Adult Medical Emergencies Handbook

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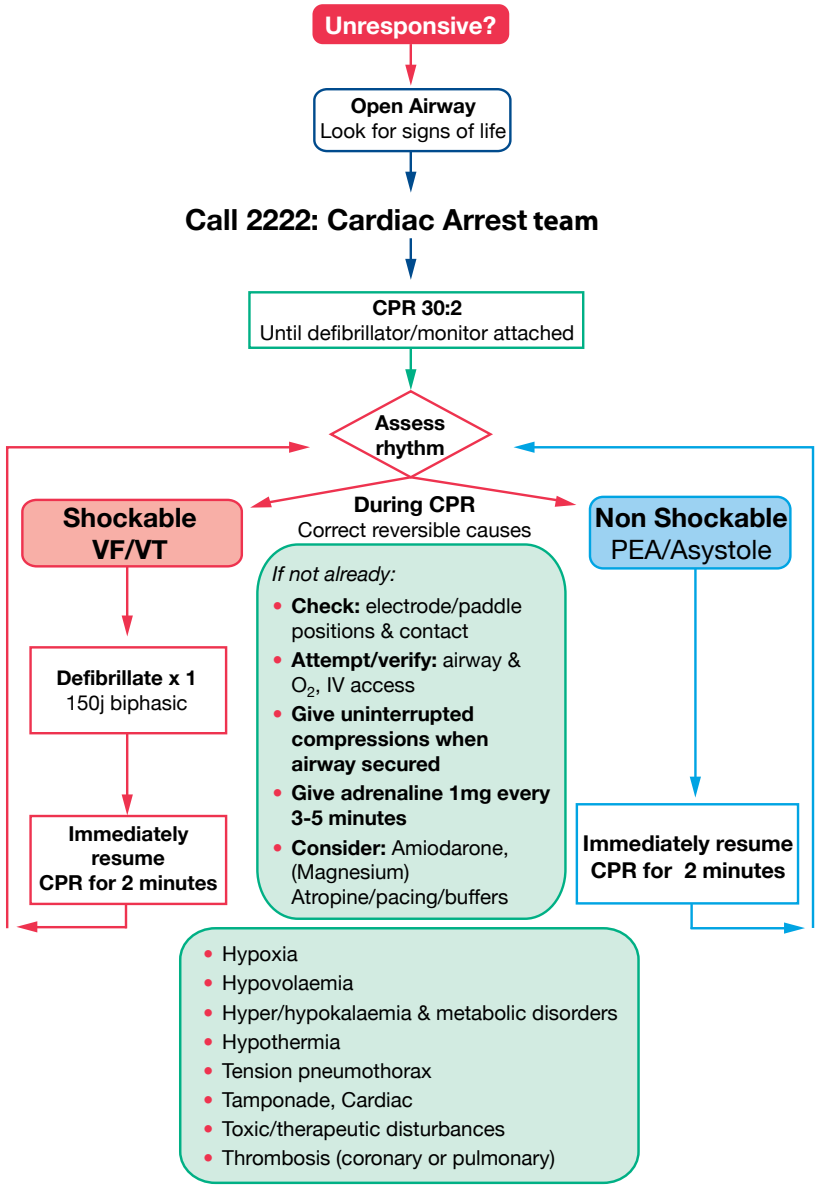
NHS Lothian

THE UNIVERSITY of EDINBURGH

NHS LOTHIAN - UNIVERSITY HOSPITALS DIVISION | **2009/2011**

ADULT ADVANCED LIFE SUPPORT ALGORITHM



Any protocols, guidelines, algorithms are subject to review and updating. Ensure you are using the current version. Ask: does this protocol/guideline apply to the individual patient I am seeing now?

WGH

IN CARDIAC ARREST & LIFE THREATENING EMERGENCY CALL 2222
HOSPITAL AT NIGHT OFFICE/COORDINATOR 33322

USEFUL TELEPHONE NUMBERS

BIOCHEMISTRY	GENERAL ENQUIRIES	31909/31910
	EMERGENCIES (<6PM)	31899
	>6PM	Bleep: 8452
HAEMATOLOGY	GENERAL ENQUIRIES	31910/31911
	COAGULATION	31171
	BLOOD BANK	31912 Bleep: 8477 >5pm
MICROBIOLOGY SPECIMEN	RECEPTION	26806/26807 >5pm Bleep 2900
CARDIOLOGY/ECG	ECG/ECHO	31852
	BLEEP	8206
CORONARY CARE UNIT		31839
STROKE	REGISTRAR	Bleep: 8699 (via Swithchboard out of hours)
DCN *ALL HEAD & SPINE CT/MRI*	SECRETARIES	32022 (X-ray appts.) *(FOR URGENTS & RESULTS)*
	MRI secretary	32026
	CT SCANNING	Body 32068/head 32036
	CT SECRETARY	32066
MAIN X-RAY	REPORTING	32315 (Main CT)
	EMERGENCY (ALL DAY)	33121
	Bleep8204 (X-ray Radiographer)	
INTENSIVE CARE		**31664/31665**
ANAESTHETIST	**IN AN EMERGENCY**	**8155**
DCN		**8519**
NEW STICKIES *(ADMISSIONS)*	ADMISSIONS OFFICE	33304
ARAU	RECEPTION	31331
	TROLLEYS	31335
	DOCTORS ROOM	31334/31313
	RESUS	31336
	ARAU XRAY	31337
BED MANAGEMENT	OFFICE BLEEP/ PAGE	8100
FOOD	DINING ROOM/MANAGER	31373/31364
DAY BED AREA	NURSES STATION	31329
COMPUTERS	WHEN THEY GO WRONG	85050
PATHOLOGY	ENQUIRIES	31960
PORTERS	ROOM/BLEEP	31534/8116
	DCN BLEEP	8252
	ARU PORTERS BLEEP	8133
NUCLEAR MEDICINE	V/Q OR BONE SCAN	32038/Fax: 32033
THEATRES	MAIN (RECEPTION)	31669
	ENDOSCOPY	31695
	DCN	31693/31694
PHARMACY	DISPENSARY	31210
	SATURDAY	Through switchboard
PSYCHIATRY	REFERRAL SECRETARY	31834
AIR TUBE	PROBLEMS	33333 (Estates)
INFECTION CONTROL		31984
MORTUARY WGH		31972 Bleep: 8225

RIE

IN CARDIAC ARREST & LIFE THREATENING EMERGENCY CALL 2222
HOSPITAL AT NIGHT OFFICE/COORDINATOR 23888

USEFUL TELEPHONE NUMBERS

CARDIOLOGY ECG	Technician	21814
CORONARY CARE UNIT		21141 Bleep:1581 (SHO)
X-RAY	PORTABLE X-RAYS	Bleep:2155
	MAIN	23700
	A&E	21300
	CT	23800
	CT SCANNING room	23797
	FILM STORE	23728
	ULTRASOUND SEC. (Wilma)	23759
MEDICINE OF THE ELDERLY/ STROKE	CONSULTANT'S SEC	26927
OPHTHALMOLOGY A&E	(mon-fri)	63751/63920
RECORDS	ADMISSIONS	23029/23028
	LIBRARY	23640
A&E	PORTERS	21329
	NURSES	21314
	HD	21345
	RADIOLOGY	23801
CAA	RECEPTION	21422
	BAY 1	21430
INTENSIVE CARE		21187/21188
HDU	WARD 116	21161/21164
		Bleep:5198 (SHO)
ALCOHOL LIAISON NURSE		21396
IMMUNOLOGY		27525
ENDOSCOPY		21600
DERMATOLOGY	APPOINTMENTS	62059 OPD: 62060
MORTUARY RIE		27177
PATHOLOGY	RESULTS/ENQUIRIES	27147
	PORTERS via Estates	24242
EMERGENCY DENTAL NURSE		EXTERNAL 5541606
THEATRES	COORDINATOR	21302 Bleep:2118
	EMERGENCY-17	23241
	TRAUMA-20	23242
	CEPOD	23239
PHARMACY: 22911	DRUG INFO	22918
PSYCHOLOGICAL MEDICINE		21392
SOCIAL WORK		27850
SALT		26915

RIE

USEFUL BLEEP NUMBERS

MED REG (ward referrals)	2112
MED REG (A&E/trolleys)	2242
MEDICAL HDU SHO	5198
SURGICAL SHO (ET)	2254
SURGICAL REG (ET)	#6435
ORTHO SHO/REG	2181
VASCULAR REG	#6440
ANAESTHETIC SHO	2140/2200
ICU REG	2306
CCU SHO	1581
RESPIRATORY REG	#6408
CARDIOLOGY REG	4028
GI REG	#6361
RENAL REG	#6394
HAEMATOLOGY REG	#6466
MEDICINE OF ELDERLY REG	#6770
DIABETIC REG	#6800
GYNAE REG	1625/4001
OBS REG	1622
PAIN TEAM CLINICAL NURSE SPECIALIST	5247
TISSUE VIABILITY NURSE	5541
INFECTION CONTROL NURSE	26061

LABORATORIES TELEPHONE AND BLEEP NUMBERS

COMBINED LABORATORIES ENQUIRIES		27777
BIOCHEMISTRY		Bleep:2221
HAEMATOLOGY		Bleep:6550
	ON CALL	Bleep: #6466
BLOOD TRANSFUSION		27501/27502
PATHOLOGY ENQUIRIES		27147
MICROBIOLOGY	ALL ENQUIRIES	27777
		Bleep: 2900
CLINICAL ENQUIRIES		26027/26048
INFECTION CONTROL	26089	

ST JOHN'S

IN CARDIAC ARREST & LIFE THREATENING EMERGENCY CALL 2222
HOSPITAL AT NIGHT OFFICE/COORDINATOR 52210

USEFUL TELEPHONE NUMBERS

ST JOHN'S SWITCHBOARD		0
BIOCHEMISTRY	GENERAL ENQUIRIES	53160/53161
	ON CALL	Bleep:3728
HAEMATOLOGY	GENERAL ENQUIRIES	53353
	BLOOD BANK	53354
	ON CALL	Bleep:3729
MICROBIOLOGY	GENERAL ENQUIRIES	53075/53077
	ON CALL	aircall via switchboard
PATHOLOGY	GENERAL ENQUIRIES	(RIE) 27148
	MORTUARY	52022
CARDIOLOGY	ECG/Echo	53851 Bleep:3655
		54124
RADIOLOGY	X-Ray (plain film)	54339
	CT	54343
	ON CALL	Bleep:3657
MEDICAL PHYSICS		52148
INTENSIVE CARE		54063/54056
ANAESTHETIST (ICU)		Bleep:3561
DUTY ANAESTHETIST (Theatres)		Bleep:3561
PAIN (acute)		53065 Bleep:3934
	ON CALL	Bleep:3561(Anaesthetics)
RESUSCITATION OFFICERS		53892 Bleep 3909
ADMISSIONS		53173
MEDICAL RECORDS		53570/53571
A&E		53012
MEDICAL DIRECTORATE COORDINATOR		Bleep:3584
SURGICAL DIRECTORATE COORDINATOR		Bleep:3624(day),HAN (night)
ENDOSCOPY		53935
PHARMACY	DISPENSARY (and weekend no.)	52037
	MEDICINES INFORMATION	52035
	ASEPTIC	52048
PORTERS		52084
DOMESTIC SUPERVISOR		52169
CATERING MANAGER		53138
INFECTION CONTROL		53088
HEALTH & SAFETY		52159
COMPUTERS	IT HELP DESK	85050
WARDS		541 plus ward number
STROKE UNIT		54104
LABOUR WARD		54125
THEATRES	RECEPTION	52243
	ANAESTHETICS OFFICE	53064
	RECOVERY	54244
	THEATRE COORDINATOR	Bleep:3541
	CEPOD COORDINATOR	Bleep:3002
	ODA ON CALL	Bleep:3656

cont...

ST JOHN'S

THEATRES 1-9	1	54233
	2	54234
	3	54235
	4	54236
	5	54237
	6	54238
	7	54239
	8	54240
	9	54241

USEFUL EXTERNAL NUMBERS

SHORT CODES	
RIE SWITCHBOARD	61000
RIE NUMBERS	Use extension no added number
WGH SWITCHBOARD	31000
WGH NUMBERS	Use extension no added number
RIE LABORATORIES	ENQUIRIES.....switchboard
PROCURATOR FISCAL	08445614240
(Linlithgow for St John's	short code 62174
patients)	Out of hours: via police
POLICE	short code 431200
TRANSPLANT COORDINATOR	switchboard
HSDU	26109

COMMON or SHARED CONTACT NUMBER

IN CARDIAC ARREST & LIFE THREATENING EMERGENCY CALL 2222

RESUSCITATION OFFICERS	RIE	21760 Page:#1612
	WGH	32496 Bleep: 8355
	SJH	53900 Bleep:3909
INTENSIVE CARE	WARD 118 RIE	21181/21187
	WARD 20 WGH	31664/31665
	ICU SJH	54063/54056
PROCURATOR FISCAL	EDINBURGH	#6118/08445613875
	WEST LOTHIAN	08445614240
MEDICINES INFORMATION SERVICE	RIE/WGH	22918/22920
	SJH	52035
NATIONAL POISONS INFORMATION SERVICE (NPIS)		08448920111 (24hr)
VIROLOGY RESULTS COMBINIED WITH BIOCHEMISTRY		
	CLINICAL ENQUIRIES	26027/26048 (for SJH/WGH/RIE)
EEG (WGH)		32097
		791 32097 from SJH
NEUROLOGY REGISTRAR		Bleep: via WGH switchboard
RHEUMATOLOGY REGISTRAR		Bleep: via WGH switchboard
SHORT CODES from WGH/RIE	AAH	49000
	LIBERTON	0
	RVH	0
	REH	46000
	St John's	53000
	Edinburgh University	7740
WARDS in RIE	NURSES	2 (ward number) 1
	DOCTORS	2 (ward number) 2
	SISTER	2 (ward number) 3
OCCUPATIONAL HEALTH		26974/49369
	ON CALL	46000(NEEDLESTICKS)

OTHER USEFUL TELEPHONE NUMBERS

NAME	LOCATION	TEL/BLEEP NUMBER

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EDITOR'S INTRODUCTION

The Adult Medical Emergencies Handbook was first developed for the Western General Hospital in Edinburgh in 1996 and first appeared in 1998. Over the following three years hospitals in Edinburgh became a Trust and a Lothian University Hospitals Trust edition was produced. This was greatly strengthened by the development of management plans agreed across the city by specialists in both the Royal Infirmary and the Western General. This edition of this evolving work (the 5th) is the Adult Medical Emergencies Handbook for Lothian Health.

We have built on the strong foundations laid by all who have contributed to the previous editions and they are accredited in the intranet version. Many new colleagues have helped with this version and I hope that they have all been acknowledged, but if not I apologise to them and thank them for their contributions.

This kind of project is dynamic. I am extremely grateful to Nicky Greenhorn of the Graphics Lab, Learning Technology Section, The University of Edinburgh who has been a major partner in the production of this book. I also acknowledge the great support and help I have had from colleagues.

I would also like to encourage any "users" to feed back with comments, suggestions and criticisms so that we can continue to improve this work. On a lighter note copies of the handbook have been sighted around the world! Basra, Sydney and Kirkcaldy! The editor would be interested in receiving notice (or photos) of future sitings.

On this occasion we have produced two versions. A printed copy which contains material required at the bedside. We have also created an electronic version which has other important information in it but material which can be read away from the clinical area.

The importance of the area of clinical decision making and diagnostic error is increasingly recognised and some new points are made about these in the text. There is a link to the Scottish Clinical Decision Making community on the back cover along with a number of other useful links. Once again I would like to encourage "users" to feed back with comments, ideas and criticisms so that we can continue to improve the handbook.

ACKNOWLEDGEMENT

We are grateful to the Resuscitation Council (UK) for permission to include algorithms from the Advanced Life Support teaching materials. We are also grateful to the American College of Surgeons for permission to reproduce a table from the ATLS manual.

LIST OF CONTRIBUTORS TO 5th EDITION & PREVIOUS EDITIONS

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Grateful acknowledgement is made to authors of:

- CCU therapeutic schedule
- Palliative care guidelines
- Acute care algorithms
- Infusion devices guidelines
- Alcohol withdrawal guideline
- Agitation/confusion in the elderly guideline
- Major Haemorrhage protocol
- Malignant Hyperpyrexia protocol
- Acute pain guidelines
- Lothian DNAR group

DISCLAIMER

Every effort has been made by the editors and contributors to the handbook to ensure accuracy of information. Users are advised to refer to drug and product information and to detailed texts for confirmation.

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Chapter 1

GOOD CLINICAL PRACTICE

INTRODUCTION

The purpose of this handbook is to provide management guidelines for adult medical emergencies in your hospital. The handbook has been written by specialists who deal with these emergencies on a daily basis. It has been edited to standardise the approach and has been reviewed and approved by colleagues. Contents are evidence and best-practice based as far as is possible and are aligned with National and International guidelines where appropriate.

This book is designed to advise staff in training and in practice on the management of most common adult medical emergencies, and in the management of unusual but important clinical conditions. However, the book is intended as a guide and is not a substitute for immediate expert help when this is needed: if in doubt ask for senior or specialist advice or assistance.

The text is divided into three sections:

Section 1	General information
Section 2	Clinical Management
Section 3	Appendices

The handbook should be used in conjunction with

- Local and Divisional protocols and guidelines.
- The Lothian Joint Formulary,
- Divisional guidelines for anti-microbial therapy (Sepsis section Chapter 2)
- Divisional Acute Pain Guidelines

Medicine doses are being continually revised and novel adverse effects of drugs may be discovered over time. Every effort has been made to ensure that recommended dose ranges are appropriate and evidence based at the time of going to press but prescribers are advised to consult the BNF and where necessary the product data sheets.

Throughout the text useful clinical information is highlighted as 'key points' identified by the notation below.

KEY POINT these are useful, often practical, pieces of information.

Comments and suggestions relating to the book are welcomed and should be addressed to: Dr Graham Nimmo -
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E-mail: g.r.nimmo@stir.ac.uk

GENERAL POINTS

Medicines

- Doses are for adults unless otherwise indicated.
- While every effort has been made to check doses, if doubt exists consult the BNF.
- The Lothian Joint Formulary should be consulted for local prescribing advice/guidance. All adverse events involving black triangle (recently marketed) and serious adverse events involving any drugs should be reported to the MHRA using yellow cards which are available in paper form in all BNF's and also online via the Trust intranet or at http://www.mhra.gov.uk
- European law requires the use of the Recommended International Nonproprietary Name (rINN) for medicinal substances. In most cases the British Approved Name (BAN) and rINN were identical. Where the two differed, the BAN was modified to accord with the rINN with the important exceptions of adrenaline and noradrenaline. The new BANs are used in this text.

Infections

- The University Hospitals Division and St John's antimicrobial guidelines offer excellent advice on treatment choice: these are updated regularly.
- Clinical Microbiological advice is available 24/7. Foundation doctors should discuss with their own registrar first.

Specialist Referral

- Throughout the text advice on criteria for specialist referral is given, along with contact numbers for specific hospital sites.
- If the patient is pregnant discuss with the Obstetric registrar on call.
- Consider early referral for ICU or HDU care (see assessing illness severity Chapter 2) when appropriate.

Decisions to be made for every admission

- Medicines: consider which long term medicines should be continued and which with-held eg stop vasodilators in sepsis or in hypovolaemia, diuretics in dehydrated.
- Remember to assess the need for **DVT prophylaxis** in all patients. Consult Divisional guideline for venous thromboembolism prophylaxis and treatment, or local protocol where appropriate.
- Consider the **resuscitation status** of each patient at admission: discuss with the consultant responsible. Document on the specific Do Not Attempt Resuscitation (DNAR) sheet and include in

casenotes. Always discuss with next of kin.

- Incapacity: e-version.
- **Diagnosis:** review the evidence. The diagnostic "label" may be inaccurate or incomplete. Don't make assumptions and "don't give up the search" for alternative explanations for the patient's presentation especially if there is poor response to initial treatment.

ADULTS WITH INCAPACITY ACT

General Principles

- Under the Act an adult is defined as a person who has attained 16 years of age.
- All adults are considered capable of making their own medical decisions unless proven otherwise.
- Without consent for any procedure or treatment the health care professional carrying out the procedure or treatment could be liable for assault.
- It is the doctor primarily responsible for the patient's medical treatment who is responsible for assessing the patient's capacity to consent to treatment.

Legal capacity requires that an individual be capable of:

- understanding why treatment or a procedure is necessary.
- retaining information given before making a decision.
- being able to communicate a decision.
- understanding implications of refusing or allowing treatment and being able to retain this information.

Incapacity may be short lived e.g. acute confusional state or more longstanding e.g. dementia.

MEDICAL TREATMENT

Medical treatment is defined as:

- 'any treatment that is designed to promote or safeguard physical or mental health'.

The treatment must be clinically indicated and must:

- promote or safeguard physical or mental health.
- take account of present and past wishes e.g. advance directive or living will.
- take account of the views of any relevant others including health care professionals involved in the patient's care, relatives or carers

as far as is reasonably possible.

- minimise the restriction of the patient's freedom - for example if it was considered *unlikely* that the patient's clinical condition would be compromised by waiting until the patient regained the capacity to give consent, then the treatment should be delayed until such time.
- respect the patient's residual autonomy, thereby empowering them as much as possible.

Therefore any medical, surgical or nursing intervention, diagnostic study or physiotherapy is covered under the act.

How does this work in practice?

- Every adult patient who is incapable of making decisions with regard to their medical treatment or care should have a completed Certificate of Incapacity filed in the front of their medical notes. The Certificate will replace consent forms unless the patient has a legally appointed proxy decision maker.

Any immediate treatment to save life or prevent serious deterioration in the patient's medical condition is exempt from the procedures laid down in the act.

- In all other cases the doctor primarily responsible for the patient can authorise the provision of medical treatment according to the general principles of the Act. However if a proxy decision maker has been nominated consent must be obtained from them prior to any procedure, *other than emergency treatment*.

Proxy decision makers include:

- **Welfare attorney.** The patient, in anticipation of their becoming incapacitated, nominates this power of attorney. The power of attorney must be registered with The Public Guardian who should issue a certificate in the prescribed form.
- **Welfare Guardian.** This proxy is appointed by a sheriff when an individual has become incapacitated or has never had the capacity to make decisions pertaining to their medical treatment.
- **Intervention Order.** Representation is provided by the courts on behalf of the incapacitated adult.

