroid – useful for monoarthritis after infection excluded by negative synovial fluid culture (discuss with rheumatology).

Allopurinol should be initiated only once an acute attack has settled **but** if acute attack occurs in a patient already receiving allopurinol, **do not stop allopurinol**.

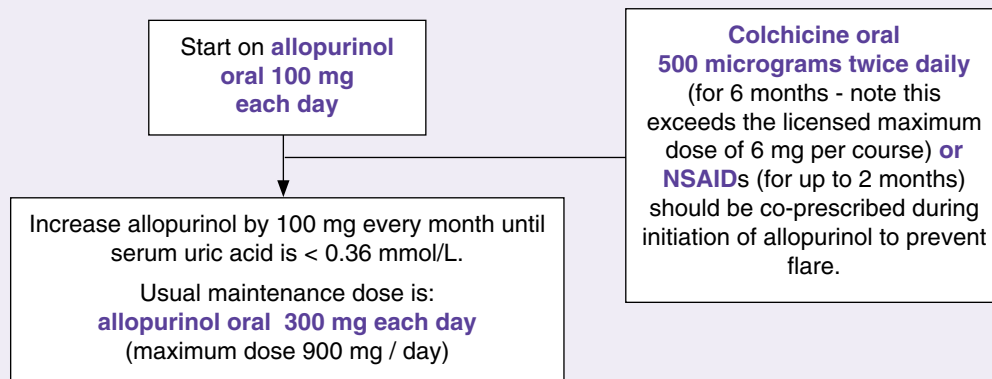
### Long-term management of gout

Long-term uric acid lowering therapy will be required for patients with:

- > 3 attacks in 1 year *or*
- Gouty tophi *or*
- Urate renal calculi *or*
- Radiological damage (erosions) secondary to gout *or*
- Serum urate > 0.6 mmol/L

Allopurinol should be initiated only once an acute attack has settled (see below). In patients whose uric acid levels have failed to respond adequately despite optimal dosing of allopurinol or those who are intolerant, an alternative is:

**Febuxostat oral 80 mg daily (increased to 120 mg daily after 4 weeks if the serum urate still exceeds 0.36 mmol/L)**. As with allopurinol, prophylaxis for flares of gout should continue for the first 6 months of treatment (see below). Febuxostat is **not** recommended for patients with ischaemic heart disease or heart failure.



# Management of Arthritis

## Introduction

This section covers the first line management of patients with:

- Osteoarthritis
- Inflammatory arthritis e.g. rheumatoid arthritis, psoriatic arthritis, reactive arthritis, spondyloarthropathy, crystal arthritis

More information can be found at:

[www.rheumatology.org.uk/resources/guidelines/bsr\\_guidelines.aspx](http://www.rheumatology.org.uk/resources/guidelines/bsr_guidelines.aspx)

## Assessment / monitoring

Refer to rheumatology services for further advice regarding the assessment and management of patients with inflammatory arthritis and in cases where there are diagnostic difficulties. This should be done as soon as possible after presentation.

This section does not address the management of septic arthritis. All cases of suspected septic arthritis should be referred to rheumatology or orthopaedics depending on local protocol.

## General management

- Exercise – all patients should receive physiotherapy advice regarding joint protection, exercise and occupational therapy input.
- Weight control – all patients should receive advice regarding maintaining ideal body weight.

## Treatment options

### A. Pain control

#### 1. Non-opioid and weak opioid analgesics

**Paracetamol oral 1 g 4 - 6 hourly (maximum 4 g in 24 hours)**

or

**Co-codamol oral (8/500 mg) 2 tablets 4 - 6 hourly (maximum 8 tablets in 24 hours)**

- Paracetamol is as effective as Non-Steroidal Anti-Inflammatory Drugs (NSAIDs) in many patients with osteoarthritis. Consider dose reduction of paracetamol in patients with low body weight ( $\leq 50$  kg), renal / hepatic impairment or glutathione deficiency (chronic malnourishment, chronic alcoholism) to 15 mg/kg/dose up to four times daily (max 60 mg/kg/day). An example is: dose reducing to **paracetamol oral 500 mg four times daily**.
- If response is inadequate to simple analgesia, NSAIDs may be tried but should be stopped if ineffective.

#### 2. NSAIDs

**Ibuprofen oral 400 mg - 600 mg three times daily after food**

or

**Naproxen oral 250 mg - 500 mg twice daily after food**

Continues on next page



### Treatment options continued

NSAIDs are associated with risk of significant toxicity, and the following should be noted:

- Always use the lowest possible dose of NSAID for the shortest possible duration.
- **Never** use combinations of NSAIDs.
- NSAIDs are contraindicated in renal failure, cardiac failure and active peptic ulcer disease.
- Consider gastroprotection in those patients at increased gastrointestinal (GI) risk (see Table 1). Remember patients remain at risk of perforation and bleeds despite gastroprotection.
- Avoid or minimise use of NSAIDs in patients with ischaemic heart disease and hypertension.
- Co-administration of ibuprofen and aspirin negates the antiplatelet effects of aspirin and should be avoided. Instead, aspirin should be taken first thing in the morning, approximately 1 hour before ibuprofen.

**Table 1 – People at high risk of serious NSAID induced GI adverse effects**

- Age  $\geq$  65 years
- History of gastroduodenal ulcer, perforation or GI bleeding.
- Concomitant use of medication known to increase risk of upper GI adverse events e.g. aspirin, anticoagulants, corticosteroids, selective serotonin re-uptake inhibitors.
- Serious co-morbidity e.g. cardiovascular disease, renal or hepatic impairment, diabetes, hypertension.
- Requirement for prolonged duration of NSAID use.
- High dose NSAID use (ibuprofen 2400 mg per day or naproxen 1 g per day).

### Gastroprotection

- **Proton pump inhibitors e.g.:**  
**Omeprazole oral 20 mg each day or**  
**Lansoprazole oral 15 mg - 30 mg each day.**
- Gastroprotection is only required for the duration of the NSAID course.
- Consider *H. pylori* eradication (see page 48 for details).

### 3. COX-2 selective NSAIDs (Coxibs)

**Choice: Celecoxib oral 100 mg twice daily**

Coxibs are associated with less GI toxicity than NSAIDs but with increased cardiovascular risk. The following should be noted:

- Coxibs should only be prescribed for patients with high risk of GI toxicity and low cardiac risk.
- Coxibs should not be prescribed for patients taking concomitant aspirin.
- For patients requiring a proton pump inhibitor, a traditional NSAID should be used in preference to a Coxib.

**Continues on next page**

**Treatment options continued****B. Disease Modifying Anti-Rheumatic Drugs (DMARDs) and immunosuppressant therapies**

Many patients with inflammatory arthritides or connective tissue diseases will be receiving one or more DMARDs or immunosuppressants including biologic agents such as tumour necrosis factor-alpha (TNF  $\alpha$ ) inhibitors therapy. These medicines are usually initiated on the advice of rheumatology. They may increase the patient's risk of infection and/or mask the typical clinical signs of sepsis.

Contact Rheumatology department if:

- Infection is suspected on treatment with DMARDs or immunosuppressants.
- Changes to DMARD doses are planned when a patient is admitted for other reasons.
- Long-term therapies stopped.
- A DMARD prescription is unclear - withhold drug until it has been discussed.

DMARDs include:

- Methotrexate (once weekly preparation, orally or subcutaneously)
- Sulfasalazine EC
- Hydroxychloroquine
- Gold
- Leflunomide
- Azathioprine
- Ciclosporin

Guidelines on DMARD monitoring (BSR / BHPR) are available at:

[www.rheumatology.org.uk/resources/guidelines/bsr\\_guidelines.aspx](http://www.rheumatology.org.uk/resources/guidelines/bsr_guidelines.aspx)

Biologics include:

- Etanercept (SC, once or twice weekly)
- Adalimumab (SC, once a fortnight)
- Infliximab (IV, usually in day-ward setting)
- Rituximab (IV, usually in day-ward setting)
- Tocilizumab (IV, once every 4 weeks)
- Abatacept (IV, initially fortnightly then once every 4 weeks)
- Certolizumab (SC, once a fortnight)

## Section 11

# Palliative Care

# Pain Management in Palliative Care

The full set of guidelines in this section are available as A5 booklets from the palliative care team and A4 folders on all wards. For patients with heart failure requiring palliative care see "Living and Dying in Advanced Heart Failure: A Palliative Care approach" on [www.palliativecarescotland.org.uk](http://www.palliativecarescotland.org.uk).