PROFESSIONAL RESPONSIBILITIES

- All staff and students must be **identifiable** by wearing an appropriate name badge at all times.
- All staff and students should wear appropriate clothing at all times.

Documentation: quality notes are crucial for good patient management and as a lasting record of ward rounds, decisions, procedures and communication. Guidelines on following page.

- Hand hygiene.
- Practical procedures: from the simple to highly complex invasive procedures adherence to the guidelines below will optimise efficacy and minimise complications.
- Procedure for Cardiac Arrest Management and Do Not Attempt Resuscitation Orders for all sites are available in all clinical areas and in the appendix. Cardiac arrest audit forms are available widely and should be completed for every cardiac arrest call. These provide invaluable information on process and outcome and influence planning of resuscitation training and equipment acquisition.
- Clinical Risk/Clinical Governance: in order to minimise adverse events a Lothian wide system is in place to allow any staff member to report a near-miss or a critical incident occurring in patient care DATIX. You should familiarise yourself with the Datix system on the hospital intranet home page.
- Major Incident procedure: in the event of a Major Incident being declared large numbers of casualties may be transported to the Royal Infirmary and St John's Hospital. SJH and the RIE are DESIGNATED RECEIVING HOSPITALS for a major incident occurring in the Lothian Region. The RIE would act as the CONTROL HOSPITAL (responsible for co-ordinating all medical activity) and SJH would act in a SUPPORT capacity. SJH's role to manage minor/intermediate injuries, medical cases, and isolated (i.e. without other major injuries) burns. Staff there should be familiar with the local policies available in the Medical Staff Handbook and RIE or SJH Major Incident Plans.

GOOD DOCUMENTATION

- Write legibly, preferably in black ink (so it can be easily read when photocopied).
- Write the patient's name, date of birth, CHI number at the top of each page (each side).
- Remember that the medical case record is a legal document to which patients and relatives have right of access.
- All entries into case records should have a date and time assigned to them, and be completed in a way that allows the writer to be identified. **Print your name**.
- Keep notes in chronological order: if writing retrospectively say so.
- Keep clear progress notes both for inpatients and outpatients.
- Make clear your **reasoning** for clinical decisions.
- Any typed notes should be checked, corrected and signed.
- Cross out errors and write a corrected entry, dated and signed.
- Record details of discussions with patients or relatives.
- Record discussion of the patient's condition or about risk/benefit of therapy.
- Any untoward or unexpected events and action taken in response to them should be adequately documented.
- At all times remember that the written record documents your thoughts for others to read.

GOOD PRESCRIBING

When a patient is admitted as an emergency consider which medicines may worsen the acute problem and omit until it is appropriate to restart.

Good Practice in Writing Prescriptions on the Prescription and Administration Record (Drug Kardex)

A clearly written prescription:

- saves everybody's time.
- reduces the risk of medication errors.
- helps ensure the right patient receives the right medicine in the right form and right dose by the right route at the right time.
- provides a clear record of the patient's drug therapy.

GOLDEN RULES FOR PRESCRIPTION WRITING

1. **Select the correct Prescription and Administration Record**
   There are three versions available in RIE and WGH:
   - a standard 14 day record
   - a standard 14 day record with a warfarin chart
   - a 28 day record

   (SJH have 14 day, 28 day and 120 day records - all with separate warfarin chart)
2. **Write clearly in block capitals, using a black ballpoint pen.**

i **Note any allergies or adverse effects of medicines. Document what happens eg rash, anaphylaxis. Document on prescription chart and in patients case notes.**

i **1 in 10 patients acutely admitted are admitted because of Adverse Drug Reactions.**

3. **Complete all the required patient details on the front of the Record**
   - Hospital/ward
   - consultant
   - weight
   - height
   - patient name*
   - patient number* CHI
   - date of birth*

   *A printed label will suffice for these 3 details

   Write the patient name and date of birth on each page of the record (ie each side). Include any previous adverse drug reactions, if known.
4. **Use approved (generic) names of medicines**
   Rare exceptions include drugs where a specific brand is necessary due to variation of response between brands e.g. theophylline, lithium, diltiazem, nifedipine, and verapamil, and combination products with no generic name e.g. Rifinah®.
5. **Write the drug dose clearly**
   - The dose of medicine must be specified. Prescribing a dose range e.g 10-20mg, is not acceptable.
   - The only acceptable abbreviations are

     g - gramme *mg* - milligram *ml* - millilitre

     All other dose units must be written out **in full** e.g. *micrograms*
   - Avoid decimal points write 100 *micrograms* (not 0.1 mg). If not avoidable, write zero in front of the decimal point e.g. 0.5 *ml* (not .5 ml).

- Prescribe liquids by writing the dose in milligrams, except where the strength is not expressed in weight e.g adrenaline 1 in 1000, where the dose should be written in millilitres (ml).
- For 'as required' medicines, include the symptoms to be relieved, the minimum time interval between doses, and the maximum daily dose. (Figure 1)

6. Route of administration

The only acceptable abbreviations are:

IV - intravenous	SL - sublingual	NG - nasogastric
IM - intramuscular	PR - per rectum	ID - intradermal
SC - subcutaneous	PV - per vaginam	TOP - topical
ETT - endotracheal	INHAL - inhaled	
NJ - nasojejunostomy	NEB - nebulised	

PEG - percutaneous endoscopic gastrostomy

Never abbreviate ORAL or INTRATHECAL.

Always specify RIGHT or LEFT for eye and ear preparations.

7. Enter the start date (Figure 2)

For courses of treatment, write only the dates therapy is required and discontinue as described below.
For alternate day treatment, put a horizontal line through the boxes in the administration section on the days the medicine is not given.

8. For once only prescriptions (Figure 3)

- Medicines intended to be given once only must be prescribed in the 'once only' section of the medicine chart (Figure 3).
- Medicines that are to be given once weekly must be prescribed in the regular section of the chart. A line must be drawn through the days that the medicine is not to be given and an instruction must be written in the notes section 'Once a week on a ...day'.

9. Sign the prescription

Initials are not acceptable. Sign and print your name.

10. If the patient also has a supplementary chart in use (Figure 4)

Enter the details in the 'other charts in use' section on the Record.

11. Never alter prescriptions

Cancel completely and rewrite.

12. Discontinue medicines by - (Figure 5)

Drawing a diagonal line through the prescription box, but do not obliterate what has been written. Drawing a vertical line down the last administration time, then a double diagonal line, then sign and date it.

13. When the discharge prescription has been written

Enter date and initial on the box on the front page of the Record.

Prescription and Administration Charts must be re-written when required as follows:

- Any item no longer required must be cancelled, and a diagonal line drawn across each page of the old chart.
- The original start date for each medicine must be written in the new chart.
- The word 're-written' and the date of re-writing, must be written at the top of the new chart.
- Ensure no medicines have been accidentally omitted from the new chart.

Good prescribing information can also be found in the British National Formulary

Specimen Drug Kardex Prescriptions

Figure 1

Figure 2

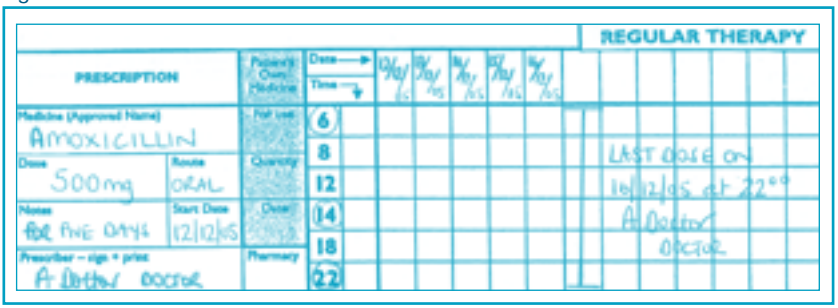


Figure 3

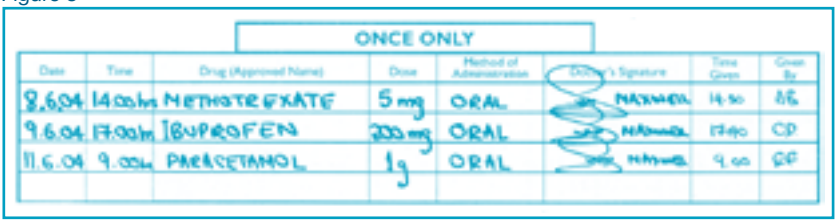


Figure 4

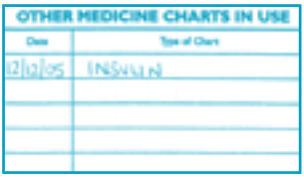
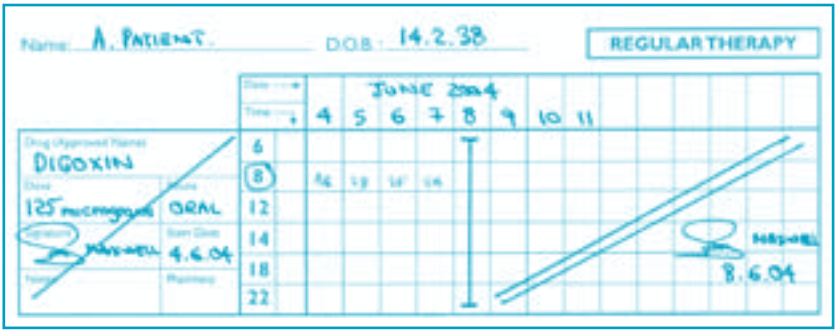


Figure 5



PRACTICAL PROCEDURES

A number of practical techniques and procedures are detailed in the electronic version of this handbook. These notes are not meant to substitute for practical instruction in the correct method of carrying out these procedures. They will however be useful reminders and should ensure that details are not overlooked.

- **Never** undertake a procedure unsupervised when inexperienced.
- If difficulties are encountered, stop and call for help.
- Before starting consider the need for a coagulation screen and blood grouping.
- Explain the procedure to the patient and prepare the patient appropriately (see chest drain insertion as an example). Familiarise yourself with the patient's anatomy and position the patient before scrubbing up.
- Always record details of the time of day and nature of the procedure in the notes together with the required monitoring asked of nursing staff.
- In the event of an unexpected change in the patient's clinical condition remember possible complications especially hypoxia, vasovagal effects, haemorrhage, anaphylaxis and infection.

Peripheral IV access: antecubital cannulation is painful, irritant and potentially dangerous. Avoid unless no alternative.

TALKING WITH PATIENTS AND RELATIVES

- Talking with, and listening to, patients and their relatives is important.
- Be open and honest.
- Do not be afraid to say you don't know the answer to a question.
- Seek advice from a senior member of staff when unsure.
- Record details of the interview in the case notes with written details of the information transmitted and the names of those present (doctor, nurse, relatives).
- Try to see relatives as soon as possible after admission to seek and document important information about the medical and social aspects of the acutely ill or confused patient.

Guidelines on the approach to breaking bad news can be found in Appendix 1.

Lothian Framework for Resuscitation Decisions

(See policy document for full details)

NHS Lothian

Can a cardiac or respiratory arrest be anticipated?

For example:
- Progressive cardiac or respiratory compromise
- Previous life-threatening event or condition in which cardiac arrest is likely
- Patient dying from irreversible condition e.g. advanced cancer

NO

Is there anything about the patient that makes you think they may not wish to be resuscitated in the event of an unexpected cardiac arrest?

For example:
- Severe incurable neurodegenerative condition

NO

CPR should be carried out
- Do not burden the patient or relevant others with a CPR decision
- Continue to communicate and assess any concerns of the patient and relevant others. This may involve discussion on CPR and its outcome
- Review only when circumstances change
- In the event of cardio-pulmonary arrest, carry out CPR

YES

YES

Advanced Decision on CPR is possible
- Sensitive exploration of the patients wishes regarding resuscitation should be undertaken by the most experienced staff available
- **If the patient is competent** for this decision, discuss options of CPR and DNAR with patient. Involve relevant others* if appropriate (with patient's permission).
- **If the patient is not competent** to understand the implications of this discussion, the medical team should make this decision based on available information regarding patient's previous wishes (from relevant others*, other healthcare professionals or members of the multidisciplinary team). Relevant others* should never be asked to make the decision unless they are the legally appointed proxy/welfare guardian for the patient.
- Document the decision and any discussion around that process
- Continue to communicate and assess any concerns of the patient and relevant others*
- Ongoing review to assess any change in circumstances
- In the event of a cardio-pulmonary arrest, act in accordance with the documented decision

Are you as certain as you can be that CPR would realistically have a medically successful outcome?

NO

NO

Are you as certain as you can be that CPR would realistically NOT have a medically successful outcome?

YES

CPR inappropriate
- As CPR would not be successful it cannot be offered as a treatment option. A DNAR form should be completed and used to communicate this information to those involved in the patient's care.
- Allow natural death with good palliative care and support for patient and relevant others
- Do not burden the patient or relevant others* with a CPR decision
- Document decision and review fortnightly or if the patient's situation changes
- Continue to communicate and assess any concerns of the patient and relevant others (which may include discussion about why CPR is inappropriate)
- Ongoing review to assess any change in circumstances

NO

Seek advice

**Relevant others refers to the patient's relatives, carers, guardian etc*

A decision about the appropriateness of CPR can only be made if the situation(s) where CPR might be required can be anticipated for the particular patient (e.g. recent MI, pneumonia, advanced cancer etc.). If such a situation can't be thought through then there is **no medical decision to make** and there is no need to burden patients with resuscitation decisions.

Advanced statements - The exception to this would be where a patient has some chronic and /or irreversible condition such that they would not wish resuscitation in the event of any unexpected cardio-respiratory arrest from any unexpected cause. This would be a quality of life issue and therefore the patient's decision rather than a medical decision. Such patients may have their wishes sensitively explored and a DNAR form +/- advanced statement completed if this is appropriate (see Lothian DNAR policy Appendix 2).

MEDICAL DECISIONS ABOUT DNAR

- The role of the medical team is to decide if CPR is realistically likely to have a medically successful outcome. Such decisions do not involve quality of life judgements.
- It may help in making a medical decision to decide whether the patient would be appropriate for Intensive Care treatment (likely outcome of a "successful" prolonged resuscitation).
- The consultant/GP responsible for the patient's care has the authority to make the final decision, but it is wise to reach a consensus with the patient, staff and relevant others.
- It is not necessary to burden the patient with resuscitation decisions if the clinical team is as certain as it can be that CPR realistically will not have a medically successful outcome and the clinician is not obliged to offer CPR in this situation. This must never prevent continuing communication with the patient and relevant others about their illness, including information about CPR, if they wish this.

PATIENTS DECISIONS ABOUT RESUSCITATION ISSUES

- Where CPR is realistically likely to have a medically successful outcome consideration of a DNAR order for quality of life reasons **must be** discussed with the patient and their wishes must be given priority in this situation.
- **Doctors cannot make a DNAR decision for a competent patient based on a quality of life judgement unless the patient specifically requests that they do this.**

THE PATIENT WHO IS NOT COMPETENT TO MAKE A DECISION ABOUT RESUSCITATION

- Enquire about previous wishes from the relevant others to help the clinical team make the most appropriate decision. Continue to communicate progress to them.
- A Treatment Plan under Section 47 of the Adults with Incapacity (Scotland) Act must be completed prior to a DNAR decision being made.
- Continue to communicate progress to the relevant others.

THE ROLE OF THE RELATIVES/RELEVANT OTHERS

- A competent patient's permission must be sought before any discussion takes place with the relevant others.
- Relatives should never be given the impression that their wishes override those of the patient. They can give information about the patient's wishes but should not be burdened with the decision unless their status as proxy for the patient has been legally established.

PATIENTS WITH A DNAR ORDER AT HOME OR BEING DISCHARGED HOME

- It is the medical and nursing team's responsibility to ensure that the family are aware of the existence of the DNAR form and know what to do in the event of the patient's death.
- Where it is felt it may be harmful to the patient to have the DNAR form in the home the GP should keep the form in the front of the medical notes and ensure that all the healthcare professionals involved in the patient's care are aware of this.
- The OOH service must be made aware of the existence of the DNAR order. Every effort must be made to ensure the emergency services are not called inappropriately where a patient's death is expected.

PATIENTS WITH A DNAR ORDER BEING TRANSPORTED BY AMBULANCE

- The ambulance section of the DNAR form must be completed for any such patient form being transported in Lothian by the Scottish Ambulance Service.
- Ambulance control must be informed of the existence of the DNAR order at the time of booking the ambulance.

WHERE NO DNAR DECISION HAS BEEN MADE AND A PATIENT ARRESTS

- The presumption is that staff would attempt to resuscitate a patient in the event of a cardio-pulmonary arrest. However, it is unlikely to be considered reasonable for medical staff or senior nursing staff to attempt to resuscitate a patient who is in the terminal phase of an illness.

PATIENT DEATHS

- See patients without delay after being informed of their death.
- Inform the GP and the relevant consultant within 24 hours of the death of all patients.
- Guidelines for 'When Death Occurs' are found in Appendix 2, e-version.
- Sudden or unexpected deaths should be reported to the Procurator Fiscal. The Fiscal should be consulted in the event of any death associated with sudden unexplained ill health, occupational disease, medical accident or suspicion of foul play, drug overdose, suicide or neglect.

DEATH AND THE PROCURATOR FISCAL

If there is doubt about the cause of death discuss the patient with your seniors, and if necessary the Procurator Fiscal. In the following circumstances you MUST refer the case to the Fiscal. DO NOT issue any certificates without first talking to the Fiscal.

INDICATIONS FOR REFERRAL TO PROCURATOR FISCAL:

summarised from circular MEL (1996) 33 which gives full details

Duty Procurator Fiscal (Edinburgh: for WGH or RIE) can be contacted during office hours at the deaths' enquiries office on #6118, and at weekends via Fettes Police switchboard on #6100 (311 3131). Procurator Fiscal Linlithgow: for SJH short code 62174, at weekends via police short code 62148.

- Death where there is evidence or suspicion of homicide;
- Death by drowning;
- Death by burning, scalding, fire or explosion;
- Death due to an accident including vehicles, aircraft, ship or train;
- Death resulting from an accident in the course of work: voluntary or charitable;
- Death where circumstances indicate possible suicide;
- Death following abortion, legal or illegal;
- Deaths while under legal custody;
- Any death which occurred in a GP surgery, Health Centre or similar facility;
- Any death due to violent, suspicious or unexplained circumstances.
- Death where circumstances indicate fault or neglect on part of another person;

- Death where a complaint is received from next of kin about medical treatment given to the deceased, and where medical treatment may have contributed to death.
- Any death caused by an industrial disease or poisoning;
- Any death due to a disease, infectious disease or syndrome which poses an acute, serious public health risk including:
  - any form of food poisoning
  - Hepatitis A, Hepatitis B (with or without delta-agent co-infection [Hepatitis D]), Hepatitis C and Hepatitis E
  - any hospital acquired infection
  - Legionnaires Disease
- Any death associated with lack of medical care;
- Any death which occurs during or associated with the administration of general or local anaesthetic;
- Any death caused by the withdrawal of life sustaining treatment to a patient in a persistent vegetative state (this is to be distinguished from the removal from a life-support machine or a person who is brain stem dead and cannot breathe unaided);
- Any death occurring as a result directly or indirectly of an infection acquired while under medical or dental care while on NHS premises, including hospitals, GP surgeries, health centres and dental surgeries.
- Any drug related death.
- Any death not falling into any of the foregoing categories where the cause may cause public anxiety.
- Death of children: SIDS, “at risk”, foster care, Local Authority care.

THE DEATH CERTIFICATE

- Detailed advice on completion of the death certificate is contained in the certificate booklet.
- Discuss with the Consultant responsible for the patient.
- Ensure that both the counter foil and the death certificate proper have the patient’s name written legibly on them.
- Ensure the date is correct, and that it is neat, legible and signed.
- When speaking to the family explain what the technical terms mean, if this is appropriate.
- Document what has been written on the certificate in patient case record.

CHECKLIST OF REQUIREMENTS

This checklist is used at ward level to ensure that all important steps are taken to document timing and responsible individuals.

	Initials	Yes	No
Patient's death confirmed by doctor?			
Senior nurse in charge informed of patient's death?			
Next of kin notified of death? (see breaking bad news guidelines) Appendix 1			
Procurator Fiscal Notification - **inform as appropriate**			
Death certificate prepared? (see instructions in Deaths booklet)			
Death certificate given to family?			
Family returning later for death certificate? (if yes please record at the bottom of the page)			
Bereavement booklet given to family?			
Valuables/belongings returned to the family?			
Valuables held in cashier office?			

Post Mortem if required - Patient's family must sign			
Copy of signed post mortem consent given to family?			
Cremation Form B (**if appropriate**) completed?			
Cremation Form B (**if appropriate**) sent to mortuary?			
Infection Certificate for undertaker sent to mortuary?			

Consultant informed - within 24 hours			
GP contacted - within 24 hours			
Medical records informed - within 24 hours			
Cancel any follow-up appointments if already booked prior to death			

Arrangements to collect death certificate: Date / / Time:

Other comments:

Determine family's wishes regarding jewellery? →

To remain on patient Yes/No

Comments:

Initials

THE CREMATION FORM

Incomplete cremation forms can delay funeral arrangements, cause distress to bereaved relatives and cause major difficulty for mortuary staff. It is sensible to complete a Form B cremation form for every death unless it is known for certain a burial is planned.

- If there is no post mortem examination Form C is completed by a senior clinician (usually arranged by the mortuary). This is coordinated by Medical Unit secretary at SJH.
- If a post mortem examination is to be done, only Form B is required and should be completed (Q8a) after speaking to the pathologist.
- Cremation forms are not given to the family but are sent to the mortuary.

POST MORTEM EXAMINATION

- If a post mortem examination is considered desirable or is requested by the family, an experienced clinician should explain to the family before requesting authorisation. The consultant responsible for the patient should be involved in this process.
- Ensure the authorisation form is fully completed, signed and witnessed. One copy of this form is given to the family with the information booklet, one copy is filed in the medical notes and the third copy is for pathology.
- A post mortem request form is completed and countersigned by a clinician of SpR/StR grade and upwards.
- Send the pathology copy of the authorisation form and the request form to the mortuary.
- The mortuary will invite clinical staff to view the post mortem findings.

ORGAN DONATION

Transplants are one of the most miraculous achievements of modern medicine, but they depend entirely on the generosity of donors and their families who are willing to make this life-saving gift to others.

At present the number of people awaiting transplantation greatly exceeds the number of organs available. It is therefore essential to maximise the potential number of organs available from the existing potential donor pool.