## Analgesic Step Ladder (see table on page opposite)

Assess pain fully before treatment (see pain assessment in full guidelines). Ask the patient regularly about their pain. Use a pain assessment tool and record pain scores. Prescribe regular analgesia for continuous pain. Discuss and resolve any concerns of the patient about taking opioids.

- Movement / incident related or episodic pain – a dose of short-acting opioid before moving or when pain occurs may help. Seek advice as it can be difficult to manage.
- Constipation – With opioids give regular laxatives (see page 45 for choice). Also further information can be found in either the palliative care booklet or in the A4 folders on the wards.
- Nausea and vomiting – Prescribe antiemetics (metoclopramide or haloperidol) as required for 5 – 10 days.

## Adjuvant Therapies

- NSAID for bone pain, liver pain, soft tissue infiltration, or inflammatory pain. Side effects include gastrointestinal ulcers / bleeding (consider proton pump inhibitor), renal impairment, fluid retention.
- Antidepressant or anticonvulsant for nerve pain e.g.
  - Amitriptyline (unlicensed indication) initial oral dose 10 mg at night. Slowly dose titrate up every 5 to 7 days.
  - Gabapentin initial oral dose 100 mg to 300 mg at night then titrate dose every few days to 300 mg three times daily. Consider a lower dose and slower titration for the frail / elderly / patients with renal impairment.

There is no clear difference in efficacy between these preparations. See BNF for side effects.

- Dexamethasone for intracranial, nerve or liver pain but dose varies:
  - Intracranial pressure – dexamethasone oral 16 mg each morning
  - Nerve pain – dexamethasone oral 12 mg each morning
  - Liver pain – dexamethasone oral 4 mg to 8 mg each morning.

Reduce to the lowest effective dose.

- For TENS, nerve block, radiotherapy, surgery, bisphosphonates, ketamine seek specialist advice.

# Analgesic Step Ladder

## Step 1: Mild Pain

**Paracetamol oral 1 g four times a day** or NSAID (if not contraindicated) +/- other adjuvant (see previous page)

**N.B.** Consider dose reduction in patients  $\leq 50$  kg, renal / hepatic impairment or glutathione deficient (chronic malnourishment, chronic alcoholism) to 15 mg/kg/dose (max. 60 mg/kg/day). An example is: reduce dose to paracetamol oral 500 mg four times daily.

## Step 2: Mild to moderate pain

Opioid <b>codeine or dihydrocodeine oral 30 – 60 mg four times a day</b>	+	Paracetamol (dose as in Step 1)	or	NSAID (if not contraindicated)	+/-	other adjuvant (see previous page)
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Can use combination preparations e.g.  
**Cocodamol oral 30/500 mg 2 tablets  
four times a day**

## Step 3: Moderate to severe pain

Opioid (first line is morphine)	+	Paracetamol (dose as in Step 1)	or	NSAID (if not contraindicated)	+/-	other adjuvant (see previous page)
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- *Stop any step 2 opioid*  
(codeine / dihydrocodeine 240 mg/24 hours  $\approx$  morphine oral 30 mg/24 hours)
- If commencing with immediate release oral morphine give 5 mg every 4 hours and as required for breakthrough pain. Use lower doses and increase slowly if patient is frail, elderly or has renal impairment. Convert to modified release morphine when stable by dividing total daily dose of immediate release morphine by 2, then prescribing the dose as oral morphine modified release 12 hourly. Also prescribe for breakthrough pain (see fifth point, below).
- If starting patient with modified release oral morphine give 10 – 15 mg twice a day and immediate release morphine 5 mg as required for breakthrough pain. Use lower doses and increase slowly if patient is frail, elderly or has renal impairment.
- Dose titration: increase regular oral morphine dose each day by around 30% (or according to the breakthrough doses used) until pain is controlled or side effects develop. Also increase laxative dose as needed (see page 45 for choice).
- Breakthrough pain - prescribe immediate release morphine at 1/6th of the regular 24 hour oral morphine dose, as required. Assess 30 – 60 minutes after a breakthrough dose and if pain persists then give a second breakthrough dose.
- When to seek advice – see next page

*Continues on next page*

## Subcutaneous analgesia

Calculate the 24 hour dose of oral morphine administered. Convert this dose to morphine SC to be given in a syringe pump over 24 hours (see next page for dose conversions).

For breakthrough pain prescribe 1/6th of the 24 hour SC opioid dose as required.

## Pain not controlled

Seek advice if:

- Pain is not responding to treatment.
- Dose of opioid rapidly increased but patient still in pain.
- Episodes of acute severe pain.
- Pain worsens on movement.

## Opioid toxicity – seek advice

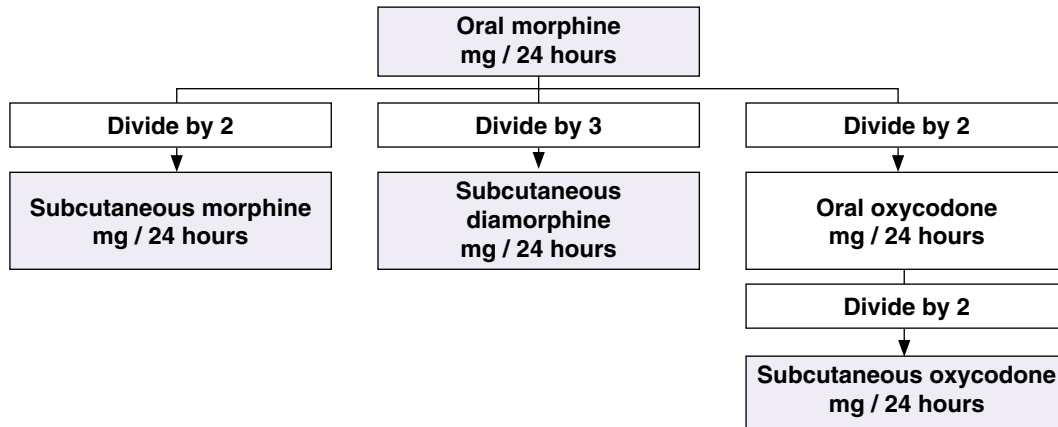
- Signs include:
  - Increasing drowsiness / sedation
  - Vivid dreams / hallucinations / delirium
  - Muscle twitching / myoclonus / jerking
  - Abnormal skin sensitivity to touch
- Reduce opioid dose by 1/3, ensure patient is well hydrated; review and re-titrate the analgesia.
- Consider adjuvant therapies and/or alternative opioids.
- Naloxone (in small titrated doses) is only needed for life-threatening respiratory depression (page 41).

# Opioid Conversion Chart

This is advice on conversion factors and calculations to estimate equivalent doses of different opioids. It is **not** a guideline on using opioids. **If converting in the opposite direction multiply rather than divide.**

**N.B.** Consider reducing final opioid dose by a further one third when changing to a different opioid; monitor for breakthrough pain and toxicity when switching opioids. Titrate dose up and down according to efficacy and side effects. Contact Palliative Care Team for advice.

## Opioid Conversion Chart



## Renal Impairment

Morphine and oxycodone are contraindicated in patients with  $\text{eGFR} < 60 \text{ ml/minute/1.73m}^2$ . Contact local palliative care team for advice on alternative opioids.

## Other opioids

Contact local Palliative Care Team or pharmacy for further information on other opioids e.g. alfentanil, hydromorphone.