Typically donation is from a variety of clinical settings:
Organ donation - is from patients in the intensive care unit following confirmation of death by *brain stem death tests or from*

Non-heart Beating Donation - patients are certified dead following cardio-respiratory arrest within the intensive care unit.

Tissue – can be donated following either the confirmation of death by brain stem tests or cardio-respiratory death. Tissue does not deteriorate immediately following cessation of the heartbeat due to its low metabolic requirements, allowing more time for retrieval and therefore may be offered in a variety of clinical settings.

All potential donors should be referred to the local donor transplant coordinator/tissue coordinator as early as possible for consideration for organ/tissue donation (Department of Health Working Party-Code of Practice for the Diagnosis of Brain Stem Death 1998). In cases of organ donation the donor transplant coordinator will be present throughout the organ donation process.

Donated organs/tissues and the families that donate them are a precious resource. The lives of hundreds of transplant patients are saved each year as a result of this gift. It is important that, where appropriate, the option of donating organs and/or tissue is offered to the next of kin/ person closest in life.

To discuss organ or tissue donation call switchboard at RIE asking for the transplant coordinator on call.

GOOD PRACTICE FOR DISCHARGING PATIENTS

- Discharge is an extremely important part of patient care.
- Planning of discharges should begin **early in the patient's admission**.

A patient's suitability for discharge will depend on:

- Medical Condition: is the patient stable and can further investigation or treatment be completed as an out-patient?
- Functional Ability: is the patient independent or dependent on others?
- Social Situation: does the patient live alone or are there carers?

If there is any doubt about a patient's ability to manage at home, a MULTIDISCIPLINARY ASSESSMENT should be performed. This will usually involve physiotherapy, occupational therapy and social work.

Procedure

- An expected date of discharge form is in use across Lothian.
- At least 6 hours before discharge of any patient you should use the patient's **Prescription and Administration Record** and **Case Notes** to help complete the **Summary Form**.
- Fill in the **Patient Discharge Information Summary** with as much information as you can.
- Fill in an **OPD Appointment Card** with Clinic Name and approximate date of attendance.
- In some units the ward secretary or housekeeper will arrange appointments.
- Write in the Case Notes:
  - Date of admission (DOA)
  - Date of discharge (DOD)
  - Diagnoses
  - Any other relevant details
  - Relevant Ix, Rx, changes to Rx
  - Follow-up
- The **medication on Discharge** (see below) should be checked with a more senior member of medical staff. You **must** complete this accurately.
- Leave in the agreed place for checking by a Pharmacist where this service is available.
- Give the nurses the discharge letter to arrange supply of discharge medications where appropriate and place the notes with summary form in the appropriate place. Give appointment card to ward clerkess.

Always consider telephoning the G.P. This is ESSENTIAL for frail elderly patients and for other patients where further medical intervention will be required e.g. patients being commenced on warfarin.

If you are in any doubt, pick up the telephone.

DISCHARGE PRESCRIPTION WRITING

- Adhere to previous guidance on good prescription writing.
- The Patient Discharge Information Summary must be used to prescribe all current medicines. The information required must be accurately transcribed from the inpatient prescription chart and the patient's medical notes.
- The doctor responsible for the patient's care must ensure that the Patient Discharge Information Summary is completed in adequate time, taking account of the patient's planned time and date of discharge.
- At least a seven day supply of medicines must be provided, unless a longer or shorter course of treatment is appropriate. The duration of therapy for antibiotic or steroid courses MUST be specified.
- Review **all inpatient medicines** and whether they need to be continued. Recommend review of changes to GP.
- Include (IN CAPITAL LETTERS)

  Name - (Patient's name, GP's name, Consultant's name)
  Address - (Patient and GP's address)
  Ward / Department
  Date
  Signature - (name printed beside signature)
- If the patient already has his or her own supply of required medicines at home or stored in the ward an additional supply should not be issued from the hospital. However, the doctor who writes the prescription, or the pharmacist, nurse or other professional who checks the prescription, must satisfy himself or herself that the patient's own supply is of an adequate quantity, quality and is correctly labelled with the current dosage instructions. The Patient Discharge Information Summary must be endorsed 'patient's own supply'.
- If the medicines are to be dispensed in the pharmacy, the Patient Discharge Information Summary must be delivered to the pharmacy at least 4 working hours before the patient is due to be discharged, to allow adequate time for dispensing and delivery to the ward.

Always review analgesic and sedative medication prior to discharge

Outpatient and discharge prescriptions for controlled drugs must comply with legal requirements. The prescription must:

- Include the name and address of the patient
- be written in indelible ink
- include the form (e.g. tablets) and if appropriate strength of the preparation e.g. morphine sulphate modified release tablets 10 mg
- include the total quantity of the preparation, or the number of dose units, in both words and figures e.g. 28 (twenty-eight) tablets, or 280 (two hundred and eighty) mg
- include the dose
- be signed and dated by the prescriber

For Warfarin: fully complete the yellow anticoagulation booklet and give to the patient.

Further information available on the Lothian Joint Formulary website: www.ljf.scot.nhs.uk

GUIDE TO GOOD DISCHARGE SUMMARIES

- The Discharge Summary is of vital importance.
- It is a **summary** of the inpatient stay.
- It is the main method of **communication** with the GP as well as being a summary for the case records.

Discharge summaries **must** include:

- The **main diagnosis** for that admission.
- Any important **concurrent** diagnoses.
- Important **social** factors e.g. living alone.
- Details of operations or major procedures e.g. central venous lines, endoscopy.
- **Drugs on discharge** including dietary advice.

Highlight any changes to treatment.

- **Community Services** arranged e.g. Home Help, District Nurse etc.
- **Follow-up**: arrangements at hospital or with GP.
- **Information** given/not given to patient and relatives.

How to do it

- **Text** should be relatively brief and detail changes in treatment and

review arrangements. Include:

a) drugs stopped (and reason why).

b) new treatments (which should be justified).

- Concentrate on selected details to indicate the disease and its severity.
- Unexpected findings, complications and **relevant** results should be included.
- **Check the format preferred in your unit.**
- The best summaries are **accurate, brief** and **timely**.
- The GP should have the full summary within **ten days of discharge**, thus it is essential you dictate promptly.

You should try to:

- Dictate summaries **daily**, or at most within 3 days of discharge.
- Give the date of dictation.
- Speak **clearly and slowly**.
- Include **all** the details listed above.
- Use **precise diagnoses** - ask your Consultant or Specialist Registrar if in doubt.
- Send **copies** of the summary where appropriate e.g. to other hospitals, to specialist units within the Division (e.g. Diabetes, Endocrine, Haematology, Neurosciences, Oncology, Orthopaedics, PAEP, Renal, Surgery), to other Consultants, and to Medical Officers of Nursing Homes.
- **Sign** your summaries (and other letters) promptly.

You should **NOT**:

- Leave your summaries until a weekend on - this is unfair to the patient and secretary, and renders it much less effective as a means of communicating.
- Use symptoms e.g. chest pain if a more precise diagnosis is available.
- Give **all** clinical details and normal results - be selective.
- Repeat all the past history - include relevant details under concurrent diagnoses.

Dictation can seem a chore, but it is MUCH EASIER to do if the patient is fresh in your mind, and MUCH HARDER if you leave it and cannot remember who the patient was.

Chapter 2

RECOGNITION ASSESSMENT AND MANAGEMENT OF THE ACUTELY ILL ADULT

GENERAL POINTS

- Acutely ill patients require rapid but careful assessment.
- Initiation of treatment often precedes definitive diagnosis but diagnosis should be actively pursued.
- Aim to prevent further deterioration and stabilise the patient.

Early involvement of experienced assistance is optimal i.e. GET HELP.

- The general principles of emergency management described here can be applied to the majority of acutely ill adults irrespective of underlying diagnosis or admitting speciality.
- Sepsis, shock and respiratory failure can occur in any clinical area. There may be life-threatening abnormalities of physiology present e.g. hypoxia or hypovolaemia, or the patient may have a specific condition which is at risk of rapid de-stabilisation e.g. acute coronary syndrome, GI bleed.

The approach to the acutely ill adult requires four elements to proceed almost in parallel:

THE FOUR KEY DOMAINS OF EMERGENCY MANAGEMENT

1.	2.	3.	4.
Acute assessment (with targeted examination) stabilisation immediate investigations & support	Monitors: reassess Surface Invasive Real time or Delayed Illness severity assessment	Clinical decision making Team work Task Mx Situation Awareness Critical Thinking	Differential diagnosis/ definitive diagnosis Immediate, medium term and long term treatment

Immediate investigations are those which will influence the **acute management** of the patient and include;

- Arterial blood gas
- Glucose
- Potassium
- Haemoglobin
- Clotting screen (where indicated).
- Twelve lead ECG.
- CXR (where indicated).
- Remember to take appropriate cultures including venous blood cultures before administering antibiotics (if practical).
- Consider sending blood for screen, group and save or cross-matching.

1. ACUTE ASSESSMENT, PRIMARY TREATMENT & INVESTIGATIONS

Acute assessment is designed to identify life-threatening physiological abnormalities and diagnoses so that immediate corrective treatment can be instituted (see algorithm). Patient observations and SEWS score are critical to the process. Within NHS Lothian an early warning scoring system (SEWS) is utilised to alert staff to severely ill patients. It is a decision support tool that compliments clinical judgement and provides a method for prioritising clinical care. An elevated SEWS score correlates with increased mortality and it is recommended that a patient with a SEWS score of 4 or greater requires urgent review and appropriate interventions commenced. Think: Do they need specialist/ critical care input **NOW**? If the answer is yes get help immediately.

However ill patients may have a NORMAL SEWS score: look at the individual patient critically.

PRIMARY ASSESSMENT & MANAGEMENT: APPROACH TO THE ACUTELY ILL PATIENT

See explanatory notes below

Approach: Hello, how are you?

What is the main problem? Do you have any allergies? What medicines are you on? PMH?

Get a clear history to assist definitive diagnosis

	CLINICAL ASSESSMENT *GET HELP NOW	ACTION	INVESTIGATIONS IN ASSESSMENT
A	**Airway and Conscious Level** Clear and coping? → Stridor*	 Chin lift, head tilt Call for help early	
B	**Breathing** Look, listen and feel Rate and volume and symmetry WOB[2]/pattern RR > 30* Paradoxical breathing*	Auscultate chest High concentration 60-100% oxygen[1] Monitor ECG, BP, SpO_2 Ventilate if required	ABG[3], PEFR, CXR
C	**Circulation** **Pulse[4]** Rate/volume Rhythm/character **Skin colour and temp** **Capillary refill[6] and warm/ cold interface** **Blood pressure (BP)** HR < 40 >140* BP < 90 SBP*	 No pulse: cardiac massage IV access[5] and fluids Auscultate Heart	12 lead ECG
D	**CNS and Conscious Level GCS/AVPU** Fall in GCS 2 points* Pupils, focal neurological signs	ABC & Consider the cause Management of coma	Glucose
E	**Examine & Assess Evidence & Environment** Temperature	Look at SEWS chart, results, drug & fluid charts	Standard bloods

[1] If not breathing, get help and give two effective rescue breaths.
[2] WOB: work of breathing.
[3] Always record inspired oxygen concentration.
[4] If collapsed carotid, if not start with radial.
[5] Take blood for x-match and immediate tests (see text).
[6] Should be <2 seconds.

NOTES ON INITIAL ASSESSMENT ALGORITHM

If you are called to a sick patient GO AND SEE THEM. Five seconds critically looking at the patient will tell you more than 10 minutes on the phone.

Airway and Breathing

- See BLS guidelines for cardiac arrest.
- By introducing yourself and saying hello you can rapidly assess the airway, breathing difficulties and the conscious level. If the patient is talking **A** is clear and **B** isn't dire.
- AMPLE: ask about allergies, medicines, past history, last food/fluid, events at home or in ward e.g. drug administration.
- If any patient with known or suspected chronic respiratory disease arrives in A&E, CAA or ARAU on high concentration oxygen check ABG immediately and adjust oxygen accordingly.
- When assessing breathing think of it in the same way as you think of the pulse: rate, volume, rhythm, character (work of breathing), symmetry. Look for accessory muscle use, and the ominous sign of paradoxical chest/abdomen movement: "see-saw".
- As you assess breathing targeted examination of the chest is appropriate.
- High concentration oxygen is best given using a mask with a reservoir bag and at 15l can provide nearly 90% oxygen.

The concentration of oxygen the patient breathes in is determined by the type of mask as well as the flow from the wall and the breathing pattern. By using a fixed performance system (Venturi) you can gauge the percentage much more accurately.

- The clinical state of the patient will determine how much oxygen to give, but the acutely ill should receive at least 60% oxygen initially.
- ABG should always be checked early to assess oxygenation, ventilation ($PaCO_2$) and metabolic state (HCO_3 and base deficit). Always record the FiO_2 (oxygen concentration).
- Oxygen therapy should be adjusted in the light of ABGs: O_2 requirements may increase or decrease as time passes.

Circulation

- As you assess circulation targeted examination of the heart is appropriate.
- IV access is often difficult in sick patients.

- The gauge of cannula needed is dictated by the required use:
  - large bore cannulae are required for volume resuscitation. Ideally insert 2 large bore (at least 16G grey) cannulae, one in each arm in the severely hypovolaemic patient.
  - an 18 gauge green cannula is usually adequate for drug administration.
- The femoral vein offers an excellent route for large bore access and an 8.5F Swan-Ganz introducer is ideal.
- If there is major blood loss speak to the labs & BTS: you may need coagulation factors as well as blood. Consider activating the Major Haemorrhage protocol dial 2222. Call Senior help.
- Use pressure infusors and blood warmers for rapid, high volume fluid resuscitation.

If the patient is very peripherally vasoconstricted and hypovolaemic don't struggle to get a 14G (brown) cannula in. Put in two 18G cannulae (green) and start fluid resuscitation through both.
CALL FOR HELP

- Machine derived cuff blood pressure is inaccurate at extremes of BP and in tachycardias (especially AF).
- Manual *sphygmomanometer* BP is more accurate in hypotension.
- In severe hypotension which is not readily corrected with fluid early consideration should be given to arterial line insertion and vasoactive drug therapy: **GET HELP**.

Disability

- Glasgow coma scale (GCS): document all three components accurately with best eye, best verbal and best motor responses.
- Recommended painful stimuli are supraorbital pressure or Trapezius pinch.

Glasgow Coma Scale to record conscious level

Eye Opening (E)	Verbal Response (V)	Motor Response (M)
4=Spontaneous 3=To voice 2=To pain 1=None	5=Normal conversation 4=Disoriented conversation 3=Words, but not coherent 2=No words.....only sounds 1=None T = intubated patients	6=Normal 5=Localizes to pain 4=Withdraws to pain 3=Decorticate posture 2=Decerebrate 1=None
		Total = E+V+M

- Check pupil size, symmetry and reaction to light.

Exposure, evidence and examination

- Further history should be obtained and further examination should be performed. Information should be sought from recent investigations, prescription or monitoring charts.

LOOK AT	ABNORMALITIES SOUGHT	INVESTIGATIONS
Trachea	Deviation	
Chest	Lateralising signs, wheeze, creps, dull PN	CXR CTPA
JVP and HS I + II	↑ JVP, III + IV HS, murmurs	ECG, Echocardiography
Abdomen	Distension, peritonism, pulsation, bowel sounds	USS, AXR, CT
CNS	Pupils, lateralising signs, neck stiffness	CT
Skin	Rashes, purpura	Blood cultures

PREVENTING DETERIORATION & CARDIAC ARREST

- Around 80% of our in-hospital cardiac arrests are in non-shockable rhythms.
- In **ventricular fibrillation/pulseless ventricular tachycardia** the onset is abrupt, and an at-risk group with acute coronary syndromes can be identified and monitored. Early defibrillation results in optimal survival.
- In contrast, in-hospital cardiac arrest in **asystole or pulseless electrical activity or PEA** has a survival rate of around 10% and there is no specific treatment. There are usually documented deteriorations in physiology prior to the arrest. These are often treatable and reversible so the aim is to recognise decline early and to provide early corrective management in order to **PREVENT CARDIAC ARREST**. (See SEWS section).

Causes of preventable asystole and PEA can also cause VF.

- **Hypoxaemia** and **hypovolaemia** are common and often co-exist e.g. in sepsis, anaphylaxis, trauma or haemorrhage such as GI bleeding.
- Electrolyte abnormalities, notably **hyperkalaemia**, **hypokalaemia** or **hypocalcaemia** are easily detected and readily correctable.
- **Drug** therapy or poisoning/toxins may contribute to instability.

Physiological abnormalities	How to pick them up
Hypoxaemia, hypercarbia, acidosis	Do an early blood gas
Hypovolaemia, hypervolaemia	Assess circulation (see algorithm)
Hypokalaemia, hyperkalaemia	Early bloods
Hypothermia	Assess context, core temp
Tension pneumothorax	Clinical context and signs
Toxins*	Clinical context, (chart in chapter 10)
Cardiac tamponade	Clinical context, early echo
Thromboembolic	Clinical context, PE/CTPA

***N.B.** β-blockers and calcium channel blockers.

- **Hypothermia, tension pneumothorax, cardiac tamponade** (particularly after thrombolysis, cardiac surgery or chest trauma) and **thrombo-embolic disease** must all be considered (in context).

2a. MONITORING & REASSESSMENT

- Real-time continuous monitoring is invaluable in the acutely ill.
- Pulse oximetry, ECG and cuff BP monitoring should be instituted immediately in all patients.
- Monitoring is an integral part of the treatment/re-assessment/ treatment/re-assessment loop.
- The place of urgent investigation is detailed previously.
- In order to make a definitive diagnosis specific blood tests or imaging techniques may be required.

Do not move unstable patients e.g. to x-ray until stabilised, and then only with adequate support, vascular access, monitoring and appropriate escort.

Assessment and re-assessment

Assess response to treatment by continuous clinical observation, repeated assessment of airway, breathing, circulation and disability (conscious level) as above with uninterrupted monitoring of ECG and oxygen saturation. Reassess regularly to see the effects of intervention, or to spot deterioration.

IF THE PATIENT IS NOT IMPROVING CONSIDER:

1. **Is the diagnosis correct?**
2. **Is the diagnosis *complete*?**
3. **Is there more than one diagnosis?**
4. **Are they so ill help is needed now?**
5. **Is there an unrecognised problem or diagnosis?**

2b. ILLNESS SEVERITY ASSESSMENT

- Working out how ill the patient is and what needs to happen to them next underpins the effective, safe management of all adult medical emergencies.

Specific scoring systems are included in specialist sections. The Standard Early Warning Scoring System is being used in Lothian.

Illness severity assessment informs four key decisions:

i) What level and speed of intervention is required? e.g. urgent ventilation, immediate surgery.

ii) Is senior help required immediately, and, if so, whom?

iii) Where should the patient be looked after? This is a decision about nursing care, monitoring and treatment level. The choices include:

- General wards.
- Intermediate care facility (Coronary Care Unit: CCU or High Dependency Unit: HDU).
- Theatre
- Intensive Care Unit (ICU).

Placing the patient in a monitored HDU bed without increasing the level of appropriate medical input and definitive treatment will not improve outcome on it's own.
Senior advice should be sought early.

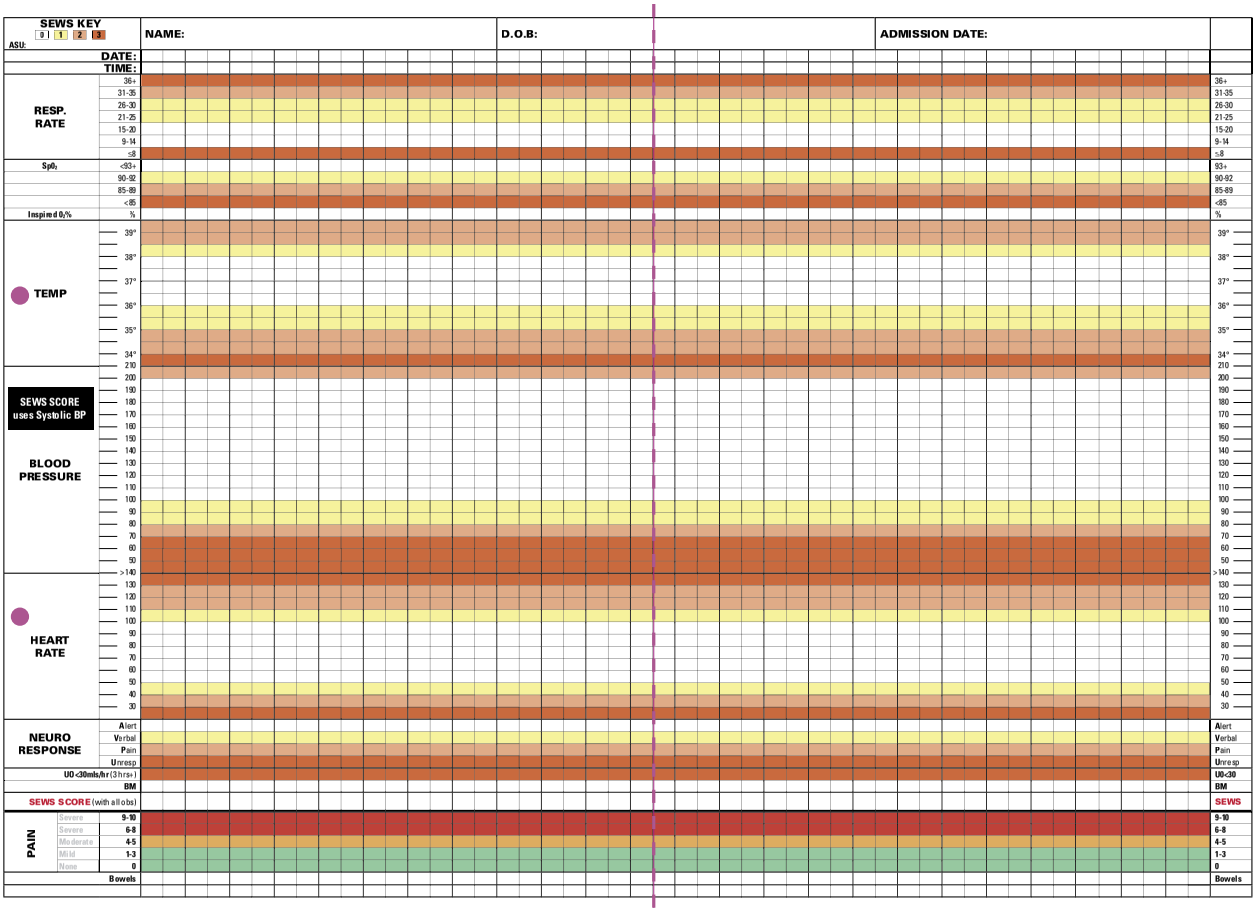
iv) What co-morbidity is present? (including drugs which blunt compensatory changes in physiology).