## Breakthrough pain

- For **same** opioid and route: divide 24 hour opioid dose by 6.
- For fentanyl patch: See guidance below.
- Consider increasing the breakthrough opioid dose as the background opioid dose increases.

Fentanyl products which are licensed for fast onset / short duration breakthrough cancer pain should only be prescribed under a palliative medicine specialist's supervision. Patients must be on a background opioid.

For general guidance on fentanyl patches, see below. More detailed information is available at [www.palliativecareggc.org.uk](http://www.palliativecareggc.org.uk) and in the Fentanyl guideline in the Palliative Care booklet from the Palliative Care Team or A4 folder on the ward.

*Continues on next page*

## Good prescribing points for transdermal fentanyl

Indications for using fentanyl patches:

- Stable pain only, not suitable for acute pain.
- Oral route not viable due to e.g. poor absorption or swallowing difficulties e.g. ileostomy, head and neck cancer, etc.
- Morphine and other oral strong opioids cannot be tolerated due to side effects e.g. confusion, excessive ongoing drowsiness, intractable constipation.
- Compliance issues – a supervised patch change will assist this.

### Remember:

- Pain **must** be stable:
  - It takes 6 - 12 hours for the patch to begin to work and will take 36 - 48 hours to reach stable plasma levels (do not increase patch before 72 hours have passed).
  - Any subsequent dose increase will take 48 hours to see full therapeutic effect.
- Fentanyl is a **potent** opioid, 100 - 150 times more potent than oral morphine.
- Fentanyl patches are not normally appropriate in opioid naive patients and great care is required in this situation. Seek specialist advice.

**Note:** Durogesic DTrans® 12 micrograms/hour is only licensed for fine titration between 25 and 75 micrograms/hour. Initiating a patient on a 12 microgram/hour patch will be an 'off-label' use. There will be clinical situations when this may be justified.

- As patches vary considerably in their appearance and to avoid the risk of patient confusion, patients should not be changed from one formulation or make to another without adequate counselling.
- If the patient, on a fentanyl patch, is dying and/or pain control becomes unstable and additional analgesia is required, **do not take the patch off**. Leave the patch on (continuing to replace every 72 hours) and add a continuous subcutaneous infusion.
- There is a very wide range in equivalency between transdermal fentanyl and oral morphine.



# Palliative Care – Symptoms

See BNF, Prescribing in Palliative Care: [www.palliativecareggc.org.uk](http://www.palliativecareggc.org.uk)  
and [www.palliativecareguidelines.scot.nhs.uk](http://www.palliativecareguidelines.scot.nhs.uk)



Palliative Care Symptoms	Important notes / comments to consider before prescribing	Therapeutic choice
Dry mouth	Encourage good oral hygiene with regular sips of water before considering saliva replacement.	Saliva replacement gel e.g. Oral Balance - use as required. See Oral Hygiene Policy.
Excessive respiratory secretions	Hyoscine butylbromide is a less sedating alternative. Hyoscine hydrobromide can cause sedation.	Hyoscine butylbromide SC bolus 20 mg hourly as required (max 120 mg / day) <b>or</b> SC infusion 60 - 120 mg over 24 hours
		Glycopyrronium bromide SC bolus 200 micrograms 6 - 8 hourly as required <b>or</b> SC infusion 600 -1200 micrograms over 24 hours
		Hyoscine hydrobromide ( <b>N.B.</b> Sedating) SC bolus 400 micrograms every 2 hours as required (max 2400 micrograms/day) <b>or</b> SC infusion 1200 - 2400 micrograms over 24 hours
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Palliative Care Symptoms	Important notes / comments to consider before prescribing	Therapeutic choice
Restlessness	Assess for cause and reverse as appropriate.  Haloperidol and levomepromazine have long half-lives and can either be given as SC infusion or as SC bolus.  Levomepromazine can cause sedation and hypotension.	Midazolam (anxiety / distress) SC infusion, initial starting dose 5 mg, titrate up to 10 - 60 mg over 24 hours.  <b>or</b> SC bolus 2 mg - 5 mg hourly as required (max 6 doses in 24 hours).
		Haloperidol (confusion / delirium) SC infusion, initial starting dose 2 mg – 5 mg over 24 hours. Titrate according to response.  <b>or</b> SC bolus, 2 mg - 5 mg in one to two divided doses.
		Levomepromazine (confusion / agitation) <b>N.B.</b> Sedating  SC infusion, initial starting dose 5 mg - 12.5 mg over 24 hours. Titrate according to response.  <b>or</b> SC bolus 5 mg - 12.5 mg in one to two divided doses
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Table continued from previous page		
Palliative Care Symptoms	Important notes / comments to consider before prescribing	Therapeutic choice
Nausea and vomiting	<p>Use guidelines to identify possible causes and suitable treatments (see <a href="http://www.palliativecareggc.org.uk">www.palliativecareggc.org.uk</a>)</p> <p>Prescribe regularly until symptoms controlled.</p> <p>If vomiting regularly, switch to SC route, ideally administer via syringe pump over 24 hours.</p> <p>Avoid pharmacologically antagonistic combinations e.g. cyclizine and metoclopramide.</p> <p>Metoclopramide: use with caution in young, especially female patients, because of risk of extrapyramidal side effects.</p> <p>In intractable nausea and vomiting, low dose levomepromazine is used as second line treatment. The 6 mg tablet is an unlicensed preparation and may be available from your hospital pharmacy. Advice about its use should be obtained from the Palliative Care team.</p>	<p>Treatment option: see Nausea and Vomiting Guideline (palliative care booklet or folder on ward).</p>
		<p>Prophylactic antiemetics may be necessary (when opioid initiated and/or opioid dose increased):</p> <p>Prescribe:</p> <p>Metoclopramide oral 10 mg 8 hourly, increased to 20 mg 6 hourly (caution with certain patient groups)</p> <p><b>or</b></p> <p>Haloperidol oral 0.5 - 3 mg at night</p>



# Palliative Care – Last days of life

When all reversible causes for the patient's deterioration have been considered, the multi-disciplinary team agrees the patient is dying and changes the goals of care. Reversible causes to consider include: dehydration, infection, opioid toxicity, renal impairment, hypercalcaemia or delirium. Clinical signs may include: patient is bedbound, increasingly drowsy or semi-comatose, only able to take sips of fluid or has difficulty swallowing tablets.

## Management of a dying patient and their family

Plan and document care; consider using a care pathway or checklist.

- Discuss prognosis (patient is dying), goals of care (maintaining comfort) and preferred place of care.
- If discharge home is possible, prompt and careful planning is needed. Contact GP, district nurse and occupational therapist urgently.
- Clarify resuscitation status; check DNA CPR form has been completed (see national policy). Reassure the patient and family that full supportive care will continue.
- Discontinue inappropriate interventions (blood tests, IV fluids and medication, vital signs monitoring, frequent blood sugar tests).

## Hydration

- Discontinue tube feeding / fluids if respiratory secretions present, if there is a risk of aspiration due to reduced conscious level or at the patient's request.
- Over-hydration contributes to distressing respiratory secretions. Artificial fluids are usually not appropriate, but if indicated can be given subcutaneously.

## Symptom control in the last days of life

### Anticipatory prescribing

In all patients the following should be prescribed in the "when required" section of the kardex:

- Opioid analgesic SC, hourly: dose depends on patient, clinical problem and previous opioid use. Prescribe 1/6th of 24 hour dose of any regular opioid or if not on a regular opioid prescribe, **morphine SC 2 mg hourly**.
- Anxiolytic sedative: **midazolam SC 2 mg to 5 mg hourly**.
- Anti-secretory medication: **hyoscine butylbromide (Buscopan®) SC 20 mg hourly**.
- Antiemetic: **haloperidol SC 500 micrograms 12 hourly or levomepromazine SC 2.5 mg to 5 mg 12 hourly**.

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## Management of symptoms present in last days of life

### Pain:

- Non-opioid analgesics: Paracetamol or diclofenac (liquid / dispersible / rectal preparations). NSAID benefits may outweigh risks in a dying patient; can help bone, joint, pressure sore, inflammatory pain.
- Opioid analgesics: Convert any regular oral morphine or oxycodone to a 24 hours SC infusion – see opioid conversion flowchart on page 309 and/or seek advice. Continue fentanyl patches in dying patient, see page 310. For breakthrough pain, prescribe dose hourly as required by:
  - Calculating 1/6th of the 24 hour of any regular oral or SC opioid
  - If not on regular opioid, prescribe **morphine SC 2 mg**

### Agitation / delirium:

- Anxiety / distress – **Midazolam SC 2 mg to 5 mg hourly as required**
- Confusion / delirium – **Haloperidol SC 2 mg once or twice daily**
- Established terminal delirium / distress –

First-line: **Midazolam SC 20 mg to 30 mg over 24 hours in a syringe pump + midazolam SC 5 mg hourly as required**

Second-line: **Midazolam SC 40 mg to 80 mg over 24 hours in a syringe pump and levomepromazine SC 12.5 mg to 25 mg 6 to 12 hourly as required. Stop haloperidol.**

### Nausea / Vomiting:

If already controlled with an oral antiemetic, use the same drug as a SC infusion. Treat new nausea / vomiting with a long-acting antiemetic given by SC injection or give a suitable antiemetic as a SC infusion in a syringe pump. Long-acting antiemetics include:

- **Haloperidol SC 1 mg 12 hourly or 2 mg once daily**
- **Levomepromazine SC 2.5 mg 12 hourly or 5 mg once daily**

For antiemetic doses in SC infusion see the Palliative Care A5 booklets available from the Palliative Care Team or refer to the A4 folders on the wards. For persistent vomiting, a nasogastric tube, if tolerated, may be better than medication.

### Respiratory tract secretions:

Avoid fluid overload; assess fluid balance, stop IV/SC fluids and tube feeding. Changing patient's position may help. Intermittent SC injections often work well or medications can be given as SC infusions (see page 311)

For information on management of other symptoms in the patient's last days of life, see Palliative Care guideline available as A4 folder on all wards, or A5 booklets can be obtained from the Palliative Care team.



Section 12

# **Oncological Emergencies**

# Management of acute oncological complications

## Introduction

Patients with locally advanced or metastatic cancer will often present as an emergency with acute complications of their disease or treatment. Some patients will have a known diagnosis of cancer and others may present with acute complications of undiagnosed malignant disease. Listed below are common oncological emergencies with guidance on signs and symptoms and initial management. In all cases, the on-call oncology or haematology registrar should be paged urgently.

As with all newly admitted patients, a thorough drug history should be taken. This is especially important for cancer patients presenting with acute toxicity from chemotherapy or other systemic anticancer therapy. Any oral anticancer therapy should be identified and discontinued until advice is sought from the on-call oncology / haematology registrar.

### **This section includes advice on management of:**

- Malignant spinal cord compression (see next page)
- Raised intracranial pressure in cancer patients (page 321)
- Tumour lysis syndrome (page 324)
- Malignant ascites (page 326)

### **Other oncological complications are covered elsewhere in the Handbook:**

- Neutropenic sepsis: see infection section page 213.
- Superior vena cava obstruction (SVCO page 153), stridor (page 151) and malignant pleural effusion (page 146) in respiratory section.

Hypercalcaemia of malignancy: see page 294 and West of Scotland guideline on the use of bisphosphonates in cancer patients [www.intranet.woscan.scot.nhs.uk](http://www.intranet.woscan.scot.nhs.uk) / Systemic Anti Cancer Therapy Protocols / Supportive Care).



# Malignant Spinal Cord Compression (MSCC)

N.B. West of Scotland guidelines on MSCC are available in the Protocols and Clinical Guidelines section of [www.beatson.scot.nhs.uk](http://www.beatson.scot.nhs.uk)

## Introduction

MSCC is most common in, but not exclusive to, patients with lung cancer, breast cancer, prostate cancer and myeloma, as well as patients with known bony metastases. For patients not known to have cancer, MSCC can be the first presentation. Early identification and referral of patients with MSCC is crucial for optimal patient outcomes.

MSCC is an oncological emergency and should be suspected in any patient with a known cancer diagnosis and suggestive symptoms (as described below). It should be discussed with a Registrar immediately, and with on-call Oncology Registrar as soon as possible.

## Signs and Symptoms

- Pain is usually the first presenting symptom and has often been present for a number of weeks before MSCC is diagnosed.
- Pain may be new, or may present as a significant change in the character of longstanding pain. Pain is usually in the back but can be radicular, often described as a tight band around the chest or abdomen.
- Later presenting symptoms are motor deficits (e.g. muscle weakness, loss of coordination, paralysis), sensory deficits (e.g. paraesthesia, loss of sensation) or autonomic dysfunction (bladder or bowel problems). You should always enquire about bowel and bladder dysfunction in patients presenting with leg weakness.

## Assessment / Monitoring

If MSCC is suspected:

- Clinical assessment and examination, including full neurological examination and assessment for a sensory level. A spastic paraparesis is the typical finding but it is not always clear cut.
- Contact the oncall Oncology Registrar ASAP.
- Urgent MRI of the whole spine (within 24 hours).
- Consider Neurosurgical referral (e.g. unstable or high spinal lesion, unknown primary).

## Treatment

**Immediate:**

- Give **dexamethasone oral 8 mg twice daily (morning and lunchtime)** as soon as MSCC is suspected, and whilst waiting for MRI. Use IV route if oral contraindicated.
- Consider prophylactic gastroprotection whilst patient on high dose steroids (**omeprazole oral 20 mg daily or lansoprazole oral 15 mg daily**).

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- Pain control.
- Keep flat until stability of spine is known (following MRI).
- Urgent radiotherapy (within 24 hours of MRI diagnosis), chemotherapy (and/or surgery) depending on radiosensitivity / chemosensitivity of the culprit tumour. Most common treatment is radiotherapy. Contact on-call Oncology Registrar.
- Thromboprophylaxis (if appropriate)

**When patient is stabilised:**

- Physiotherapy and occupational therapy referral – on day of admission
- Palliative Care referral
- Patient / care / family information and psychological care

# Raised intracranial pressure in cancer patients

## Introduction

For patients with malignancy the principle causes of raised intracranial pressure (ICP) will be the presence of space-occupying tumours or obstructive hydrocephalus. It should not be forgotten however that rarely other causes (such as hypertension, head injury, non-tumour space-occupying lesions (such as abscess) or excess cerebral spinal fluid production) may be the cause and require additional expertise. Cardinal features are headache and vomiting which may be associated with hypertension and bradycardia. Fundoscopy may be helpful, showing papilloedema and loss of retinal venous pulsation. In extreme situations there may be depression of consciousness, false localising signs and pupillary abnormalities suggesting imminent coning.

## Treatment / drug therapy

### Emergency

In an emergency situation if the history and clinical signs indicate imminent coning, nurse the patient in a position with head elevated and give:

**Dexamethasone IV 8 mg and repeat 4 hourly if needed.**

Consider prophylactic gastroprotection whilst patient on high dose corticosteroids.

When the situation is under control manage as below.

### Urgent

If the clinical diagnosis is clear but the cause is not established, an emergency CT (or MRI) scan is indicated – if out-of-hours, discuss with a senior member of the team. This should be performed with and without contrast and the result discussed with the radiologist without delay.

Treatment depends on cause:

- One or more intracranial mass lesions causing pressure
  - Tumour: ..... Is there a therapeutic option? ..... Yes..... Go to A
  - ..... No ..... Go to C
  - Non tumour (e.g. abscess)..... Go to D
- Obstructive hydrocephalus..... Go to B
- Brain Swelling or ventricular enlargement of unknown cause..... Go to D

### A. Stabilising the condition to allow a therapeutic option

1. Nurse patient with head of bed elevated
2. Ensure adequate analgesia – use subcutaneous route if patient is vomiting.

Prescribe adequate analgesia (see page 306). Pain of raised ICP can be extremely severe.