If the parameters are nomal is that appropriate for the clinical state of the patient?

SEWS PARAMETERS AND SCORING SYSTEM

Parameter	Score						
	3	2	1	0	1	2	3
Respiratory rate	≥ 36	31-35	21-30	9-20			≤ 8
SpO_2 (%)	< 85	85-89	90-92	≥ 93			
Temperature		≥ 39	38-38.9	36-37.9	35-35.9	34-34.9	≤ 33.9
BP_S (mm Hg)		≥ 200		100-199	80-99	70-79	≤ 69
HR	≥ 130	110-129	100-109	50-99	40-49	30-39	≤ 29
AVPU Response				Alert	Verbal	Pain	None

Case example Patient presents in respiratory distress.
RR 32, SpO_2 90%, T° 38.9, BP_S 160/70, HR 105, AVPU: Verbal
SEWS score = 6
Patient requires increased frequency of observations and urgent medical review.


SEWS KEY
0 1 2 3
ASU:
NAME:
D.O.B:
ADMISSION DATE:
DATE:
TIME:
RESP. RATE
36+
31-35
26-30
21-25
15-20
9-14
≤8
SpO2
<93+
90-92
85-89
<85
Inspired O2%
%
TEMP
39°
38°
37°
36°
35°
34°
SEWS SCORE uses Systolic BP
BLOOD PRESSURE
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
>140
HEART RATE
130
120
110
100
90
80
70
60
50
40
30
NEURO RESPONSE
Alert
Verbal
Pain
Unresp
UO <30mls/hr (3hrs+)
BM
SEWS SCORE (with all obs)
PAIN
Severe
Severe
Moderate
Mild
None
9-10
6-8
4-5
1-3
0
Bowels

Observation Chart

NHS Lothian

Consultant: _____

Date chart commenced: _____

This is chart number _____ **this admission**

Actual or estimated patient weight _____ **kgs**

Attach a patient Addressograph here

An Early Warning Score (SEWS) must be calculated every time patient observations are recorded. If SEWS score 4 or more then call the appropriate doctor and nurse in charge using the guidelines below. Increased frequency of observations (minimum hourly) should be commenced and a detailed report in the patient's medical notes should be completed.

Early Warning Score 4 or more
or concern with a patients condition.

Call Junior Doctor & Senior Nurse/Nurse Practitioner
If Dr cannot attend within 20 mins, they should arrange a Deputy.

Practitioner/Dr unable to attend within 20 mins **or** SEWS increased by 2 **or** patient deteriorating.

Early Warning Score 6 or more
or rapidly deteriorating patient.

Call appropriate SHO/Registrar & Senior Nurse/Nurse Practitioner

Dr unable to attend within 10 mins **or** SEWS increased by 2 **or** patient deteriorating.

Call appropriate Registrar/Consultant
Consider ICU referral/review of treatment plan

Persistent Pain – 6 or above and unresponsive to guidelines

Call Medical Staff/Senior Nurse/Nurse Practitioner

For further advice contact:

ACUTE
Mon- Fri: **Bleep Acute Pain Team**
Out of hours: **On-call anaesthetist**

CANCER-RELATED
Mon- Fri: **Bleep Palliative Care Team**
Out of hours: **via switchboard**

How to calculate SEWS Score

- **Do not add pain score to SEWS Score**.
- Record standard observations (RR, $Sp0_2$, Temp, BP, HR, AVPU).
- Note whether observation falls in shaded "At Risk Zone". Score as per SEWS key.
- Add points scored and record total "SEWS Score" in bottom row of chart.
- Action as per guidelines on front of chart.

If RR >24	Review patient / CXR +/- gases / PEF (Peak Expiratory Flow) etc ∓ Definitive Therapy			
If $Sp0_2$ sats <93%	Review probe ? accurate Review patient ∓ prescribe oxygen on drug chart if indicated, consider ABGs.			
If Temp >38	Blood cultures Other cultures Start antibiotic therapy if indicated.			
If Systolic BP<100	Review monitoring *(cardiac / oximetry / urine output / invasive BP etc).* IV Access Review patient / drug kardex.			
Consider:	IV Fluid ∓ Definitive Therapy			
Consider:	Hypovolaemia *Dehydration* *Blood loss*	Cardiac *Arrhythmia* *Pump failure*	Obstructive *PE* *Tamponade*	Distributive *Sepsis* *Anaphylaxis*
If Pulse >130	Review monitoring *(cardiac monitor indicated)* IV Access Review patient / ECG / electrolytes ∓ Definitive Therapy			
If responds to pain only or unresponsive	Assess airway, BM, GCS, consider neuro observation chart, review patient / kardex.			
If BM <4	Give Oral Carbohydrate / IV Dextrose. Consider checking urgent laboratory blood glucose.			

Pain Assessment & Management Guidelines

How to score pain:

Cancer-related pain: **Always** score **worst** pain in last 24 hours or since last assessment.
Acute pain: Score **current** pain e.g. on movement/deep breathing.

Pain Score:		Action:
0	**NONE**	Continue to assess pain daily or with observations.
1-3	**MILD**	Continue to assess pain daily or with observations.
4-5	**MODERATE**	Assess. Using guidelines, prescribe analgesia as appropriate for the patient. Review.
6-10	**SEVERE**	Assess. Using guidelines, prescribe analgesia as appropriate for the patient. Review.

Lothian Guidelines

Cancer-related pain: Initiate Edinburgh Pain Assessment Tool (EPAT©) for pain score of 4 or above.
Use Palliative Care Guidelines.

Acute pain Use Acute Pain Guidelines.

PERSISTENT MODERATE OR SEVERE PAIN, WHICH DISTRESSES PATIENT: REFER. SEE FLOW CHART OVER.

Illness Severity and Diagnosis (Risk of Deterioration)

- As the ABCD is secured a specific diagnosis is sought with the 'Targeted Examination' and specific treatment can then be instituted.
- Explanation, reassurance and analgesia are integral parts of acute care. Always keep the patient, family and/relevant others informed about progress.
- Objective information on severity of illness may be obtained from blood tests e.g. acidosis and oxygenation, K^+, renal dysfunction, liver failure and DIC.
- If acidosis is due to tissue hypoxia, base deficit can be followed as a guide to response to treatment (unless metabolic acidosis is due to e.g. renal failure).

BASE DEFICIT is very important.

+3 to -3	**normal**
-5 to -10	**moderately ill**
-10 or worse	**severely ill**

Arterial blood lactate

- If elevated has prognostic significance - the higher the worse.
  N.B. patients may have tissue hypoxia with a normal lactate.

IDENTIFICATION OF THE ACUTELY ILL PATIENT REQUIRING INTENSIVE CARE OR HIGH DEPENDENCY UNIT REFERRAL

CRITERIA FOR EARLY REFERRAL TO INTENSIVE CARE

Respiratory Failure	Threatened or obstructed airway Stridor Respiratory arrest Tachypnoea >35/min, respiratory distress SpO_2 <90% on high concentration (>60%) oxygen Rising $PaCO_2$ (generally >8 kPa or >2 kPa above patient's normal level, with respiratory acidosis)
Shock	Cardiac arrest (unless circulation restored rapidly by defibrillation and with return of consciousness) Shock: tachycardia and/or hypotension not responsive to volume resuscitation Evidence of tissue hypoperfusion/hypoxia Clinically poor peripheral perfusion Metabolic acidosis Hyperlactataemia Diminished conscious level Poor urine output
Renal Failure	Oliguria Hyperkalaemia Uraemia
↓ GCS	Diminished conscious level Threatened airway Absent gag/cough Failure to maintain normal PaO_2 and $PaCO_2$ Status epilepticus
Gastro-intestinal/ Liver	Liver failure GI bleeding
Sepsis	Severe sepsis and septic shock.

Even in the absence of a specific diagnosis of concern or greatly impaired physiology early ICU involvement may be appropriate: seek senior advice.

Watch for the development of cardiovascular, respiratory and other organ system failure, particularly in patients known to be at risk because of their illness.

INVOLVE ICU EARLY

These guidelines are intended to facilitate referral of acutely ill patients for consideration of Intensive Care, High Dependency care and treatment of major organ system failure.

Mechanism of referral:

ICU

RIE - Ward 118: 21187/21188
SJH - 54063/54056 BLEEP 561
WGH - Ward 20: Call ICU Consultant

HDU (Level 2)

RIE - Ward 116 HDU: 21161
(SHO 5198 for medical referrals or med.HDU consultant)
SJH - 54063/54056 BLEEP 561
WGH - Ward 20: Call ICU Consultant

EXAMPLES OF PATIENTS

Surgical problems

- Perforated, ischaemic or infarcted bowel (both upper and lower).
- Acute pancreatitis.
- Sepsis from the gastro-intestinal, biliary or urinary tract.
- Respiratory or cardiorespiratory failure after any operation.
- Significant cardiovascular or respiratory disease in patients undergoing major surgery.

Medical problems

- Pneumonia, acute exacerbation of COPD, severe acute asthma.
- Sepsis.
- Cardiovascular failure e.g. severe LVF, post-MI.
- Post cardiac arrest (unless rapid return of circulation, ventilation and consciousness) usually go to CCU.
- GI bleed with haemodynamic instability.
- Severe diabetic ketoacidosis
- Poisoned patients at risk of airway or haemodynamic compromise.

Patients with Neurological disease with:

- Inability to breathe adequately.
- Inability to protect their airway.
- These include patients with reduced conscious level or brain-stem dysfunction.

3. CLINICAL DECISION MAKING

Decision making underpins all aspects of clinical and professional behaviour and is one of the commonest activities in which we engage. You should understand

- the factors involved in clinical decision making such as knowledge, experience, biases, emotions, uncertainty, context
- the critical relationship between CDM and patient safety
- the ways in which we process decision making: system 1 and system 2 (see elink on back cover)
- the place of algorithms, guidelines, protocols in supporting decision making and potential pitfalls in their use
- the pivotal decisions in diagnosis, differential diagnosis, handing over and receiving diagnoses and the need to review evidence for diagnosis at these times

4. DEFINITIVE DIAGNOSIS & TREATMENT

- Immediate life-saving treatment often prevents further decline or effects improvement while the diagnosis is made and specific therapy applied e.g. thrombolysis in MI, endoscopic treatment of an upper GI bleeding source. Outcome is better in patients where a definite diagnosis has been made and definitive therapy started.

FULL EXAMINATION & SPECIALIST INVESTIGATIONS

- Get a good history: useful information is always available.
- Relatives, GP, neighbours, ambulance staff may all be helpful.

If the patient is not improving consider:
1. Is the diagnosis secure?
2. Is the illness severity so great help is needed?
3. Is there something else going on?

SHOCK

Definition & Classification

- Shock is an acute metabolic emergency where compromised oxygen transport leads to cellular oxygen utilisation which is insufficient to sustain normal aerobic metabolism.
- **The aim of therapy in shock is to optimise tissue oxygen delivery in relation to oxygen requirements**, whilst making a specific diagnosis and treating the underlying problem.
- Shock may result from inadequate oxygen delivery to the tissues (hypovolaemia, anaemia, low cardiac output), maldistribution of blood flow (sepsis, anaphylaxis) or the inability of the cells to utilise oxygen (sepsis).

TRADITIONAL CLASSIFICATION (aetiological):

- Hypovolaemic
- Septic
- Cardiogenic
- Anaphylactic
- Obstructive
- Neurogenic

FUNCTIONAL CLASSIFICATION (pathophysiological):

Intact oxygen utilisation (low flow: low stroke volume)	Abnormal (low oxygen utilisation: low systemic vascular resistance)
Cardiogenic	Septic
Hypovolaemic	Anaphylactic
Obstructive e.g. pulmonary embolism, tension pneumothorax, tamponade	Late low flow shock

Clinical Presentation

Clinical evidence of organ dysfunction:

- Tachypnoea
- Tachycardia
- Hypotension
- Poor peripheral perfusion
- Abnormal mental state
- Oliguria

Hypotension is a sign of advanced shock in hypovolaemic/ cardiogenic/low flow shock, implying decompensation of cardiovascular defence mechanisms.

ASSESSMENT OF SEVERITY IN HAEMORRHAGE & IMPLICATIONS FOR TREATMENT*

	Class I	Class II	Class III	Class IV
Blood loss (mL)	**Up to 750**	**750-1500**	**1500-2000**	**>2000**
Blood loss (%BV)	Up to 15%	15-30%	30-40%	>40%
Pulse rate	<100	>100	>120	>140
Blood pressure	Normal	Normal	Decreased	Decreased
Pulse pressure (mm Hg)	Normal or increased	Normal	Decreased	Decreased
Respiratory rate	14-20	20-30	30-40	>35
Urine output (mL/hr)	>30	20-30	5-15	Neglible
CNS/Mental state	Slightly anxious	Mildly anxious	Anxious and confused	Confused and lethargic
Fluid replacement	Crystalloid or colloid	Crystalloid or colloid	Crystalloid, colloid & blood	Crystalloid, colloid & blood

* For a 70kg male

Management

- Assess ABCDE and treat accordingy as detailed above.
- Get help.
- Correct hypoxaemia with high concentration oxygen by mask.
- Secure adequate IV access: this may be difficult.
- Correct hypovolaemia with colloid, crystalloid and blood as appropriate maintaining haemoglobin around 100g/l.
- Take blood and other samples for culture and give appropriate antibiotics. Early surgical intervention may be crucial e.g. laparotomy for perforated bowel, control of haemorrhage, abscess drainage.

SHOCK MANAGEMENT SUMMARY

In sepsis large volumes of fluid may be required and clinically important anaemia may result from haemodilution . Even if the patient is not bleeding blood transfusion may be necessary.

Monitoring

- Pulse oximetry, continuous ECG, non-invasive blood pressure (NIBP) should be used routinely.

Cuff BP by machine may be extremely inaccurate in sick patients.

Treatment

- The management of cardiogenic, hypovolaemic or septic shock unresponsive to the above measures can be very difficult.
- Tracheal intubation and ventilation, vasoactive drug therapy, invasive haemodynamic monitoring or mechanical circulatory support may be required.
- In acute coronary syndromes PCI, thrombolysis, or other interventions may be needed.
- Persisting hypotension with impaired organ perfusion despite supplemental oxygen and correction of volume status may necessitate vaso-active drug support.
- The drug of first choice is adrenaline (short term) as it has inotropic and vasoconstrictor effects, the latter predominating at higher doses.
- An arterial line should be used to monitor BP.
- Adrenaline should be infused via a central venous catheter.

Adrenaline 6mg is diluted in 100ml dextrose 5% and run initially at 3-10ml/hr.

☎ **GET EXPERT HELP EARLY:** contact numbers for **ICU, Cardiology, Anaesthetics, Respiratory, GI** & other specialists in appropriate chapters of the book and in telephone lists.

BLOOD AND BLOOD COMPONENTS

Comprehensive notes on the use of blood and its products can be found in the comprehensive Stationary Office Handbook of Transfusion Medicine 3rd Edition March 2001 and in the Divisional Blood Components Clinical Procedures Manual.

The Major Haemorrhage protocol is at the back of this book.

Blood

- Blood is usually supplied as red cell concentrates, unless otherwise requested (volume 280-350mls).
- In general fully cross-matched blood should be used.
- In an emergency this can be provided within 40 minutes of receipt of the sample.
- In an extreme emergency group specific blood can be used.

- ORhD negative uncrossmatched blood is available in A&E, Labour Ward and blood bank on RIE/Simpsons NRIE site and in WGH in Blood Bank and in blood bank (Haematology lab) at SJH.
- Please note that if a patient is found to have red cell antibodies there will be some delay in finding compatible blood.
- In the context of an acute bleed, blood may be transfused as quickly as required to attain haemodynamic stability.
- When transfusing anaemic patients with no acute bleed then it is given more slowly, in general 2 to 4 hourly. In those patients with poor cardiac reserve give blood 4 hourly and "cover" with oral furosemide e.g. 40 mg with alternate bags.
- Large transfusions may impair clotting and cause thrombocytopenia. After 5 units check FBC, PTR and APTT, and correct with fresh frozen plasma (FFP) and platelet transfusions if clinically appropriate i.e. PTR >1.5 x normal, APTT >2 x normal, platelets <50.
- If an additional transfusion is required more than three days later, then a new sample must be sent for cross match (this is not necessary if more blood is requested within 72 hours of initial cross-match).
- If a reaction e.g. rigors, hypotension, loin pain occurs, STOP the transfusion, take down blood bag and giving set and send the blood bag, and a serum sample with EDTA and serum tubes to Blood Bank and citrate and EDTA tubes and urine specimen to the Haematology lab. Check coagulation screen, blood cultures, electrolytes.
- Contact the BTS or Haematologist for advice.
- Some patients e.g. bone marrow transplant, multiply transfused, renal patients require 'special' e.g. CMV -ve blood, irradiated, genotyped or filtered blood. These requests must be arranged in advance.
- Planned transfusion (top up or for surgery). Sample should be sent at least 24 hours ahead.
- If in doubt ask.

Platelets

- Check indication with a Haematologist.
- Given to correct a low platelet count (except when due to peripheral consumption e.g. ITP).
- In general transfuse if active bleeding and platelet count $<50x10^9/l$.

If no bleeding and platelets <20x10^9/l consider transfusion. Transfuse if <10x10^9/l.

- 4 units of platelets are usually given over 30 to 60 minutes (a 250ml pooled or apheresis bag).
- Check platelet count 1 hour post transfusion for increment if pre-surgery or procedure.
- In general blood group specific platelets are given. If these are not available group compatible will be given. Rhesus negative platelet concentrates should be used for Rhesus negative patients.

Fresh Frozen Plasma

- Discuss with Haemotologist.
- Used to correct some coagulation defects e.g. over anticoagulation with warfarin, DIC.
- Usual dose is 10-15ml/kg i.e. 1 litre for 70kg adult.
- Must be compatible blood group i.e. AB universal, O only to O recipient.
- The units have a short half-life. Once defrosted use immediately if possible and certainly within 4 hours.
- Infuse over <15mins.
- Use immediately pre procedure.
- Reactions may occur: contact the haematologist for advice.

Reactions to blood products

- Transfusion reactions with fever/rigors can be managed with paracetamol.
- Allergic reactions such as urticaria or bronchospasm may require hydrocortisone, chlorphenamine (chlorpheniramine), bronchodilators as detailed in anaphylaxis chapter.

Sites with blood fridges

RIE	WGH	RHSC	SJH
A&E	Ward 1	Theatre	Haematology Laboratory
Orthopaedic recovery	Ward 8		
GI/Liver/Renal recovery	DCN theatre		
Cardiothoracic recovery	Main theatre		
Adjacent to Obstetrics recovery			
General HDU ward 116			

Mandatory Data Set Requirements for Blood Transfusion Requests

Dangerous or fatal transfusion errors are usually caused by failing to keep to standard procedures. Inadequate patient identification or sample labelling may lead to ABO-incompatible transfusions.
As a result, the transfusion laboratory has to reject requests that arrive where the sample or request form do not comply with the mandatory data set.

Please remember to always seek positive identification of the patient before drawing the sample ('Please tell me your name and date of birth') and never write on the sample tube before drawing the sample.

Mandatory Data Set

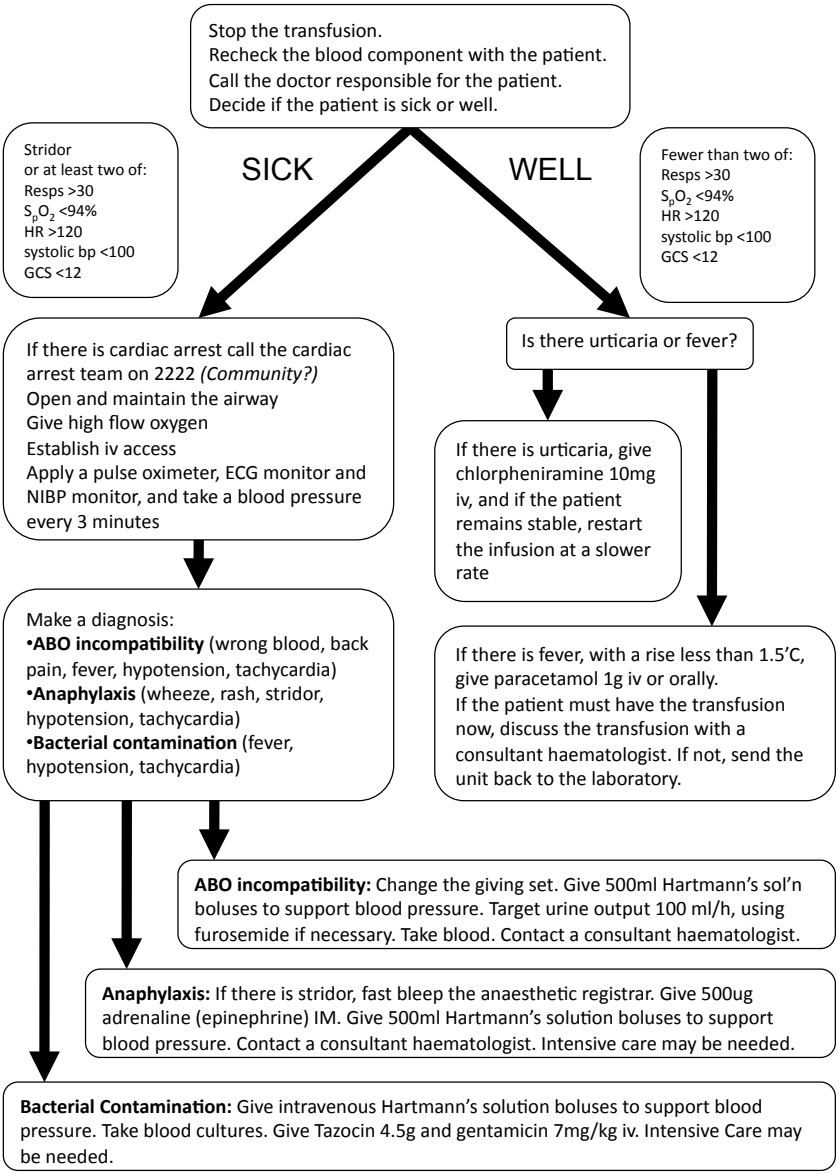
Mandatory information required on the **SAMPLE TUBE (handwritten at the bedside – patient identification sticky label must not be used):**

1. Surname
2. First name
3. Patient identification number (hospital number or CHI number)
4. Date of birth
5. Sample date
6. Signature of person taking sample
7. If the patient identification number is unavailable, please include postcode

Mandatory information required on the **REQUEST FORM (patient identification sticky label may be used):**

1. Patient identification number (hospital number or CHI number)
2. Surname
3. First name
4. Date of birth
5. Gender
6. Location
7. Signature of requesting doctor (or appropriately trained nurse practitioner)
8. Name of person taking sample (if different from above)
9. If the patient identification number is unavailable, please include postcode

Figure 1: Algorithm for Acute Transfusion Reactions



If you are unsure whether the diagnosis is Bacterial Contamination or ABO incompatibility, treat both, and contact a consultant haematologist for advice.