**Continues on next page**

### Treatment /drug therapy continued

3. Administer corticosteroid

**Dexamethasone IV 8 mg. If the patient responds, is stable and not vomiting then continue with dexamethasone oral 4 mg four times daily.**

If the patient remains unwell or continues to vomit then continue with IV dexamethasone. **Doses of up to dexamethasone IV 8 mg 3 - 4 hourly can be given for up to 2 - 3 days if needed.**

Consider prophylactic gastroprotection whilst patient on high dose corticosteroids (**omeprazole oral 20 mg daily or lansoprazole oral 15 mg daily**).

4. If the patient still does not respond then try mannitol IV – seek advice from a senior colleague. Long-term mannitol is contraindicated.

**Mannitol total dose is 1 g/kg. First give 100 ml of a 20% solution (20 g mannitol) over 15 minutes. Then give the remainder over approximately 45 minutes.** Repeat the following day if required but not long-term.

**Example:** For a patient weighing 60 kg, give 100 ml of 20% mannitol (20 g) over 15 minutes and then 200 ml of 20% mannitol (40 g) over 45 minutes.

5. For nausea and vomiting give:

**Cyclizine SC 100 mg to 150 mg over 24 hours via syringe driver.**

6. Beware of seizure threshold and ensure antiepileptic medication is continued – switch oral to parenteral if patient vomiting (see palliative care guidelines for seizure control at [www.palliativecareguidelines.scot.nhs.uk](http://www.palliativecareguidelines.scot.nhs.uk))

7. Refer for definitive therapy (surgery, radiotherapy)

### **B. Patient requires a shunt to stabilise**

Manage as A (but do not give mannitol) and contact neurosurgeons urgently requesting opinion on shunt placement.

### **C. Palliative care only (no longer-term management option)**

1. If there is no therapeutic option then corticosteroids can still be tried for symptom relief. See above for initial dosing of dexamethasone. Doses greater than 16 mg of dexamethasone should rarely be used.
2. Analgesics – see page 306 for guidance. Patients terminally ill with raised ICP may need high doses of opiates. Consider a non-steroidal anti-inflammatory medicine e.g. **Diclofenac which may be given SC via syringe driver (150 mg over 24 hours).**
3. Anti-emetics – Try **cyclizine 100 mg to 150 mg SC over 24 hours via syringe driver.**
4. Sedation. Patients may be agitated for a variety of reasons. Benzodiazepines, mostly midazolam SC, are a standard approach to sedation. (for more information see palliative care guidelines at [www.palliativecareguidelines.scot.nhs.uk](http://www.palliativecareguidelines.scot.nhs.uk)).

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**Treatment /drug therapy continued**

5. Give analgesics, anti-emetics and sedatives by continuous SC infusion – see Palliative Care section pages 308 - 313. Also be aware of syringe driver compatibilities (see palliative care guidelines at [www.palliativecareguidelines.scot.nhs.uk](http://www.palliativecareguidelines.scot.nhs.uk)).
6. Consider referral to hospital specialist palliative care team.
7. If the patient appears to be in the last days of life, and fits the criteria for the Liverpool Care Pathway (LCP), then this option should be discussed with senior medical staff.

**D. This may well be a condition not directly associated with intracranial tumour**

Treat with corticosteroids as in A but do not give mannitol. Contact the neurology or neurosurgical team as appropriate.

# Tumour Lysis Syndrome

This section describes diagnosis and initial management. For advice on prevention refer to local haematology department policy.

## Introduction

Tumour lysis syndrome (TLS) is a potentially fatal syndrome characterised by a group of metabolic derangements caused by the release of cellular components into the blood after rapid lysis of malignant cells. This is seen most often at the initial treatment of a number of high grade malignant haematological disorders and results from the instigation of treatment. However, in a small number of cases, patients can present with TLS prior to initiation of any chemotherapy. Patients at highest risk of TLS include those with high cell-count leukaemias, lymphoblastic lymphoma, bulky diffuse large B cell and Burkitt lymphoma, but less commonly, some non-haematological malignancies may present with TLS eg. germ cell tumours or small cell lung cancer. Patients with TLS often have a high lactate dehydrogenase (LDH) level.

Seek an urgent haemato-oncology review for patients presenting with clinical and laboratory features of TLS.

### Clinical features of TLS

#### Reflect associated metabolic abnormalities

- Acute oliguria and renal failure
- Cardiac rhythm disturbance
- Confusion and seizures
- Nausea and vomiting
- Muscle cramps and tetany

#### Laboratory features of TLS

- Hyperuricaemia
- Hyperkalaemia
- Uraemia
- Hypocalcaemia
- Hyperphosphataemia

**N.B.** Spontaneous TLS prior to the initiation of any chemotherapy is associated with hyperuricaemia but frequently NOT with hyperphosphataemia.

- Use the Cairo-Bishop classification of laboratory TLS (see Cairo MS, Bishop M. Tumour Lysis Syndrome: New Therapeutic Strategies and Classification. Br J Haematol. 2004; 127(1): 3 - 11).
- Laboratory TLS =  $\geq 2$  laboratory changes in the Cairo-Bishop definition for laboratory TLS and within 3 days before or 7 days after cytotoxic therapy.
- Clinical TLS = laboratory TLS plus one or more of the following that is not directly or probably attributable to a therapeutic agent: increased serum creatinine concentration ( $> 1.5 \times \text{ULN}$ ), cardiac arrhythmia / sudden death, or a seizure.

Crystallisation of uric acid in renal tubules can further impair renal function. This is an oncological emergency and warrants aggressive therapy and possibly renal support. Sudden death may result from hyperkalaemia and cardiac arrest.

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## Treatment of established TLS (only under supervision of haemato-oncologist)

First page the on-call haematology registrar urgently. Effective management involves the combination of treating specific electrolyte abnormalities and/or acute renal failure. The haematology registrar will advise on use of a loop diuretic e.g. furosemide, and intravenous fluids (up to 4 - 6 L/24hours) to attempt to wash out the obstructing uric acid crystals. Rasburicase should also be prescribed. *This may only be prescribed by the haematology specialist and is highly effective in causing a rapid reduction in serum urate levels.*

Renal support with dialysis or continuous veno-venous haemofiltration can be life saving in these patients. Seek an early renal opinion in all established cases particularly in those with oliguria, persistent hyperphosphataemia and hyperkalaemia.

## Management of electrolyte abnormalities

For treatment of hyperkalaemia and hypocalcaemia, refer to pages 286 and 296.

### Hyperphosphataemia

- Phosphate > 2.1 mmol/L (moderate) – Increase hydration. Administer phosphate binder (**calcium acetate oral 1 g three times a day, adjust according to phosphate concentration – usual dose 4 - 6 g daily; max 12 g daily**)
- Phosphate > 2.5 mmol/L (severe) – Urgent renal opinion.

**Uraemia:** early renal opinion in all patients

# Malignant Ascites

## Introduction

Malignant ascites is associated with diffuse peritoneal cancer, sub-phrenic lymphatic drainage and portal hypertension. The pathophysiology is not clearly understood but includes mechanical obstruction of lymphatic drainage by tumour cells that prevent absorption of intraperitoneal fluid and protein thereby allowing ascites to develop. Other factors are changes in vascular permeability and also changes affecting the renin-angiotensin-aldosterone pathway.

## Assessment / monitoring

- Bloods for FBC, coagulation screen, U&Es, LFTs
- Arrange ultrasound of abdomen

## Treatment / drug therapy

Other than treatment of the underlying cancer there are no evidence based guidelines for the prevention or reduction of ascites.

**Systemic chemotherapy:** This will be decided by the oncologist

**Diuretics:** Consider especially if there is also peripheral oedema. This is more likely to be effective when portal hypertension is present than in malignant disease. Give:

- **Spironolactone oral 100 mg daily initially and dose can be increased up to 400 mg, as long as no adverse clinical or biochemical features develop. Maintenance therapy should be 2/3<sup>rd</sup> of the treatment dose (usually 300 mg or less).**
- U&Es must be monitored. If hyperkalaemia develops, consider substituting furosemide for spironolactone.