Table 1: Guidelines for Recognition and Management of Acute Transfusion Reactions

CATEGORY	SIGNS	SYMPTOMS	POSSIBLE CAUSE
Category 1: Mild	Localised cutaneous reactions: • Urticaria • Rash • Mild Fever	Pruritis	Hypersensitvity Febrile non-haemolytic transfusion reactions: • Antibodies to white blood cells, platelets • Antibodies to proteins, including IgA
Category 2: Moderately Severe	• Flushing • Urticaria • Rigors • Fever • Restlessness • Tachypnoea • Tachycardia	Anxiety Pruritis Palpitations Mild dyspnoea Headache	Hypersensitivity (moderate-severe) Febrile non-haemolytic transfusion reactions: • Antibodies to white blood cells, platelets • Antibodies to proteins, including IgA Possible contamination with pyrogens and/or bacteria
Category 3: Life Threatening	• Rigors • Fever • Restlessness • Hypotension (fall of >20% in systolic BP) • Tachypnoea +++ • Tachycardia (rise of >20% in heart rate) • Haemoglobinuria • Unexplained bleeding (DIC)	Anxiety Chest pain Pain near infusion site Respiratory distress/ shortness of breath Loin/back pain Headache	Acute intravascular haemolysis Bacterial contamination and septic shock Fluid overload Anaphylaxis Transfusion related acute lung injury (TRALI) Transfusion associated Graft versus Host Dyspnoea disease (TA-GvHD)

Note: If an acute transfusion reaction occurs, as you are starting to treat the patient check the blood pack labels and the patient's identity. These events should happen at the same time. If there is any discrepancy, stop the transfusion immediately and consult the hospital transfusion laboratory.

In an unconscious or anaesthetised patient, hypotension and uncontrolled bleeding may be the only signs of an incompatible transfusion.

In a conscious patient undergoing a severe haemolytic transfusion reaction, signs and symptoms may appear very quickly - within minutes

of infusing only 5-10mls of blood. Close observation at the start of the transfusion of each unit is essential.

Table 2: Immediate Management of Acute Transfusion Reactions

IMMEDIATE REACTION
CATEGORY 1: MILD 1. Slow the transfusion. 2. If required, administer antipyretic/antihistamine. 3. If no clinical improvement within 30 minutes or if signs and symptoms worsen, **treat as Category 2**.
CATEGORY 2: MODERATELY SEVERE 1. Stop the transfusion. Replace the giving set and keep the IV line open with saline 0.9%. 2. Notify the doctor and the Hospital Transfusion Laboratory immediately. 3. Send the blood unit with the giving set, freshly collected blood samples (including blood cultures) with appropriate request form to the Hospital Transfusion Laboratory for investigations. 4. Administer antipyretic/antihistamine (avoid aspirin in thrombocytopenic patients). 5. Treat as per anaphylaxis protocol: stridor, wheeze and hypotension will require treatment with oxygen and im adrenaline. Call experienced help early: ICU/Anaesthetics. 6. Collect urine for next 24 hours for evidence of haemolysis and send to laboratory. 7. If clinical improvement, restart transfusion slowly with new blood unit and observe carefully. 8. If no clinical improvement within 5-10 minutes or if signs and symptoms worsen, **treat as Category 3 and ensure help is coming**.

Table 2 continued

IMMEDIATE REACTION

CATEGORY 3: LIFE-THREATENING

1. Maintain airway and give high concentration (60-100%) oxygen by mask.
2. Stop the transfusion. Replace the giving set and keep the IV line open with 0.9% saline.
3. Manage as anaphylaxis protocol **and ensure help is coming**: stridor, wheeze and hypotension require treatment with oxygen and im adrenaline. Critical care admission will be necessary.
4. Notify the Consultant Haematologist and the Hospital Transfusion Laboratory immediately.
5. Send the blood unit with the giving set, freshly collected blood samples with appropriate request form to the Hospital Transfusion Laboratory for investigations.
6. Check a fresh urine sample visually for signs of haemoglobinuria.
7. Commence a 24 hour urine collection and fluid balance chart and record all intake and output. Maintain fluid balance.
8. Assess for bleeding from puncture sites or wounds, if DIC suspected seek expert advice.
9. Reassess:
   - Treat bronchospasm and shock as per protocol.
   - Acute renal failure or hyperkalaemia may require urgent renal replacement therapy.
10. If bacteraemia is suspected (rigors, fever, collapse, no evidence of a haemolytic reaction), take blood cultures and give broad spectrum antibiotics with Pseudomonas cover: Piperacillin-tazobactam 4.5G tds IV plus gentamicin 7mg/kg od IV (ideal bodyweight). Discuss with haematologist on call.

Table 3: Drugs that may be required in the management of Acute Transfusion Reactions

RELEVANT EFFECTS	DRUGS & DOSES		NOTES
	Name	Route & Dosage	
	Oxygen	60-100%	1st line
Bronchodilator Vasopressor	Adrenaline	500 micrograms im repeated after 5 mins if no better, or worse	1st line
Expand blood volume	0.9% - Saline, Gelofusine	If patient hypotensive, 20ml/kg over 5 minutes	1st line
Reduce fever and inflamm-atory response	Paracetamol	Oral or rectal 10 mg/kg	2nd line Avoid aspirin containing products if patient has low platelet count
Inhibits histamine mediated responses	Chlorphen-amine (Chlorphen-iramine)	IV 0.1 mg/kg	2nd line
Inhibits immune mediated bronchospasm	Salbutamol Amino-phyllline	By 5mg nebuliser Use under expert guidance	2nd line
Vasopressor Bronchodilator	Adrenaline 6mg in 100ml 5% dextrose (6%)	5-10ml/hr	Use only under expert guidance

Table 4: Investigating Acute Transfusion Reactions

INVESTIGATING ACUTE TRANFUSION REACTIONS

1. Immediately report all acute transfusion reactions with the exceptions of mild hypersensitvity and non-haemolytic febrile transfusion reactions, to the Consultant Haematologist and the Hospital Transfusion Laboratory
2. Record the following information on the patient's notes:
   - Type of transfusion reaction
   - Length of time after the start of the transfusion and when the reaction occurred
   - Volume, type and pack numbers of the blood components transfused
3. Take the following samples and send them to the Hospital Transfusion Laboratory:
   - Immediate post transfusion blood samples from a vein in the opposite arm:
     - Group & Antibody Screen
     - Direct Antiglobulin Test
     - Return blood unit and giving set containing residues of the transfused donor blood
4. Take the following samples and send them to the Haematology/ Clinical Chemistry Laboratory for:
   - Full blood count
   - Coagulation screen
   - Urea
   - Creatinine
   - Electrolytes
   - Blood culture in an appropriate blood culture bottle
5. Complete a transfusion reaction report form.
6. Record the results of the investigations in the patient's records for future follow-up, if required.

SEPSIS AND SEPTIC SHOCK

Sepsis is a systemic response to infection and a useful **clinical definition** which allows early identification and treatment of patients before organ dysfunction or failure occurs.

For **sepsis** to be diagnosed two or more of the following should be present:

- Respiratory rate >20 breaths/min or $PaCO_2$ <4.3 kPa.
- Heart rate >90 beats/min.
- Temperature >38ºC or <36ºC.
- WBC>12,000 cells/mm^3, <4000 cells/mm^3, or >10 percent immature forms.

Plus suspected or confirmed infection.

i A low diastolic and wide pulse pressure eg 110/40mmHg often indicates sepsis

Severe sepsis is present when organ dysfunction, hypoperfusion (e.g. lactic acidosis, oliguria, or an acute alteration in mental status) or hypotension (systolic BP <90mmHg) has supervened.

Septic shock is broadly defined as the development of hypotension and organ failure as a result of severe infection. Septic shock is a **clinical** diagnosis, confirmed by positive blood cultures in only a proportion of cases.

i ASK! Has the patient had chemotherapy for cancer recently? Could they have neutropenic sepsis? - see chapter 9

CLINICAL FEATURES

General clinical features

Fever and rigors.

Hypothermia is common and indicates poor prognosis.

Change in mental state: confusion or coma can occur.

Where is the source? Specific clinical features:

- Auscultation may reveal evidence of pneumonia or endocarditis.
- Abdomen - tenderness, peritonitis.
- Skin - rash, petechiae in meningoccaemia.
- Skin: cellulitis, evidence of IVDA.
- CNS: Photophobia and neck stiffness in meningitis.
- Urinary tract symptoms? Loin pain?
- Lines - Intravascular
- Trauma

Assessment

- Airway: usually secure initially unless reduced conscious level.
- Breathing: tachypnoea is common and an early sign.
- Circulation: tachycardia and hypotension may occur. In early shock there is peripheral vasodilatation and increased cardiac output. The patient is hypotensive, with warm peripheries. In advanced septic shock cardiac output falls due to hypovolaemia (+/- myocardial depression) and the skin becomes cold, cyanotic and mottled with increased capillary refill time. If unresponsive to volume resuscitation the patient is at high risk of death.
- Disability - GCS, pupils, focal neurological signs.

Organisms

- Community-acquired sepsis: Coliforms, *Streptococcus pneumoniae, Neisseria meningitidis, Staphylococcus aureus. Group A Streptococcus.*
- In hospital patients or recently discharged patients MRSA is increasingly encountered as are multi-resistant gram negatives.
- Clostridium difficile may develop up to 8 weeks after antibiotic.
- In patients with abdominal sepsis, mixed infection with coliforms, anaerobes.
- In patients with neutropenia, *Pseudomonas aeruginosa* must be covered.
- Splenectomised patients are at particular risk from capsulated organisms (*Streptococcus pneumoniae, Haemophilus influenzae, Neisseria meningitidis*) and severe malaria.
- Seek advice from ID or Microbiology if unusual freatures - travel history, animal contact, IVDU.

Investigations

Take blood cultures x2 before giving antibiotics. Administration of antibiotics should not be delayed in severely unwell patients until after other investigations including lumbar puncture.

- Blood cultures. Send *at least* 2 sets. At least 10ml of blood should be cultured per set
- Chest X-ray
- Urine: dipstick for WCC and nitrites (urgent laboratory microscopy is not usually necessary)
- Pus, wound swabs
- Sputum
- CSF
- Blood (EDTA or clotted) PCR if meningitis suspected
- Stool if diarrhoea
- FBC,CRP

Neutropenia *secondary* to sepsis is an ominous finding indicating advanced sepsis.

ANTIBIOTIC MINI-GUIDE FOR ADULTS

- Take cultures prior to starting antibiotics.
- Antibiotics should only be prescribed if there is clinical evidence of bacterial infection.
- IV antibiotics should only be used when the patient is seriously unwell, unable to take medications orally or has a diagnosis that requires IV therapy (eg. meningitis, endocarditis, bone/joint infection).
- Antibiotic therapy should be reviewed when culture results available and antibiotics stopped if microbiology results do not support a diagnosis of bacterial infection.

Infection	1st line	Alternative if allergy to 1st line
Community Acquired Pneumonia record CURB65 score and evidence of CXR consolidation	**Non severe CURB-65 0 or 1** Amoxicillin 500mg tds oral	Clarithromycin 500mg bd oral
	Severe CURB-65 2-5 Co-amoxiclav 1.2 g tds IV AND Clarithromycin 500mg bd IV	Contact Microbiology
Infective exacerbation of COPD and other LRTI without CXR consolidation	Amoxicillin 500mg tds oral (500mg-1g tds IV if severe or unable to take orally)	Doxycycline 200mg stat, then 100mg od oral or Clarithromycin 500mg bd oral
Hospital acquired pneumonia / aspiration pneumonia	If <5 days admission: Co-amoxiclav 625mg tds oral or 1.2g IV tds if oral not suitable If >5 days or recent antibiotic, contact Microbiology.	Contact Microbiology
Cystitis	Trimethoprim 200mg bd oral	Nitrofurantoin 50mg qds oral (females only)
Pyelonephritis	Co-amoxiclav 1.2g IV tds AND single dose gentamicin* 7mg/kg ideal body weight pending culture results	Ciprofloxacin 500mg bd oral
Catheter UTI	No systemic symptoms – no antibiotic Systemic illness gentamicin 160mg IV once with catheter change Single dose gentamicin may be sufficient otherwise treat according to diagnosis (cystitis/pyelonephritis)	
Cellulitis (excludes MRSA infection)	**Mild** Flucloxacillin 500mg qds oral	Clarithromycin 500mg oral bd
	Severe Flucloxacillin 1-2g qds IV and Benzylpenicillin 1.2g – 1.8g 4 hrly IV	Clindamycin 1.2g qds IV
Necrotising soft tissue infection	This is a surgical emergency Contact plastic surgery and microbiology	
Non-severe MRSA infection chest, soft tissue, urine - excludes colonisation	Doxycycline 200mg oral stat, then 100mg bd oral	Trimethoprim 200mg bd oral alternative for urine if susceptible, others discuss with microbiology
Severe MRSA infection	Vancomycin* or Teicoplanin IV: see local guidelines for dosing information	
C.difficile	See separate guidelines, assess severity, mild to moderate metronidazole 400mg tds oral	
Infective diarrhoea (gastroenteritis)	Antibiotics are usually contraindicated. If patient severely ill/septicaemic perform cultures and discuss with microbiology isolate patient.	
Intra-abdominal sepsis	Piperacillin-tazobactam 4.5g tds IV	Contact microbiology
Sepsis Unknown site (excluding meningitis) document sepsis criteria	Co-amoxiclav 1.2g IV tds AND single dose gentamicin 7mg/Kg ideal body weight pending culture results. Seek senior opinion. Obtain full history (assess exposures - travel, sexual, occupational, leisure, zoonotic, drugs) and examination.	
Neutropenic sepsis	Piperacillin-tazobactam 4.5g IV qds. Add Gentamicin* 7mg/Kg ideal body weight if haematological malignancy or SEWS 6 or more (solid tumour)	
Bacterial meningitis	Ceftriaxone 2g IV bd If patient is > 55 yrs, pregnant or immunocompromised add amoxicillin 2g IV 4 hourly to cover *Listeria*. Consider dexamethasone 10 mg qds IV if pneumococcal meningitis likely and patient has not already received antibiotics	Contact microbiology

*Therapeutic drug monitoring is required.
There may be some local variations: check your local policy.

If life-threatening penicillin allergy, discuss alternative antibiotics promptly with on call consultant in Microbiology or ID.

Differential diagnosis

Remember other causes of hypotension and shock:

Unexplained Hypotension - think of:

- Sepsis (including Toxic Shock Syndrome)
- Myocardial infarct with no chest pain (early ECG)
- Occult blood loss
- Poisoning
- Pulmonary embolism
- Anaphylaxis
- Addison's disease
- Autonomic dysfunction
- Cardiac tamponade

Supportive management

Call ICU early

- High concentration oxygen by face mask: 60-100% aiming for SpO_2 >96%.
- Secure adequate IV access and commence volume replacement. Insert a large bore peripheral venous line and administer saline 0.9% or colloid. If the patient is hypotensive give 250ml boluses of Gelofusine.
- Volume replacement is a priority, and should be monitored scrupulously.
- Take blood cultures x2, and other Microbiology samples, then choose and start appropriate IV antibiotics.
- Draw venous blood for FBC, U&Es, glucose, clotting.
- Check arterial blood gases and blood lactate.
- Make a full assessment of the patient's condition and the likely aetiology as above.
- Insert a urinary catheter.
- Observe carefully for fluid overload and be aware of the possibility of acute renal failure.
- Remove or drain any obvious source of infection such as an abscess or infected IV line.

- Remember to look for intra-abdominal sources, severe cellulitis, necrotising fasciitis or gangrene and if suspected seek urgent surgical opinion.

Septic shock unresponsive to oxygen therapy and initial volume loading has a high mortality. Invasive monitoring and vasopressor therapy are likely to be necessary.

CALL ICU EARLY.

ASK! What is the diagnosis? (source of Sepsis)

See Identifying Sepsis Early materials:
www.scottishintensivecare.org.uk education section

ANAPHYLAXIS

Anaphylaxis is an acute allergic process where a substance to which the individual has been previously exposed results in mast cell degranulation and massive mediator release. Anaphylactic shock is twice as common in women and atopy is present in about a third of cases.

Aetiology

- Foods: nuts, fish.
- Drugs: NSAIDs, antibiotics, anaesthetics.
- Stings
- Idiopathic

Presentation

There is a spectrum of severity from mild to catastrophic, and treatment must be tailored to the individual situation.

Clinical features

- Airway compromise and breathing difficulties: stridor, wheeze, tachypnoea.
- Circulatory collapse: hypotension, tachycardia.
- Itch, skin rash, angio-oedema - may be absent.
- In about 20% abdominal or muscle pain or GI upset are major symptoms.

ACUTE ANAPHYLAXIS

Bronchospasm and/or cardiovascular collapse. Adrenaline should be given to all patients with respiratory difficulties and/or hypotension.

1. Immediate action

O_2 + Help
Adrenaline
IV Fluids

- Discontinue administration of suspect drug, blood transfusion or IV fluid.
- **GET HELP - call 2222.**
- ABC: maintain airway and give 100% oxygen by high flow with oxygen mask and reservoir bag or bag/mask/valve apparatus. Intubation may be required early, particularly if stridor is present.

- Commence basic life support (CPR) if no pulse present.
- Secure adequate IV access if not already.
- Monitor oxygen saturation and BP.
- ECG must be continuously monitored, and a defibrillator immediately available.
- **Give adrenaline 500 micrograms intramuscular (0.5ml of 1 in 1000 solution). Repeat in 5-10 mins if no better or getting worse.**
- Give IV fluids. Hartmann's solution, 0.9% saline or Gelofusine 10ml/kg (about 500ml to 1 litre) can be used initially. Colloid may be more efficient at restoring blood volume especially in severe cases.

2. Supplementary action to damp down inflammation/prevent recurrence

- Give **hydrocortisone 200mg IV (slowly)**.
- Give antihistamines: **chlorphenamine** (chlorpheniramine) **10-20mg IV slowly**.
- Give **salbutamol 5mg** nebuliser if wheeze present.
- Measure arterial blood gases and coagulation.

VERY SEVERE ANAPHYLAXIS

Most cases will resolve with the above treatment. However in the most severe cases with life-threatening shock or airway compromise, particularly in association with general anaesthesia, adrenaline should be given intravenously as described here.

- This is a rapidly life-threatening condition requiring **experienced** clinical management. Intravenous adrenaline boluses should only be given by, or under the direct supervision of, an appropriately experienced clinician.
- Give **ADRENALINE INTRAVENOUSLY** (especially in the presence of stridor or wheeze) starting with **50 to 100 micrograms** (0.5-1 ml of 1 in 10,000 i.e. Minijet), with further 50 to 100 microgram aliquots as required.
- Adrenaline dose in *cardiac arrest* is 1 mg (10ml of 1 in 10,000).

SUBSEQUENT ACTION

Record allergy prominently in notes and explain to patient and family.

CONTINUING PROBLEMS (requiring ICU referral for:)

Severe and resistant bronchospasm

- **Salbutamol** 5mg nebulised in 100% oxygen, repeated as necessary.

Always maintain oxygen therapy during administration of bronchodilators.

- **Salbutamol** 250 micrograms slowly IV (4micrograms/kg over at least 10 mins) as a loading dose followed by 5-20 micrograms/min infusion (directed by Senior Clinicians).

  N.B. Can cause tachyarrhythmias, hypotension, hypokalaemia.

Alternatively (as directed by Senior Clinicians)

- **Adrenaline** by infusion 6mg diluted in 100ml of dextrose 5% at 3-10 ml per hour.
- **Aminophylline** 250mg IV over 20 mins by volumetric pump or syringe driver. This is usually sufficient but up to 6-8mg/kg can be used.

  N.B. Can cause tachyarrhythmias, myocardial ischaemia and hypokalaemia. Caution in the elderly, IHD or if on oral theophylline. Half loading dose if on theophylline or level unavailable.

Refractory hypotension and/or pulmonary oedema and/or bronchospasm requires ICU referral.

FURTHER MANAGEMENT

Even if stabilised and improving:

- admit to ICU or HDU or appropriate monitored area.
- monitor respiratory rate, ECG, BP, SpO_2.
- continue steroids and anti-histamines orally or IV.

Follow up is crucial: over 60% of patients will have repeated attacks.

- Patients should be advised to wear a medic-alert type bracelet or talisman. Information on this is available from:

  Anaphylaxis Campaign

  01252 542029 **info@anaphylaxis.org.uk**

  British Allergy Foundation

  02083 038792 **www.allergyfoundation.com**
  email: allergybaf@compuserve.com

- In food, insect or unknown allergies provide an Epipen or Anapen adrenaline injector and training in use.
- Referral to allergist is ideal.

ALGORITHM FOR FIRST MEDICAL RESPONDER TO ANAPHYLAXIS

Resuscitation Council (UK)

Anaphylaxis algorithm

Anaphylactic reaction?

↓

Airway, Breathing, Circulation, Disability, Exposure

↓

Diagnosis - look for:
- Acute onset of illness
- Life-threatening Airway and/or Breathing and/or Circulation problems [1]
- And usually skin changes

↓

- **Call for help**
- Lie patient flat *
- Raise patient's legs

↓

Adrenaline [2]

↓

When skills and equipment available:
- Establish airway
- High flow oxygen
- IV fluid challenge [3]
- Chlorphenamine [4]
- Hydrocortisone [5]

Monitor:
- Pulse oximetry
- ECG
- Blood pressure

---

[1] Life-threatening problems:

Airway:	swelling, hoarseness, stridor
Breathing:	rapid breathing, wheeze, fatigue, cyanosis, SpO_2 < 92%, confusion
Circulation:	pale, clammy, low blood pressure, faintness, drowsy/coma

[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 more than 12 years	10 mg	200 mg
Child 6 - 12 years	5 mg	100 mg
Child 6 months to 6 years	2.5 mg	50 mg
Child less than 6 months	250 micrograms/kg	25 mg

* May worsen Respiratory distress

URTICARIA AND ANGIO-OEDEMA

- These conditions are sub-acute or chronic unless they accompany anaphylaxis or the airway is involved by swelling.
- Sudden total airway obstruction can result and is rapidly fatal unless oxygenation is maintained.

Management

- Airway compromise: if stridor is present and airway obstruction imminent endotracheal intubation is mandatory (GET HELP).
- Give high concentration oxygen. Intubation may be difficult: fast bleep (2222) anaesthetics and ICU.
- In severe cases of urticaria/angio-oedema adrenaline should be given as for anaphylaxis: 500 micrograms im (0.5ml 1 in 1000 solution) or using the IV schedule detailed above.
- If total upper airway obstruction occurs oxygenation must be maintained via emergency cricothyrotomy. Kit in A&E, ARAU, Theatres and ICUs.
- May be more resistant to drug treatment than anaphylaxis and need early intubation. Often a very difficult procedure.
- Nebulised adrenaline may be effective.
- Antihistamines and steroids are used as for anaphylaxis.

LIFE-THREATENING UPPER-AIRWAY OBSTRUCTION

Inability to get gas in by patient or by attendants.

- Causes include foreign body, swelling (anaphylaxis, angio-oedema see above), trauma, burns and peri-anaesthetic (laryngospasm).
- Administer 100% oxygen via BMV and call for Anaesthetic/ICU HELP.
- May need to contact ENT surgeons for definitive airway.

ACUTE PAIN MANAGEMENT

The effective management of pain is an essential component of the care of almost every patient admitted to hospital. While it is important to provide analgesia for humanitarian reasons, pain is not a benign symptom and can be a contributory factor to morbidity and mortality in some circumstances. Conversely effective pain relief can facilitate recovery from illness and surgery.

More detailed guidance on acute pain management can be found in the Lothian Guidelines for the Management of Acute Pain available on the intranet and on most wards. Also, the hospitals acute pain teams should be contacted for advice, information and appropriate patient referrals (see over page for contact details).

Pain score/ level of distress	Intervention	Prescription
0 to 3 mild undistressing pain	None required	Mild analgesics should be available as required if pain is anticipated Paracetamol, NSAID & a weak opioid such as codeine or a combination e.g. cocodamol should be prescribed as appropriate
3 to 6 moderate pain &/or distress	Rescue analgesia required Review of prescribed analgesia required	Usually an opioid titrated to effect orally or parenterally Is the patient on: • regular paracetamol? • regular NSAID? • regular opioid?
7 to 10 severe and distressing pain	**Urgent** rescue analgesia required Review of prescribed analgesia required	Intravenous morphine or equivalent titrated to effect. Is the patient on: • regular paracetamol? • regular NSAID? • regular opioid of appropriate strength?

PAIN MANAGEMENT BASIC PRINCIPLES

- Pain management regimens must be tailored to individual patient requirements. Where appropriate the combined use of different analgesics (multimodal analgesia) should be used. This is more effective, limits the dose of any one therapy and helps to minimise serious side effects. It is necessary to review the patient's response to therapy and then tailor ongoing analgesia to their needs.
- In acute pain it is anticipated that the worst pain will be present initially and steadily improve with time. It is therefore essential to have an appropriate level of maximum therapy instituted at the outset of treatment and gradually stepped down.
- Regular assessment of pain scores and the side effects of therapy is necessary to ensure effective and safe treatment.
- Pain management should aim to control pain to a tolerable level. Remember it should be possible with appropriate interventions as above to control acute pain for most hospital patients to a level with which the patient is comfortable. However, it is inappropriate to aim for complete analgesia in all patients since this is likely to lead to problems with treatment side effects.
- Pain relief from any analgesic regime is balanced against side effects. In some situations a compromise is necessary, where less effective analgesia is acceptable to avoid complications of therapy which may be distressing or which may lead to morbidity and even mortality.
- Regular analgesia is more effective than "as required" dosing. "As required" prescribing should only be used for the mildest pain or to relieve breakthrough pain in addition to regular analgesia.
- When converting from a more complex analgesic regime eg epidural, adequate step down analgesia must be prescribed.
- Analgesic prescriptions should be reviewed regularly, giving consideration to changing requirements and possible drug interactions.
- Where a patient can take oral medications, analgesia including opioids should be given orally unless severe uncontrolled pain necessitates iv titration.

DO YOU NEED HELP ?

Contact the Acute pain team

Or Anaesthetist on call (out of hours and at weekends)

ACUTE PAIN GROUPS : CONTACT NUMBERS

Western General - 08.00-17.00: contact the Clinical Nurse Specialists for Pain on bleep 5292 or ext. 31670. Out of hours and at weekends contact the duty anaesthetist on bleep 5112.

Royal Infirmary - 08.00-17.00: contact the Clinical Nurse Specialists for Pain on bleep 5247 or ext. 23205. Out of hours and at weekends contact the duty anaesthetist on bleep 2140.

St John's Hospital - 08.00-17.00: contact the Clinical Nurse Specialists for Pain on bleep 934 or ext. 53065. Out of hours and at weekends contact the duty anaesthetist on bleep 561

Further Information: Lothian Acute Pain Guidelines Site (Intranet)

SUMMARY OF PRINCIPLES OF ACUTE CARE

- Assess and treat simultaneously.
- Give enough oxygen to correct hypoxaemia.
- Establish adequate IV access. Take blood for urgent tests, including ABG and cross-match.
- Commence continuous monitoring.
- Perform illness severity assesment: SEWS scoring and **look at the patient!**
  ? risk of deterioration/cardiac arrest.
  ? where to admit.
  ? co-morbidity.
- Get help as indicated.
- Write in notes and prescribe drugs (incuding oxygen and fluids).
- Communicate with patient, family and significant others.
- Re-assess repeatedly and act on findings.
- Treat pain, nausea and other symptoms appropriately.
- Make a diagnosis, institute definitive treatment and assess response.
- Communicate the above and the plan with the patient, the ward team and the patient's relatives.

Many of these elements should happen at the same time.

THE FOUR KEY ELEMENTS OF EMERGENCY MANAGEMENT

1.	2.	3.	4.
Acute assessment (with targeted examination) stabilisation immediate investigations & support	Monitors: reassess Surface Invasive Real time or Delayed Illness severity assessment	Clinical decision making Team work Task Mx Situation Awareness Critical Thinking	Differential diagnosis/ definitive diagnosis Immediate, medium term and long term treatment

APPROACH TO THE PATIENT WITH …

CHEST PAIN

You have been called to see the patient…

- Ensure P, BP, temp and RR are recorded while you are getting there.

On your way to the ward work through a differential diagnosis:

- Angina or MI
- Pleurisy or Pericarditis.
- Oesophageal/dyspepsia
- Musculoskeletal pain

i On arrival use the initial assessment process described in Chapter 2.

- **Give oxygen and establish IV access if appropriate.**
- Make your clinical assessment and take an ECG.
- Draw bloods if appropriate.
- Make your own assessment of the need for analgesia and prescribe it/administer it as necessary.
- Pulse oximetry and ECG monitoring may be indicated.
- Decide on illness severity, the need for senior opinion and further treatment/investigations.
- Write in notes and prescribe drugs including oxygen.

A ROUGH GUIDE

- STEMI: call CCU and initiate treatment; see Cardiology section.
- Acute Coronary Syndrome: initiate treatment and consider need for monitoring, d/w Cardiology bleep 4028 RIE, 5689 at WGH, #630 at SJH (the on call medical middle grade).

- Angina (rate related): treat rate (will depend on cause and rhythm).
- Oesophageal reflux: gaviscon or mucogel.
- Musculoskeletal pain: prescribe appropriate analgesia.
- Pleurisy: treat cause (PE, pneumonia) and give analgesia.

ACUTE SHORTNESS OF BREATH

Use the initial assessment process previously described.

- Give oxygen and establish IV access if appropriate.
- Pulse oximetry is essential and ECG monitoring may be indicated.

Remember if RR > 30 &/or paradoxical breathing - it is serious. GET HELP EARLY.

- Ensure temp, P, BP, RR, PEFR are all done.
- Organise a CXR.
- Do ECG, take bloods and ABG's on O_2 recording FiO_2.
- Based on your clinical judgement commence treatment e.g. nebulised bronchodilators.

Have a differential diagnosis in mind, such as:

- Asthma
- LVF
- PE
- Pneumonia
- Pneumothorax
- Sepsis
- Metabolic acidosis

- Get bloods etc sorted.
- Write in notes and prescribe drugs including oxygen.
- Reassess when all the information is to hand, and consider response to initial therapy: better, the same or worse?

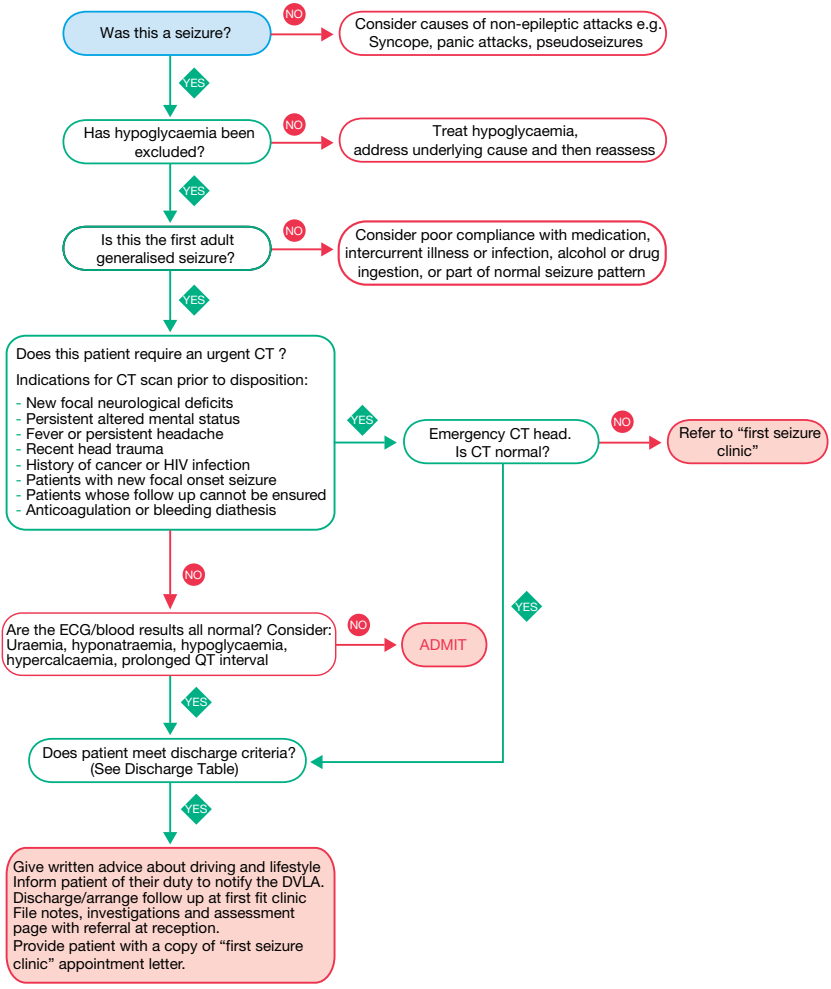
TREATMENT

Get help if necessary

Asthma	
LVF	see appropriate
PE	sections
Pneumothorax	
Pneumonia	
Sepsis	
Metabolic acidosis	

PROTOCOLS FOR SPECIFIC PROBLEMS (based on RIE protocols)

FIRST SEIZURE IN ADULTS



Produced by Protocol Group October 2003

"FIRST SEIZURE" APPOINTMENT LETTER

DATE:

Patient ID sticker

Dear

We think it is possible that you have had an epileptic seizure (fit) to account for your recent symptoms. We are therefore referring you to a specialist for a further opinion regarding the diagnosis, possible investigations and treatment if necessary.

In order to make your appointment, you need to telephone the Medical Outpatient Department 2 on 0131 242 1368 or 1369. The department is open Monday-Thursday 0900-1700, and Fridays 0900 to 1600. You should ask the receptionist to book you an appointment in **Dr Davenport's First Seizure clinic** and we recommend that you have a pen and piece of paper handy to note the date and time of your appointment. The clinic is currently held on a Monday morning in MOPD 2 in the Royal Infirmary of Edinburgh.

- If someone witnessed your collapse or funny turn, then please bring them with you to the clinic, or arrange for them to be contactable by phone, as the doctor may wish to speak to them.
- Please bring any prescription medications that you are taking with you, in their packaging, or a list of the medications you are taking and their doses.
- If you hold a driving licence, we would advise you that should not drive until you have been seen in the clinic.

Doctor's name (printed):……

Responsible doctor should document in ED record that patient has been given this letter and forward the ED sheet together with completed first seizure protocol to Dr Davenport, Consultant Neurologist, MOPD 2, RIE

Doctor's signature:……

MANAGEMENT OF FIRST SEIZURE IN ADULTS

Inclusion Criteria	• Patients >16yrs <60yrs • Clear history of first generalised seizure • Seizures related to drug or alcohol ingestion or withdrawal	Name DoB Address Tel No
Exclusion Criteria	• Patients with non-epileptic attacks (e.g. syncope, pseudoseizures) • Patients with known seizure or metabolic disorder • Seizures related to recent trauma • Eclampsia	

History Table (please tick if relevant)	✓
Witness history	
Type of seizure (generalised, partial)	
Previous history of seizures, febrile fits, birth trauma, meningitis, head injuries	
Family history of seizures	
Possible precipitating events (alcohol, drugs, sleep deprivation)	

Clinical Findings (enter findings)

Temperature	Pulse	BP	Resp Rate	BM	Breath Alcohol

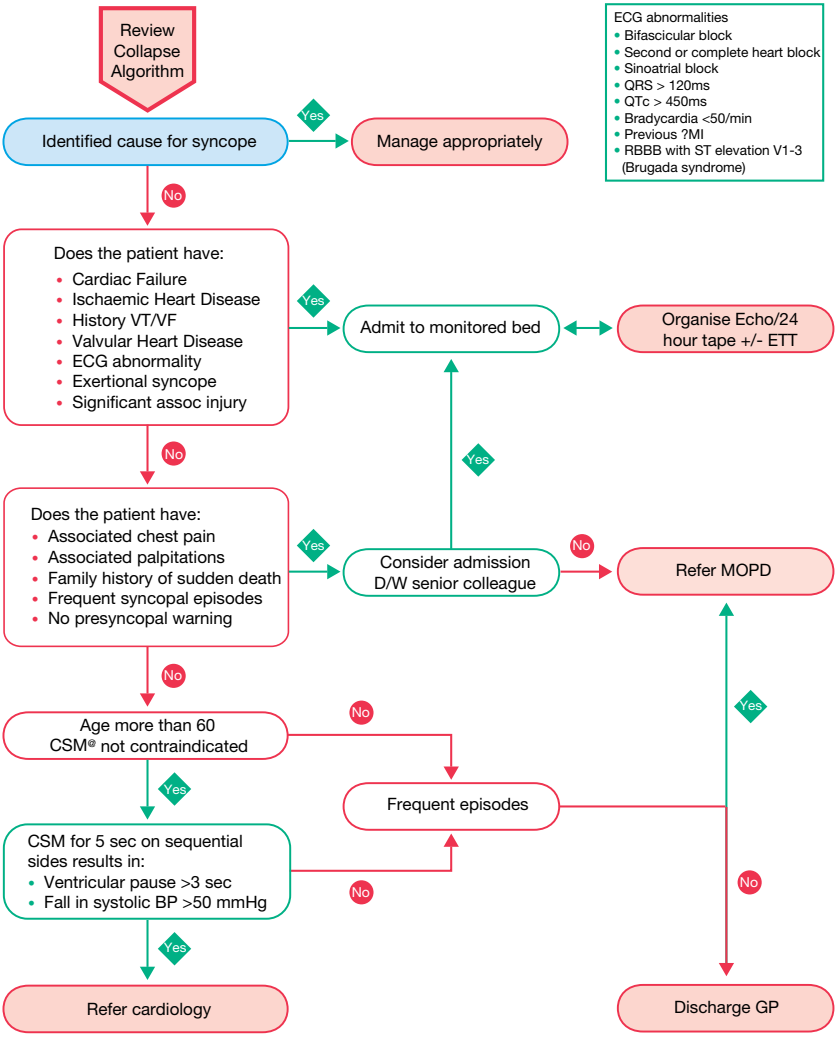
GCS			Pupils				Limb Movement			
			Right		Left		R Arm	L Arm	R Leg	L Leg
E	M	V	Size	Reaction	Size	Reaction				

Investigations Table (enter result)

ECG			
Urea		Hb	
Creat		MCV	
Na		WCC	
K		PLT	
CO_2		Bil	
Ca		GGT	
Alb		ALT	
Glu		Alk Ph	
CT			

Discharge Table (all boxes MUST be ticked before discharge)	✓
Patient fully recovered with no persistent neurological symptoms/signs (include headache)	
Normal observations and investigations (include temperature)	
Patient has been given written advice about driving and lifestyle changes and their duty to notify the DVLA	
Patient has a responsible adult to stay with following discharge	
Patient will attend follow up	
First fit clinic letter with copies of all notes and investigations forwarded to Dr Davenport's secretary at MOPD 2, RIE	

MANAGEMENT OF SYNCOPE



@Carotid Sinus Massage contraindicated if:
Carotid Bruit present; recent CVA, TIA or MI (6 months)

Produced by Protocol Group October 2003

MANAGEMENT OF UNEXPLAINED SYNCOPE IN ADULTS

Inclusion Criteria	• Patients >16yrs • Confirmed history of unexplained loss of consciousness	Name
Exclusion Criteria	• Any of the following after assessment for collapse (Fit, hypoglycaemia, postural hypotension, arrhythmia, PE, CVA, vasovagal event, GTN syncope, situational syncope, structural cardiac cause) FOLLOW COLLAPSE ALGORITHM	DoB Address Tel No

Indications for admission	**Indications for MOPD follow up**
• Congestive Cardiac Failure • Ischaemic Heart Disease • History of ventricular arrhythmia • Significant Valvular heart disease • ECG abnormality (see algorithm) • Exertional syncope • Significant injury associated with syncope	• Syncope associated with chest pain or palpitations • Family history of sudden death • Frequent episodes • No presyncopal warning • Syncope while supine

Clinical Findings (enter findings)

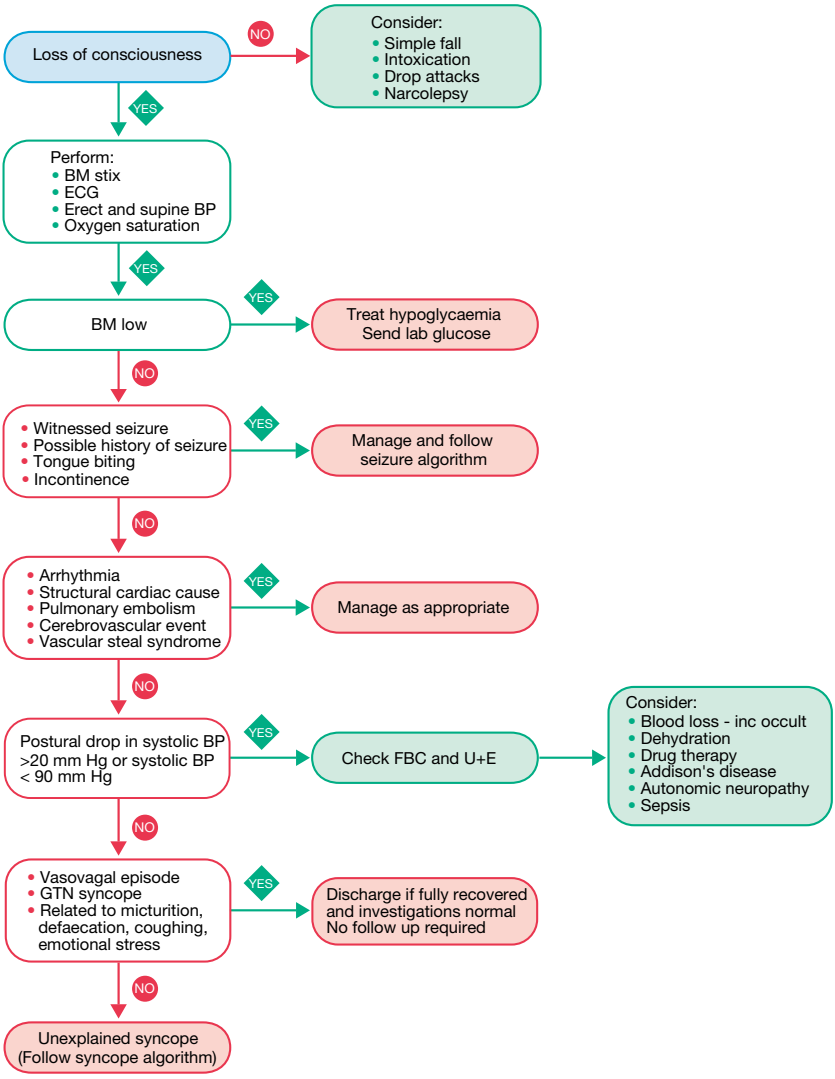
Temperature	Pulse	O_2 saturations	BM	Breath Alcohol
Lying BP	Standing BP	Carotid Sinus Massage		

Investigations Table (enter result)

ECG (see list)			
Urea		Hb	
Creat		MCV	
Na		WCC	
K		PLT	
CO_2		Bil	
Ca		GGT	
Alb		ALT	
Glu		Alk Ph	
Other			

Discharge Table (all boxes MUST be ticked before discharge)	✓
Is the patient fully recovered and appropriate for discharge? (see admission criteria above)	
Is the patient fit for discharge i.e. consider social support, mobility and age	
Has MOPD referral form been completed and relevant documents included (see follow up criteria above)	
Patient has a responsible adult to stay with following discharge	
Arrange Echo and 24 hour tape for all patients attending MOPD. Other investigations e.g. ETT and Tilt table will be organised *AFTER* MOPD review	
Advice has been given regarding driving, hobbies and occupation	

MANAGEMENT OF COLLAPSE



Inclusion Criteria	• Age <60y • Typical pain with (microscopic) haematuria	Name DoB
Exclusion Criteria	• Age >60y • Temperature > 38C • Known Vascular Disease	Address Tel N o