**Paracentesis:** indicated for symptoms of abdominal pressure such as nausea, vomiting, pain, dyspnoea and orthopnea. The procedure can usually be performed safely, without diagnostic imaging if there is evidence of substantial ascites in the form of a tense abdomen and fluid thrill. Ultrasound evaluation with or without marking of the drainage point may be required in cases of diagnostic uncertainty or suspected loculation of fluid.

- Drain one litre every 2 - 4 hours.
- Side effects include the risk of plasma fluid depletion, with hypovolaemia and hypotension. If there is a risk of hypovolaemia then treatment with intravenous fluids at the time of paracentesis may be appropriate. Concurrent albumin infusions have been derived from cirrhosis associated ascites and have no proven role in paracentesis of malignant disease.
- Other risks include hypoproteinaemia and bowel perforation, peritonitis, formation of drainage nodules and peritoneocutaneous fistula.

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**Treatment / drug therapy continued**

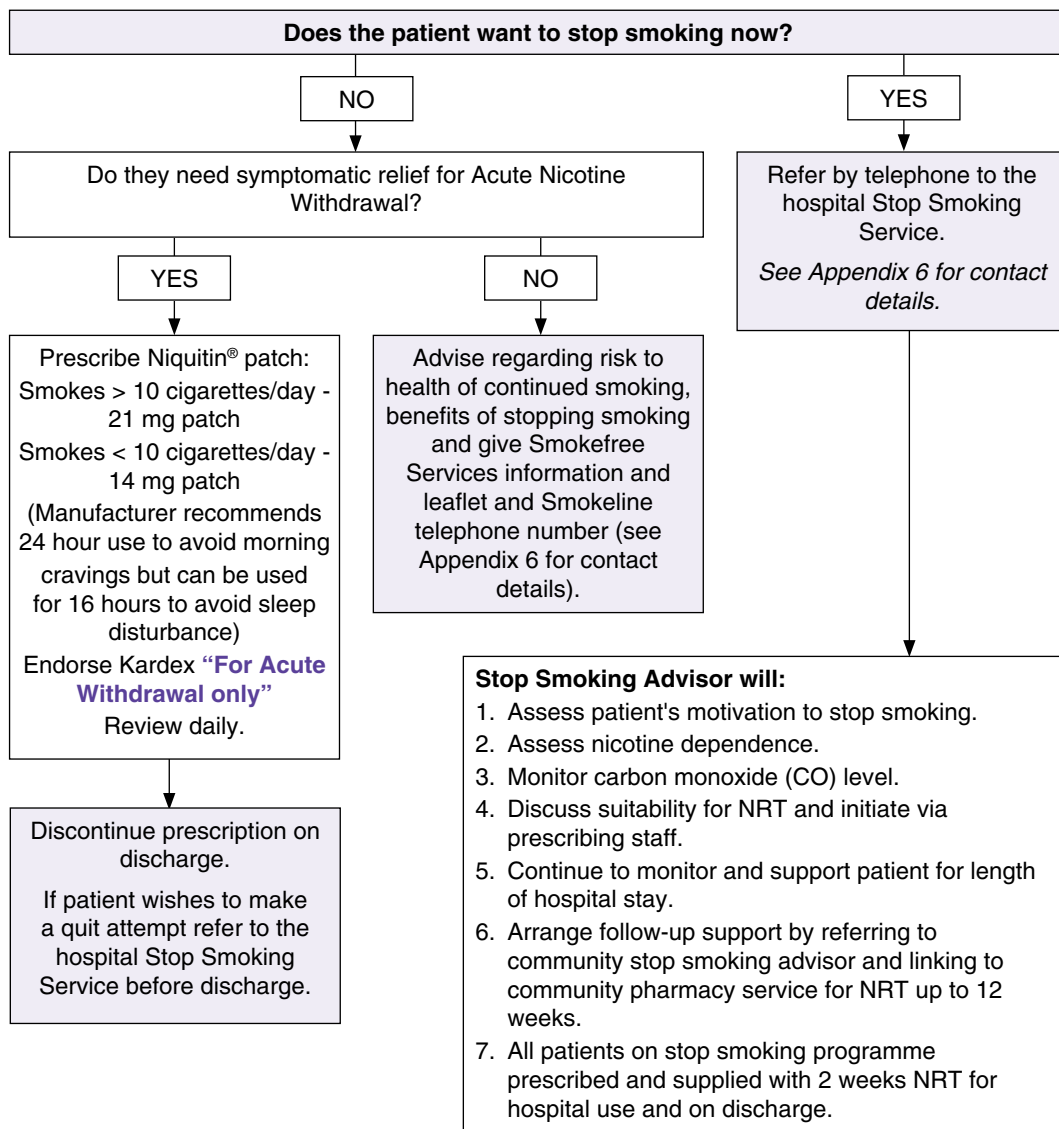
- Repeated large volume paracentesis without plasma volume expansion may be associated with significantly higher incidence of pre-renal and renal impairment and dilutional hyponatraemia.
- If the patient is too frail, consider alternatives such as analgesics for abdominal discomfort, metoclopramide and antacids for 'squashed stomach' symptoms.



# Appendices

# Appendix 1

## Nicotine Replacement Therapy (NRT)



**N.B.** All pregnant women should be referred to NHSGGC Smokefree Pregnancy Services. See Appendix 6 for contact details.

## Appendix 2

### Preparation of Intravenous Medicines

The UK NHS Injectable Medicines Guide (IMG) (Medusa) is an electronic resource containing information on the IV preparation and administration of over 200 injectable medicines. In each clinical area a folder containing 83 core monographs is available (entitled NHSGGC Adult Intravenous Medicine Monographs) with further monographs available via StaffNet or [www.injguide.nhs.uk](http://www.injguide.nhs.uk) (username and password available on StaffNet). The monographs available on Medusa are not exhaustive.

It should be noted that monographs will not be available for every drug and it may be necessary to refer to other sources of information for advice on preparation and administration such as:

- Summary of Product Characteristics (SPC) for the medicine (usually available at: [www.medicines.org.uk](http://www.medicines.org.uk))
- BNF [www.bnf.org/bnf/index.htm](http://www.bnf.org/bnf/index.htm) or [www.knowledge.scot.nhs.uk](http://www.knowledge.scot.nhs.uk) (password required)
- Medicines Information Centres – see Appendix 6 for contact details.

Specific information regarding intravenous dosing for the following medicines are included in this section:

- Aminophylline
- Amiodarone
- Glyceryl trinitrate (GTN)

**N.B.** Dobutamine and Dopamine dosing information is no longer detailed in this handbook. Refer to local protocols as practice between sites may differ.

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## Aminophylline

If intravenous aminophylline is required in a patient who was already taking a theophylline preparation, check the serum theophylline concentration and seek advice before giving a loading dose. If an infusion is required, monitor the patient closely for adverse effects and check the concentration within 24 hours. Contact your clinical pharmacist or Medicines Information for further advice.

Aminophylline	Loading dose	Maintenance infusion
Dose	5 mg/kg	0.5 mg/kg/hr
Preparation	Add dose to 100 ml glucose 5% or sodium chloride 0.9%	Add 500 mg (20 ml) to 500 ml glucose 5% or sodium chloride 0.9%
Weight (kg)	Dose (volume) of 250 mg / 10 ml ampoule	Infusion rate
40	200 mg (8 ml)	20 ml/hr
50	250 mg (10 ml)	25 ml/hr
60	300 mg (12 ml)	30 ml/hr
70	350 mg (14 ml)	35 ml/hr
80	400 mg (16 ml)	40 ml/hr
90	450 mg (18 ml)	45 ml/hr
100	500 mg (20 ml)	50 ml/hr
Other	Dose (mg) = 5 x wt (kg) Vol (ml) = (dose/250) x 10 Maximum 500 mg (20 ml)	0.5 x wt (kg) = ml/hr
Infusion rate	500 ml/hr for 30 minutes	Up to 50 ml/hr

## Amiodarone

Give amiodarone through a central line. If this is not feasible, give the drug through as large a vein as possible (for example median cubital) or via a suitable long line, inserted peripherally.

Amiodarone	Loading Dose	Infusion 1	Infusion 2
Dose	300 mg over 1 hour	450 mg over 12 hours	450 mg over 12 hours
Preparation	Add 300 mg (6 ml) to 250 ml glucose 5%	Add 450 mg (9 ml) to 250 ml glucose 5%	Add 450 mg (9 ml) to 250 ml glucose 5%
Infusion rate	250 ml/hr for 1 hour	21 ml/hr for 12 hours	21 ml/hr for 12 hours

### Glyceryl Trinitrate (GTN) infusion

GTN Dose	Normotensive patient 1 mg/hour	Hypotensive patient 0.5 mg/hour
Preparation (Use 5 mg/ml ampoule)	Add 50 mg (10 ml) to 500 ml polyfusor of glucose 5% or sodium chloride 0.9%	Add 50 mg (10 ml) to 500 ml polyfusor of glucose 5% or sodium chloride 0.9%
Infusion Rate	10 ml/hour Increasing according to clinical response	5 ml/hour Increasing according to clinical response

### Glyceryl Trinitrate (GTN) syringe driver (50 mg / 50 ml)

Preparation	Put 50 mg (50 ml) GTN in a 50 ml BD Plastipak syringe. No need for further dilution.
Infusion Rate	Normotensive patient: 1 ml/hour (1 mg/hour) Hypotensive patient: 0.5 ml/hour (0.5 mg/hour) Further increases should be based on clinical response

- Extravasation may cause tissue damage.

# Appendix 3

## Therapeutic Drug Monitoring (target concentration ranges)

**Table 1 – Antibiotics**

Drug	Time to steady state	Ideal sampling time	Target Range	Comments
Amikacin	1 day (longer in renal impairment)	Trough End of dose interval  Peak 1 hr after dose	< 5 mg/L (< 2 mg/L for alternative dosing guidelines) 15 - 30 mg/L (> 35 mg/L for alternative dosing guidelines)	Dose depends on renal function (see page 257)
Gentamicin	1 day (longer in renal impairment)	6 - 14 hrs after dose	See plot on page 259	Dose depends on renal function (see page 258) Peak 1 hr post dose > 10 mg/L and trough < 1 mg/L
Tobramycin	1 day (longer in renal impairment)	Trough End of dose interval  Peak 1 hr after dose  OR 6 - 14 hrs post dose (if not CF)	<1 mg/L  >10 mg/L  Use gentamicin plot on page 259	Use patient specific dose in cystic fibrosis (CF)  Use gentamicin guidelines if patient specific dose is not available
Vancomycin	1 day (longer in renal impairment)	Trough End of dose interval  During constant rate infusion	10 - 20 mg/L  15 - 25 mg/L	Page 260 - 261  Page 262 - 263

For further advice on when to take blood samples and how to interpret the results please contact your clinical pharmacist.



**Table 2 – Other drugs**

Drug	Time to steady state	Ideal sampling time	Target Range	Comments
Carbamazepine	2 - 3 weeks (new therapy) 2 - 4 days (dose change)	Predose (not critical)	4 - 12 mg/L	Metabolised in the liver, autoinduction
Ciclosporin	2 - 4 days	Predose	Depends on use and time post transplant	Metabolised in the liver
Digoxin	7 - 10 days	6 - 24 hours after dose	0.5 - 2 micrograms/L 0.5 - 1 micrograms/L in heart failure	Dose depends on renal function
Lithium	5 days	12 hours after dose (24 hourly dosing)	0.4 - 1 mmol/L	Dose depends on renal function
Phenytoin	2 - 3 weeks	Predose (not critical)	10 - 20 mg/L	5 - 10 mg/L may be adequate. Metabolised in the liver. Nonlinear increase in conc. with dose.
Tacrolimus	2 - 4 days	Predose	Depends on use and time post transplant	Metabolised in the liver
Theophylline	2 - 3 days	8 - 12 hours after dose (not critical)	10 - 20 mg/L	Metabolised in liver. 5-10 mg/L adequate in some circumstances
Valproic acid	3 days	Predose	50 - 100 mg/L	Metabolised in the liver. Analysis rarely useful.

For further advice on when to take blood samples and how to interpret the results please contact your clinical pharmacist.

**N.B.** Interactions are common with these drugs – see BNF Appendix 1 or contact your clinical pharmacist for details.

## Appendix 4

# Mental Health Legislation relating to Emergency Sedation

In medical and psychiatric emergencies for any **non detained** patient, common law allows treatment to protect patient's life and/or wellbeing and/or wellbeing of others. No certification is needed beyond description of the action in the casefile. However any patient who has capacity to make or withhold consent cannot be given medical treatment without that consent. The law provides the remedies below for the treatment of patients incapable to consent to treatment because of mental disorder. Advice can be sought within working hours from liaison psychiatry in the general hospitals and outwith working hours from the duty psychiatrists at local psychiatric hospitals (see Appendix 6 for contact numbers).

## Adults with Incapacity (Scotland) Act 2000

A patient who is incapable of making decisions about medical treatment can be given "any procedure or treatment designed to safeguard or promote physical or mental health" under section 47 of the Adults with Incapacity (Scotland) Act 2000 in the absence of consent, subject to the principles of that Act. This requires the 'medical practitioner primarily responsible for the medical treatment of the adult i.e. usually their medical / surgical Consultant or General Practitioner to issue a section 47 Certificate of Incapacity.

## Mental Health (Care and Treatment) (Scotland) Act 2003

The Act allows for the administration of medication to treat mental disorder (includes acute disturbed behaviour secondary to delirium and dementia) without and/or against consent of patient. It does not allow administration of non psychiatric treatments without consent.

In medical emergencies for any **detained patient**, section 243, Mental Health (Care & Treatment) (Scotland) Act 2003 allows the administration of medical treatment, without consent to:

- Save the patient's life
- Prevent serious deterioration in the patient's condition
- Alleviate serious suffering on the part of the patient
- Prevent the patient behaving violently and/or being a danger to themselves or others.

Following this treatment the administering doctor has a responsibility to inform the Mental Welfare Commission of their action **within 7 days** and to inform the patient's Responsible Medical Officer.

## Appendix 5

### Normal Immunoglobulins

Normal immunoglobulins are plasma products that remain the only treatment option for patients with primary immunodeficiencies which, in certain cases, are life-threatening. These medicines are prone to temporary shortages and it is imperative to minimise the impact of these shortages by limiting their use to patients who have a clear indication for treatment. In addition, normal immunoglobulins represent a significant cost pressure for NHS GGC.

Considering the above, the use of normal immunoglobulins is restricted to specific indications and treatment must be initiated and reviewed by a Consultant. These indications have been classified into a colour coding system to allow clinical prioritisation in times of shortage.

#### **Red indications: High priority**

Treatment may be life-saving. Supply should be reserved for these indications in time of shortage.

#### **Blue indications: Medium priority**

Evidence base is reasonable but other treatment options are available. Treatment should be modified in times of shortage.

#### **Grey indications: Low priority (non-Formulary)**

Evidence base is weak, in many cases because the disease is rare. Treatment should be considered on a case by case basis, prioritised against other competing demands.

#### **Black indications: Use is not appropriate (non-Formulary)**

The prescription of normal immunoglobulins *is not recommended* for these conditions

A comprehensive list of colour-coded indications can be found on the National Guidelines for the Use of Normal Immunoglobulins for NHS Scotland. An updated version of these guidelines has been issued in March 2012 and is available as a pdf on [www.nsd.scot.nhs.uk](http://www.nsd.scot.nhs.uk) (select Publications, Guidelines and Other Reports, then Guidelines Section) or on StaffNet (Clinical guidelines section). Treatment with normal immunoglobulins for grey or black indications is considered non-Formulary within NHS GGC. Any indication not listed in the National Guidelines is also non-Formulary.