Clinical Findings **(enter findings)**

Temperature	Pulse	BP	Resp Rate	BM	Urinalysis	Urine

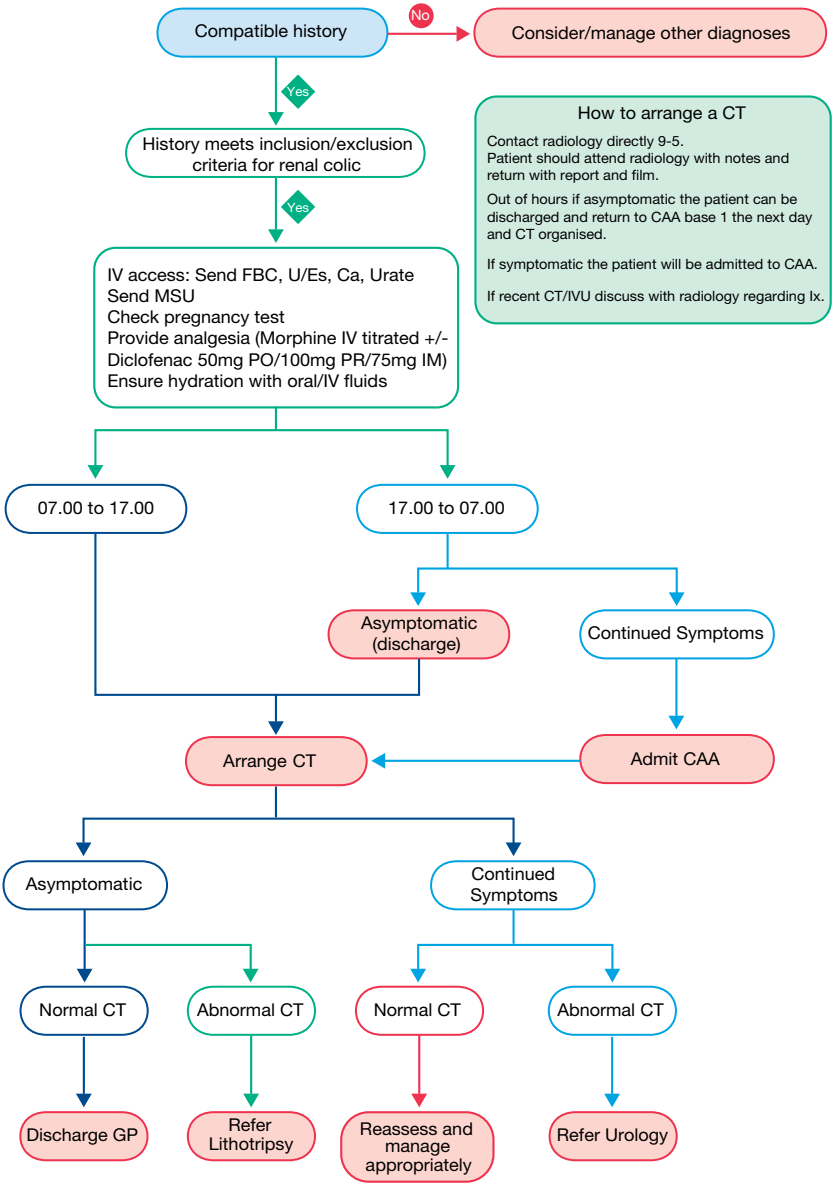
Investigations Table **(enter result)**

Urea		Glu	
Creat		Urate	
Na		Hb	
K		WCC	
CO_2		Platelets	
Ca			
KUB		CT	
IVU			

Indications for admission	✓
Intractable pain and vomiting	
Known single kidney	
Renal transplant	
Chronic renal failure	
CT reveals proximal stone or >8 mm stone and patient symptomatic (refer urology)	
Discharge from CAA **(all boxes MUST be ticked before discharge)**	✓
Patient fully recovered with controlled symptoms/signs	
Normal observations and investigations (include temperature), MSU sample sent	
Normal U+Es	
Regular analgesia prescribed	
If discharged at night patient able to attend RIE CAA base 1 or ARAU WGH 09.00 following morning for Ix.	
If discharged during day CT normal	
Lithotripsy Unit follow up	✓
Abnormal CT	
Lithotripsy referral form completed	
Full length CT and KUB sent by courier to Lithotripsy Unit with referral form	
Patient aware Lithotripsy Unit will make contact within 3 working days	

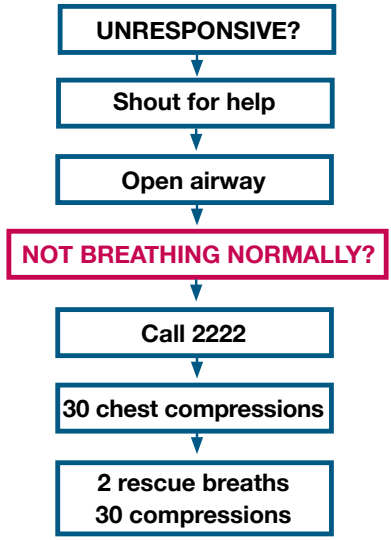
MANAGEMENT OF RENAL COLIC

Based on RIE Procedure



RESUSCITATION

ADULT BASIC LIFE SUPPORT



- If he is breathing turn into recovery position, monitor for continued breathing and get/send for help.
- If he is not breathing send someone for help or, **if you are on your own, leave the victim and telephone for help using 2222**.
- Return and immediately commence chest compressions at a ratio of 30 compressions to 2 ventilations at rate of 100/minute.
- Continue until the victim shows signs of life or advanced life support techniques can be applied.
- Do not interrupt CPR unless the patient responds, help takes over or you are exhausted.
- In respiratory only arrest continue to ventilate the patient at a rate of 10-12 breaths per minute.

Training sessions can be arranged by contacting your local resuscitation department:

REH - 46748
RIE - 21760
SJH - 53892
WGH - 32496

ADULT ADVANCED LIFE SUPPORT: Notes on Algorithm see page 1

- Basic life support is commenced in unmonitored situations while the monitor/defibrillator is obtained and attached.
- In witnessed and monitored collapse a single precordial thump can be administered by trained personnel.
- In monitored patients the clinical and ECG detection of cardiac arrest should be simultaneous.

In the presence of VF/pulseless VT defibrillation must occur as soon as possible.

- Once the airway is secured (endo-tracheal tube) chest compressions are performed at 100/min and asynchronous ventilations at 10/min.

VENTRICULAR FIBRILLATION/ PULSELESS VENTRICULAR TACHYCARDIA

VF/Pulseless VT section

Defibrillation: The first shock is given at 150j biphasic (360j monophasic) ensuring good contact with the chest wall. Use of gel pads or hands free pads as applicable ensuring correct positioning and pressure application.

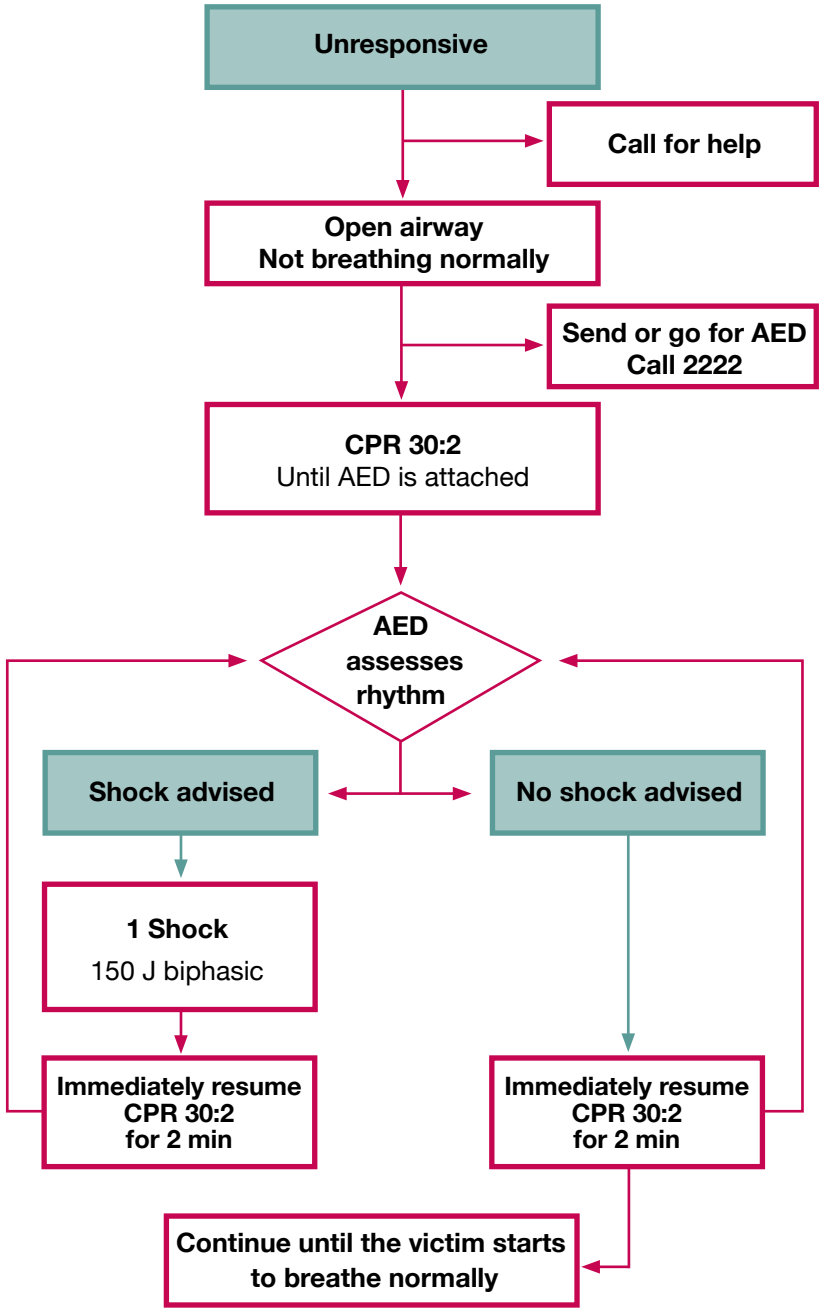
- The second and all subsequent shocks are delivered using the same energy level.
- A pulse check is no longer performed unless the patient responds to treatment.
- A two minute period of CPR immediately follows defibrillation.
- **Adrenaline 1mg should be given IV immediately before the third shock then every 3-5 minutes (alternate cycles)**. If no IV access give adrenaline 3mg (diluted to 10 mls with sterile water) via the ET Tube.
- **Adrenaline** should be administered just prior to shock.

Drug therapy

- In refractory cases amiodarone can be considered and would be given immediately prior to the fourth shock. A dose of 300mg IV from prefilled syringe or made up to 20mls with 5% dextrose over 2-5 minutes in a large/central vein. A generous flush should be given if using a peripheral vein.
- Expert advice should be sought.
- The use of IV sodium bicarbonate should be limited to patients with a severe metabolic acidosis, hyperkalaemia or tricyclic antidepressant overdose.

The mainstay of the correction of acidosis in cardiac arrest is adequate ventilation and oxygenation with rapid restoration of a perfusing cardiac rhythm.

ALGORITHM FOR AUTOMATED EXTERNAL DEFIBRILLATION



NON SHOCKABLE RHYTHMS

Cardiac arrest in asystole and PEA may result from a number of causes other than ischaemic heart disease (see page 47).

These are potentially **reversible** causes of cardiac arrest. They should also be regarded as **preventable** causes of cardiac arrest, in that their recognition and treatment prior to cardiac arrest can prevent deterioration.

- On this side of the algorithm CPR is conducted for 2 minute periods whilst considering and treating any of the above.
- The airway should be secured, IV access obtained and adrenaline 1mg given IV every 3-5 minutes. (alternate cycles).
- After 2 minutes of CPR the ECG rhythm is re-assessed.
- If a rhythm compatible with cardiac output is present check the pulse.
- If VF/pulseless VT is present follow that side of the algorithm. Otherwise, continue with loops of the right hand path of the algorithm for as long as it is appropriate to continue active resuscitation attempts.

Drugs

- A single dose of **Atropine 3mg IV** is given in **asystole** to block vagal activity, and in **PEA with a ventricular rate under 60 beats per minute**.
- Adrenaline is given 1mg IV every 3-5 minutes (as above).

Pacing

External or transvenous pacing is unsuccessful in asystole but may be effective in ventricular asystole where p waves are still evident. Percussion pacing may also be effective.

External pacing defibrillators can be found at the following locations:
RIE: A&E, CAA, CCU, General and Cardiothoracic ICU's & HDU's
SJH: A&E and Ward 24
WGH: ARAU, ICU, all HDU's, ECG, Wards 15, 26, 43 & 54
Liberton Hospital

Chapter 3

ACUTE CARDIOLOGY AND VASCULAR EMERGENCIES

CONTACT NUMBERS

RIE fast bleep non cardiac arrest	1111
RIE cardiac arrest	2222
WGH fast bleep non cardiac arrest	2222
WGH cardiac arrest	2222
SJH cardiac arrest	2222

Registrars Room (WGH) 31850 5689

Registrars Rooms (RIE)..... 21910 4028

Cardiology bed coordinator (RIE) ...5606

GENERAL ADMINISTRATIVE POLICY (RIE)

ADMISSIONS TO CCU

The following patients should be considered for admission to CCU:

- Patients with an acute coronary syndrome within the preceding 24 hours.
- Patients with life threatening, or haemodynamically unstable arrhythmias.
- Heart failure, pulmonary oedema or cardiogenic shock where intensive management/monitoring is required.
- Patients requiring monitoring after interventional cardiology procedures.
- Following cardiac arrest.
- Acute Aortic dissection (Type A&B).

TRANSFERS/DISCHARGES

- After an uncomplicated ACS the patient may be transferred to a **non-monitored** cardiology or general medical bed after 24 hours. If there is a pressure on CCU beds transfer could take place sooner.

- Patients should be pain free and haemodynamically stable.
- Uncomplicated, stable infarct patients may be transferred from CCU to a **monitored** bed in the general cardiology ward within 24 hours of admission.
- The consultant with responsibility for CCU patients for the week will decide which patients are suitable for transfer out at each ward round in discussion with CCU charge nurse.
- Ideally all transfers should take place before 20.00hrs. Transfers should ideally be accompanied by a letter or written clinical summary when transferring out-with cardiology. Transfers within cardiology should at least involve a handover by verbal clinical summary for the team taking over care of the patient. This summary should include details of diagnosis, treatment at time of transfer/discharge and consultant responsible for the patient.
- Discharges home should be planned according to hospital discharge planning policy (for discharge pathway see the MI integrated care pathway).

CARDIOLOGY SUPPORT

There is an organised 24 hour rota for Consultant/Registrar cardiology opinion.

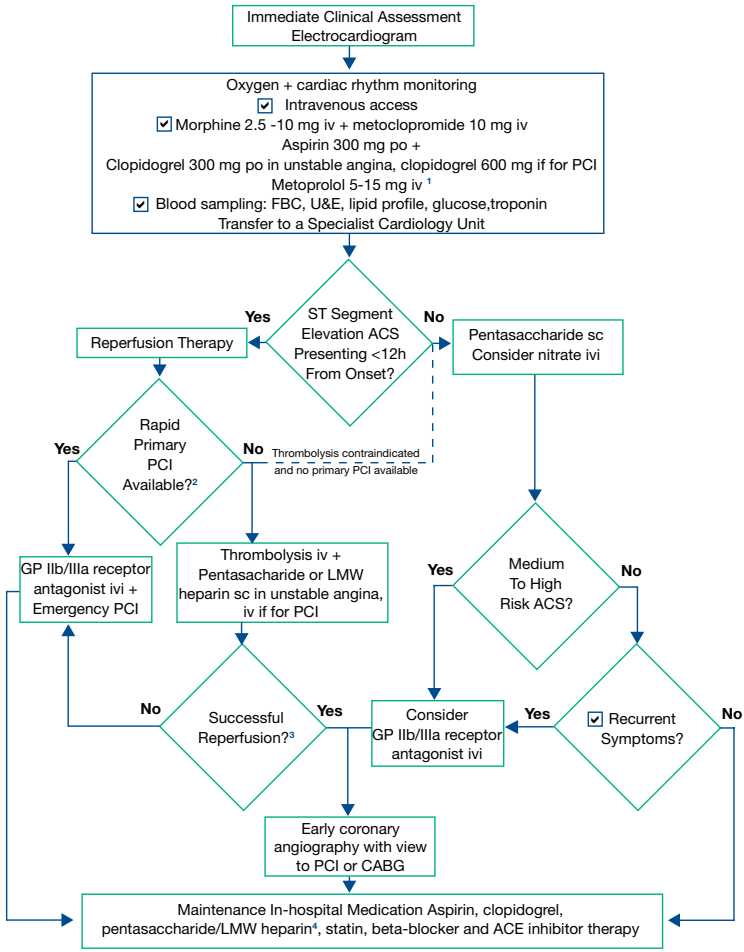
Out of hours the appropriate person can be contacted by bleep, radiopage (via switchboard), mobile phone or at home.

A copy of the rota is available in CCUs, cardiac catheter labs and switchboards.

HANDOVER OF CLINICAL CARE

When required, it is the responsibility of the medical and nursing team to ensure there is a hand-over to the team on the ward (letter or verbal). Outwith normal working hours (i.e.: from 5pm & at weekends) CCU nursing staff will inform the appropriate nursing and medical team of the transfer.

SUMMARY OF MANAGEMENT OF ACUTE CORONARY SYNDROME



TIMI risk score
(Death, MI, recurrent ischaemia)
Low risk ≤ 2
Medium risk 3-4
High risk ≥ 5
GRACE score (Death)
Low risk ≤ 4.9%
Medium risk 5-9.9%
High risk ≥ 10%

[1]Killip class 1 in the absence of bradycardia (heart rate <65/min) or hypotension (systolic blood pressure <105 mmHg).
[2]Within 90 minutes of diagnosis or if thrombolysis is contra-indicated.
[3]Patients presenting within six hours of symptom onset.
[4]Continued for eight days, or until hospital discharge or coronary revascularisation.

Myocardial Ischaemia may be caused by anaemia, particularly with an acute bleed. In this case blood transfusion and cessation of bleeding are appropriate and most of the above therapy is contraindicated ie heparin, GTN, antiplatelet agents and β–blockers.

ACUTE CORONARY SYNDROMES

In order to make a presumptive diagnosis of ACS the patient should exhibit symptoms consistent with acute myocardial ischaemia and have one of the following:

- electrocardiographic changes consistent with an ACS
- serial increases in biochemical markers of myocardial necrosis, and/or
- documentation of coronary artery disease.

IMMEDIATE MANAGEMENT

In combination with the clinical presentation, an ST segment elevation acute coronary syndrome is defined by the presence of ≥1mm ST elevation in at least two adjacent limb leads, ≥ 2mm ST elevation in at least two contiguous precordial leads, or new onset bundle branch block. In absence of ST segment elevation (non-ST segment elevation acute coronary syndrome), patients are initially managed *without* emergency reperfusion therapy.

The categories of ACS, unstable angina or myocardial infarction, are defined by the serum concentration of cardiac enzymes and markers. The cardiac markers, troponin I and troponin T are extremely sensitive to myocardial injury and damage. Very small amounts of damage can be detected allowing identification of 'micro-infarcts' where there is an elevation in the troponin concentration without a significant rise in creatine kinase or other cardiac enzymes.

DIAGNOSIS AND RISK STRATIFICATION OF PATIENTS WITH ACUTE CORONARY SYNDROME

Many treatments, especially for ST elevation acute coronary syndrome, are critically time-dependent and the immediate clinical assessment of all patients with a suspected acute coronary syndrome is essential. The electrocardiogram should be repeated

- with recurrent or persistent pain
- the day after admission
- prior to discharge
- with any change in the patient's symptoms

Patient's with suspected acute coronary syndrome require immediate clinical assessment and 12 lead electrocardiogram.

To establish a diagnosis in patients with acute coronary syndome (without ST elevation), a serum troponin concentration should be measured 12 hours from the onset of symptoms.

Troponin concentration provides one measure of risk that should not be relied upon in isolation. For example, patients with unstable angina and a troponin concentration within the reference range at 12 hours, can have a high risk of future cardiovascular events (30 day risk of death up to 4-5%). Elevated troponin concentrations are associated with adverse outcomes in many different clinical settings including congestive heart failure, sepsis, pulmonary disease, acute pulmonary embolism and chronic renal failure.

Investigations - electrolytes, urea, creatinine, liver function tests, glucose, full blood count and cholesterol.

Risk stratification using clinical scores should be conducted to identify those patients with an acute coronary syndrome who would benefit from early therapeutic intervention.

IMMEDIATE MANAGEMENT OF ACUTE CORONARY SYNDROME

This section refers to all categories of ACS including those patients with ST segment elevation. In the event of unstable angina or acute MI including STEMI occurring in the wards, theatres or other clinical areas at WGH or SJH treatment should be initiated as described in this chapter and the Cardiology Registrar should be contacted.

Typical history of ACS
Establish continuous ECG monitoring

- Oxygen to keep SpO_2>97%
- IV access (2 for those receiving TNK)
- Anti-emetic: metoclopramide 10mg IV standard
- Morphine 2.5-10mg IV initially
- Aspirin 300mg to chew (unless already given by ambulance crew) and clopidogrel 300mg or 600mg if ECG shows ST elevation
- Blood sampling for U+Es, lipid profile, glucose, FBC

CONTACT CARDIOLOGY see page 94

IMMEDIATE MANAGEMENT OF ST ELEVATION ACUTE CORONARY SYNDROME

All patients with ST segment elevation acute coronary syndrome presenting within 12 hours of symptom onset should be considered for immediate reperfusion therapy.