Normal immunoglobins should be prescribed generically with the exception of patients with primary immunodeficiency and those on home therapy. Any contraindications / allergies to specific brands must be made on the request form *and on the drug kardex*. More information on dosing adjustments, method of administration and monitoring of normal immunoglobulins is available on StaffNet.

The ordering of these medicines is subject to specific documentation, which is available from Pharmacy upon request and must be completed prior to supply.

# Appendix 6

## Useful telephone numbers

N.B. Only in the Glasgow hospitals are the phone extensions active between sites.

### Allergy Service

West of Scotland Anaphylaxis Service (Western Infirmary) .....0141 211 1837

### Antimicrobial Management Team (AMT)

Lead Physician: .....0141 211 0292 or 50292

Lead Microbiologist .....0141 211 4640 / 4651

Lead Pharmacist .....0141 211 3000, page 5271  
or ext 57963

#### Antimicrobial Pharmacists

Gartnavel General, Western Infirmary, and Beatson.....0141 211 3322 or 53322  
or page 5008

Glasgow Royal Infirmary and Stobhill.....0141 211 4775 or 24775  
or page 3997

Inverclyde Royal .....01475 633777 ext 64070

Southern General and Victoria Infirmary .....0141 201 5533 or 65533  
or page 6055

Royal Alexandra and Vale of Leven .....01389 817 571  
or page 56260 via RAH  
switchboard

### Beatson WOSCC

0141 301 7000

Medicines Information .....24407 (GRI)

Pharmacy dispensary .....0141 301 7409

### Brownlee Centre (at Gartnavel General)

Duty page .....0141 211 3000, page 5295

HIV pharmacist (during work hours) .....0141 211 3000, page 5388

*Continues on next page*

## Drug Misuse

### Hospital Liaison Addiction Nurse Service:

Southern General / Victoria Infirmary / Gartnavel General / Glasgow Royal Infirmary / Western Infirmary / Stobhill.....0141 418 4942 / 4943

### Glasgow Addiction Services:

Main switchboard.....0141 276 6600

Glasgow Addiction Services Senior Medical Officers.....0141 276 6600

### Renfrewshire Drug Service

Main switchboard .....0141 889 1223

### Inverclyde Drug Service

Main switchboard .....01475 499 000

### Leven Addiction Services

Main switchboard.....01389 812 018

### Clyde Special Needs In Pregnancy Service (SNIPS)

Royal Alexandra .....0141 314 6199

Inverclyde Royal.....01475 504 833

Vale of Leven.....01389 817 270

### Clyde Doctors

Ravenscraig.....01475 633 777

Dykebar .....0141 884 5122

Leven Addiction Services .....01389 812 018

### Pregnancy Services in Glasgow

Women's Reproductive Health Service (telephone: Main switchboard - 0141 211 5400 and ask to radio page Dr Hepburn, or Dr Ellis, or the WRHS on call midwife) or SNIPs in Clyde.

Glasgow Addiction Services Pharmacy Team.....0141 276 6600

### Formulary Team

0141 211 4407

*Continues on next page*

## **Gartnavel General Hospital**

0141 211 3000

Medicines Information .....24407 (GRI)

On-call GU Medicine Doctor:.....page via switchboard

Pharmacy dispensary .....53316

## **Glasgow Royal Infirmary (GRI)**

0141 211 4000

Medicines Information .....24407

Pharmacy dispensary .....25004

## **Glasgow and Clyde Anticoagulation Service (GCAS)**

0141 232 0800

Lead Nurse for the Glasgow and Clyde

Anticoagulant Service .....0141 211 8731

Anticoagulation pharmacist ..... 01389 754121 pager 53092 (or via pharmacy, Vale of Leven)

## **Golden Jubilee National Hospital**

0141 951 5000

## **Inverclyde Royal Hospital**

01475 633 777

Medicines Information .....0141 314 6819 (RAH)

Pharmacy dispensary .....65421

## **Liaison Psychiatrists**

### *During work hours*

Glasgow Royal Infirmary (East Team).....0141 211 4417 or 24417

Ravenscraig .....01475 633 777 (IRH switchboard)

Southern General (South Team) .....0141 201 2422 or 62422

Stobhill (North Team) .....0141 531 3255 or 43255

Vale of Leven Hospital.....01389 817 572 (Christie Ward)

Western Infirmary (West Team) .....0141 211 2131 or 52131

### *Out-of-hours*

Dykebar .....0141 314 4000

Gartnavel Royal.....0141 211 3600

Leverndale .....0141 211 6400

Parkhead .....0141 211 8300

Ravenscraig .....01475 633 777 (IRH switchboard)

Southern General ..... 0141 201 1100

Stobhill .....0141 531 3100

Vale of Leven .....01389 754 121 (Christie Ward)

*Continues on next page*

## **Liver Transplant Unit**

(Edinburgh Royal Infirmary) .....0131 242 2069

## **Outpatient and Home Parenteral Antibiotic Therapy (OHPAT)**

During work hours .....0141 211 1053  
or extension 51053  
or 0141 211 3000, and radiopage  
07939585652

Out of working hours  
(Brownlee Centre) .....0141 211 3000, page 5295

**Medicines Information** *See under individual hospital*

## **National Poisons Information Service (NPIS)**

0844 892 0011

## **Parkinson's disease nurse specialists**

Drumchapel hospital ..... 0141 211 6012  
Glasgow Royal and Lightburn .....0141 211 1522  
Inverclyde Royal .....0141 314 6833  
Royal Alexandra .....0141 314 6833  
SGH Institute of Neurological Sciences .....0141 201 2590 / 2747  
Southern General ..... 0141 201 2453  
Stobhill ..... 0141 355 1480  
Vale of Leven ..... 0141 314 6833  
Victoria Infirmary..... 0141 201 6319

**Pharmacy Dispensary** *See under individual hospital*

## **Public Health Protection Unit (NHSGGC)**

0141 201 4917

## **Royal Alexandra Hospital (RAH)**

0141 887 9111

Medicines Information .....46819

Pharmacy dispensary .....47070

## **Sandyford Centre**

Sandyford Centre (Sexual Health Service).....0141 211 8130  
or page on-call GUM via Gartnavel General switchboard

Sandyford Initiative  
(GUM).....0141 211 8130

For on-call page GU Medicine doctor – page via Gartnavel switchboard

Sandyford Initiative  
Professional Helpline.....0141 211 6717

*Continues on next page*

## Smoking Cessation

Smokeline .....	0800 84 84 84
North Glasgow – Stop Smoking Service .....	20729
Clyde Hospitals – Stop Smoking Service .....	0141 314 6692
South Glasgow – Stop Smoking Service .....	65148

Smokefree Pregnancy Services – Contact North, South or Clyde Hospitals on numbers above.

## Southern General Hospital

0141 201 1100	
Medicines Information .....	24407 (GRI)
Neurosurgical registrar (on-call) via SGH switchboard, .....	Page 7777
Pharmacy dispensary .....	61385 / 61394

## Stobhill Hospital

0141 201 3000	
Medicines Information .....	24407 (GRI)
Pharmacy dispensary .....	13579

## Vale of Leven Hospital

01389 754 121	
Medicines Information .....	0141 314 6819 (RAH)
Pharmacy dispensary .....	27540

## Victoria Infirmary

0141 201 6000	
Medicines Information .....	24407 (GRI)
Pharmacy dispensary .....	65549 / 65594

## Western Infirmary

0141 211 2000	
Medicines Information .....	24407 (GRI)
Pharmacy dispensary .....	52386

## Women's Reproductive Health Service (WRHS)

0141 211 5400 (ask for radiopage of Dr Hepburn, Dr Ellis or the on-call WRHS Midwife)



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**Notes**

## Notes

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