If the ECG is normal, immediate reperfusion therapy should not be given, even if the history is suggestive of MI. 'T' wave inversion and widespread ST depression is not an indication for immediate reperfusion therapy. If there is diagnostic doubt then consider:

- Posterior ECG leads [ST elevation in 2 or more contiguous leads V7-V9]
- Repeat ECG after 10 minutes
- Early Cardiology opinion

Primary Percutaneous Coronary Intervention (PCI)

When compared with thrombolysis, primary PCI reduces short and

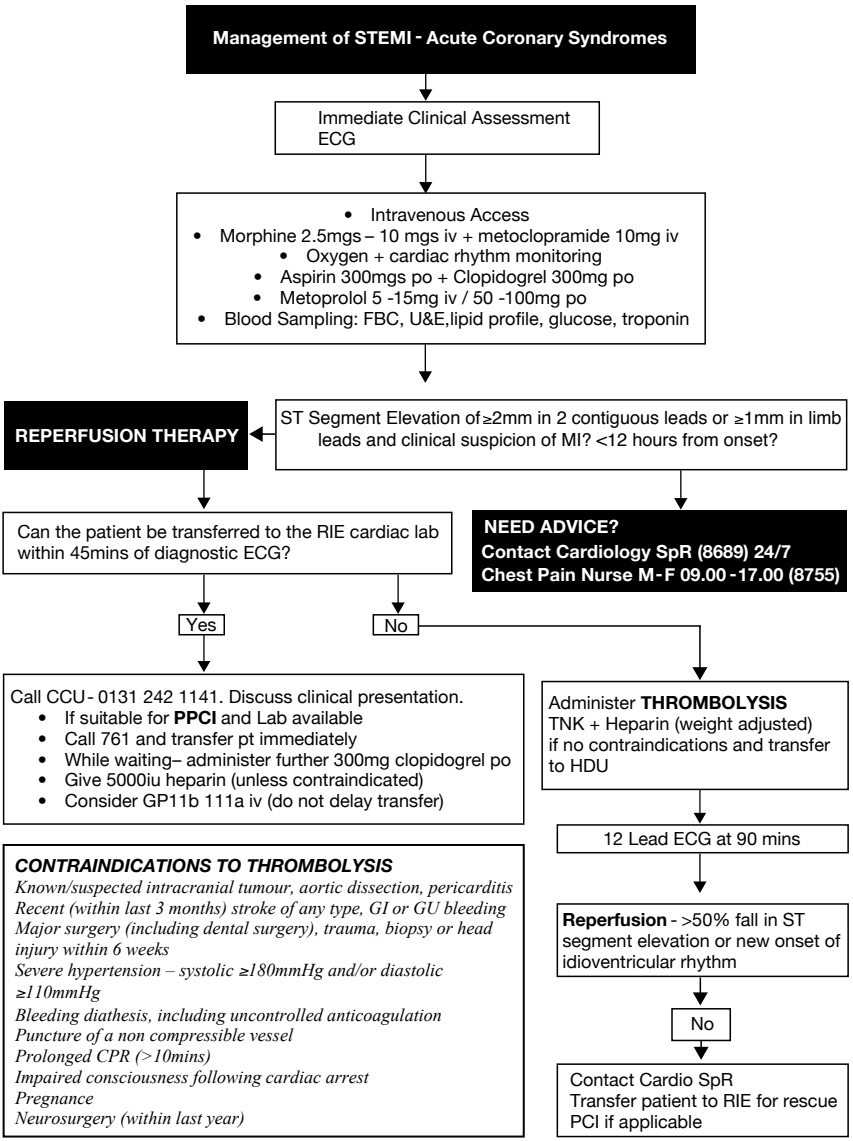
long-term mortality, stroke, re-infarction, recurrent ischaemia and the need for coronary artery bypass graft (CABG) surgery as well as the combined end points of death or non-fatal re-infarction. This benefit is consistent across all patient subgroups and is independent of the thrombolytic agent used. The greatest benefit is seen in those patients treated within 12 hours of symptom onset.

Patients with ST elevation acute coronary syndrome should be treated immediately with primary percutaneous coronary intervention.

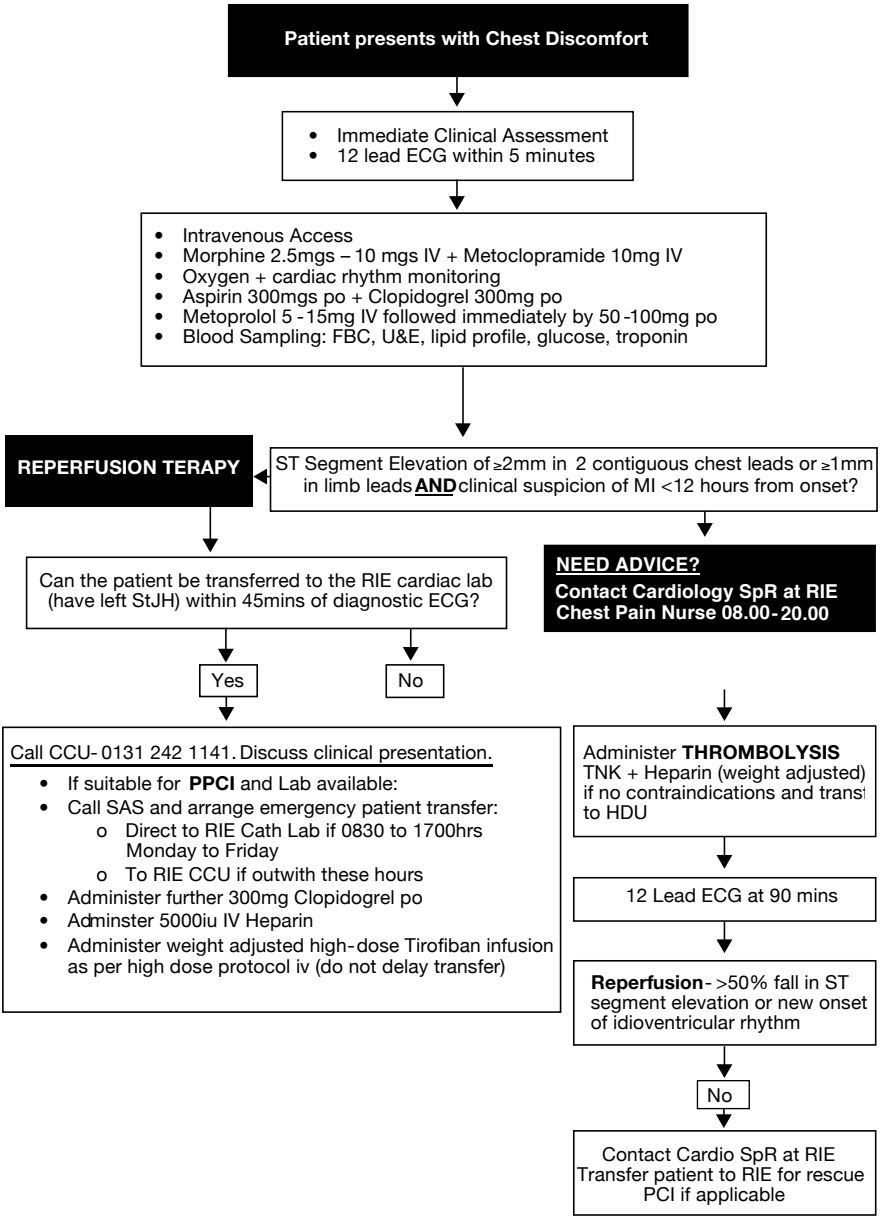
Patients undergoing primary percutaneous coronary intervention should be treated with a glycoprotein IIb/IIIa receptor antagonist.

When primary percutaneous coronary intervention cannot be provided within 90 minutes of diagnosis, patients with ST elevation acute coronary syndrome should receive immediate thrombolytic therapy.

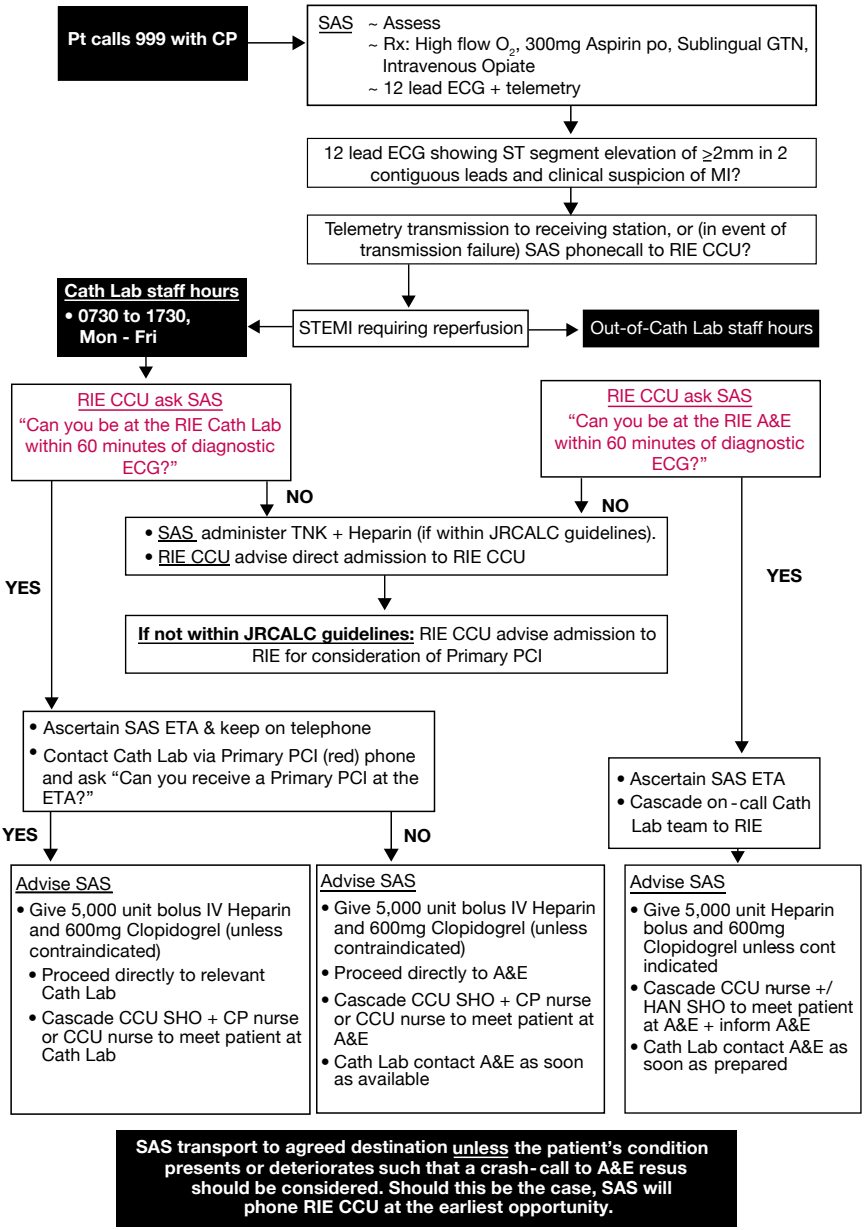
CHEST PAIN PATHWAY - NHS LOTHIAN OPERATIONAL FRAMEWORK WESTERN GENERAL HOSPITAL



STEMI PATHWAY - NHS LOTHIAN OPERATIONAL FRAMEWORK ST. JOHNS HOSPITAL

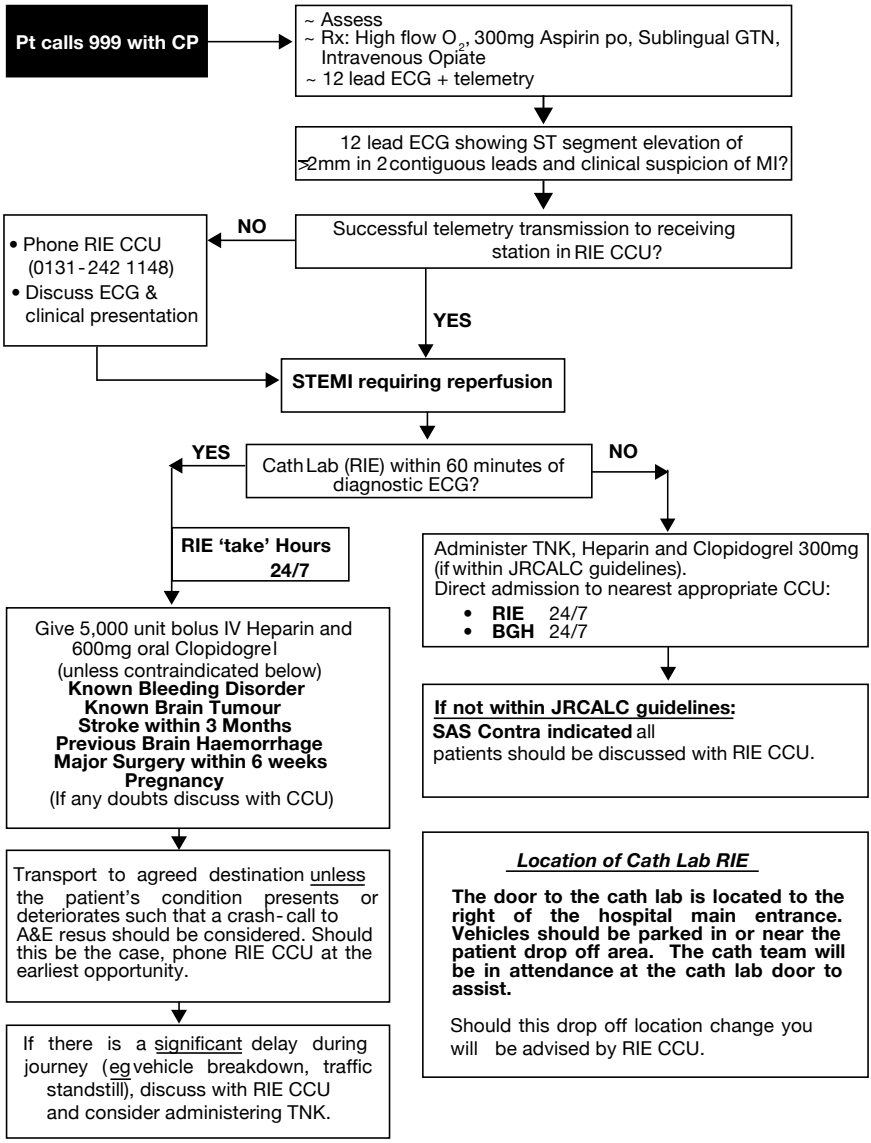


LOTHIAN PRIMARY PCI/PRE-HOSPITAL THROMBOLYSIS INITIATIVE - NHS LOTHIAN AND NHS FORTH VALLEY OPERATIONAL FRAMEWORK SAS PRESENTERS



SAS transport to agreed destination unless the patient's condition presents or deteriorates such that a crash-call to A&E resus should be considered. Should this be the case, SAS will phone RIE CCU at the earliest opportunity.

LOTHIAN PRIMARY PCI/PRE-HOSPITAL THROMBOLYSIS INITIATIVE - SAS OPERATIONAL FRAMEWORK



Thrombolysis

Since the clinical benefits of thrombolysis are time-dependent with an increase of 1.6 deaths per hour of delay per 1,000 patients treated, various strategies have been employed to minimise the delay between diagnosis and administration of thrombolysis. Pre-hospital thrombolysis should be used where possible because it shortens the time between the call for help and the administration of thrombolysis. Significant improvements in door-to-needle times are achieved by administration of thrombolysis within the Emergency Department. This can be facilitated by an experienced cardiology nurse and accomplished without compromising the appropriateness of its administration. **Door-to-needle time should be less than 30 minutes.**

Contra-indications to thrombolysis:

- Known/suspected intracranial tumour, aortic dissection, pericarditis.
- Recent [within last 3 months] stroke of any type, GI or GU bleeding.
- Major surgery [including dental surgery], trauma, biopsy or head injury within 6 weeks.
- Severe hypertension – systolic > 180 mmHg and/or diastolic > 110 mmHg (see below)
- Bleeding diathesis, including uncontrolled anticoagulation.
- Puncture of a non-compressible vessel.
- Prolonged (> 10 minutes) cardiopulmonary resuscitation.
- Impaired consciousness following cardiac arrest.
- Pregnancy
- Neurosurgery (within last year).

Choice of thrombolytic:

Tenecteplase is the thrombolytic agent of choice.

Ease of use favours a bolus fibrin-specific agent on practical grounds, particularly in the pre-hospital setting.

Tenecteplase dosing: weight adjusted

<60kg	30mg	6000 units
60-69kg	35mg	7000 units
70-79kg	40mg	8000 units
80-89kg	45mg	9000 units
> 90kg	50mg	10000 units

Heparin is commenced following this

<67kg 4000 units IV unfractionated (heparin bolus)
Then 800 iv/hr
>67kg 5000 units IV unfractionated (heparin bolus)
Then 1000 iv/hr

Check APTT at 6 hrs aiming for 1.5-2.5

From WGH CCU: check your local policy

Hypertension. All patients should already have received intravenous opiate analgesia and beta-blockade. Repeated dosing should be given if appropriate. Further hypertension can be managed with intravenous nitrate infusion. Thrombolysis can be commenced once systolic blood pressure <180 mmHg and diastolic blood pressure <110 mmHg.

Anticoagulation following thrombolysis:

Patients with ST elevation acute coronary syndrome who receive thrombolytic therapy should be treated immediately with either a pentasaccharide (fondaparinux 2.5 mg iv then sc daily) or low molecular weight heparin (enoxaparin 1 mg/kg bd sc). This should be continued for eight days, or until hospital discharge or coronary revascularisation.

Failure to reperfuse following thrombolysis:

Rescue PCI is undertaken within 12 hours of thrombolysis administration when there is an apparent failure to reperfuse the infarct-related artery. Reperfusion is taken to have occurred when there is a >50% fall in ST segment elevation or new onset of idioventricular rhythm.

Patients presenting with ST elevation acute coronary syndrome within six hours of symptom onset, who fail to reperfuse following thrombolysis, should undergo rescue percutaneous coronary intervention.

Reperfusion therapy not administered

Some patients may not reach the full electrocardiographic criteria for reperfusion therapy, have a delayed presentation (>12 hours from symptom onset) or have significant contra-indications or co-morbidity that limits the administration of reperfusion therapy.

Patients with ST elevation acute coronary syndrome who do not receive reperfusion therapy should be treated immediately with a pentasaccharide (fondaparinux 2.5 mg sc). This should be continued for eight days, or until hospital discharge or coronary revascularisation. Contact CCU to discuss immediate PCI.

IMMEDIATE MANAGEMENT OF NON-ST SEGMENT ELEVATION ACUTE CORONARY SYNDROMES

Patients with non-ST elevation ACS should be treated immediately with fondaparinux 2.5 mg sc daily. This should be continued for eight days, or until hospital discharge or coronary revascularisation.

Patients with an ACS who have dynamic ST segment changes, haemodynamic compromise or acute heart failure are at particularly high risk. Such patients benefit from early invasive intervention. “Up stream” use of glycoprotein IIb/IIIa receptor antagonism reduces events and improves outcomes particularly where the patient has diabetes mellitus or an elevated troponin.

High-risk patients with non-ST elevation acute coronary syndrome should be treated with an intravenous glycoprotein IIb/IIIa receptor antagonist and considered for urgent PCI.

FURTHER MANAGEMENT OF ACUTE CORONARY SYNDROMES

PATIENTS WITH CLINICAL MYOCARDIAL INFARCTION AND DIABETES MELLITUS

Patients with clinical myocardial infarction and diabetes mellitus or marked hyperglycaemia (>11.0 mmol/L) should have immediate intensive blood glucose control using intravenous insulin and glucose. This should be continued for at least 24 hours.

Where possible, patients with clinical myocardial infarction should be commenced on long-term angiotensin-converting enzyme inhibitor therapy within the first 36 hours.

Patients with clinical myocardial infarction complicated by left ventricular dysfunction or heart failure should be commenced on long-term angiotensin receptor blocker therapy if they are intolerant of angiotensin-converting enzyme inhibitor therapy.

Patients with clinical myocardial infarction complicated by left ventricular dysfunction (ejection fraction <35%) in the presence of either heart failure or diabetes mellitus should be commenced on long-term aldosterone receptor antagonist therapy.

RISK STRATIFICATION AND INVASIVE INVESTIGATION

- Risk stratification using clinical scores should be conducted to identify those patients with ACS who would benefit from early therapeutic intervention.
- Assess cardiac function to identify patients at high risk (those who benefit from selected therapeutic interventions, such as aldosterone receptor antagonism).

Patients with ST elevation ACS treated with thrombolytic therapy should be considered for coronary angiography and revascularisation during their index hospital admission.

MANAGEMENT OF COMPLICATIONS ASSOCIATED WITH MYOCARDIAL INFARCTION

RECURRENT ISCHAEMIC PAIN

- ECG should be recorded **during** pain if possible.

The following may be required, depending on the circumstances:

- Additional opiate.
- Buccal nitrates 2-5mg as required.
- Optimisation of beta blockade (heart rate<70 bpm).
- Consideration of IV glycoprotein IIb/IIIa receptor antagonist
- Consideration of urgent coronary angiography.

PERICARDIAL PAIN

A friction rub may or may not be heard. Mild pain can be controlled by paracetamol 1g qds or dihydrocodeine 30mg qds. Non-steroidal anti-inflammatory drugs such as ibuprofen may be considered but avoided in the presence of extensive infarction, renal failure or cardiac failure. More severe pain should be treated with IV opiate.

NAUSEA AND VOMITING

Metoclopramide 10mg IV 8 hourly is the first line drug of choice.

MILD-MODERATE LEFT VENTRICULAR FAILURE/PULMONARY OEDEMA

The following features either together or in isolation should raise clinical suspicion of heart failure:

- Mild breathlessness at rest or on minimal exertion.
- Persistent tachycardia.
- Elevated JVP.
- Basal crepitations.
- Upper lobe diversion on CXR.
- Pulmonary oedema on CXR.

After a myocardial infarction an elevated JVP as an isolated feature may reflect right ventricular infarction particularly in the setting of an inferior or posterior infarction. Diuretic therapy may worsen the situation.

Management

- Oxygen (high concentration ≥60%).
- Blood gases are not always required but should be performed if shock or COPD also present.
- Monitor O_2 saturation and ECG.
- Consider reducing or stopping beta blocker temporarily.
- Ensure the patient is on an ACE inhibitor such as lisinopril or ramipril unless contra-indicated.
- Consider oral diuretics such as furosemide or bumetanide. Assess the need for diuretics daily. Be careful not to over-treat.
- Assess cardiac structure and function by echocardiography prior to hospital discharge.
- Use intravenous glyceryl trinitrate if systolic blood pressure >90mmHg.
- *Once the patient is stable* with no signs of pulmonary oedema or salt and water excess consider starting a low dose beta-blocker such as bisoprolol 1.25mg od or Carvedilol 3.125mg bd.

SEVERE LEFT VENTRICULAR FAILURE (LVF)

Patient breathless at rest. Sinus tachycardia is usual, or possibly rapid atrial fibrillation (BP often high). A gallop rhythm and widespread crepitations are often present. CXR shows features of pulmonary oedema.

If a patient looks "shocked": tachypnoeic and tachycardic but with a high BP LVF is the likely problem.

Management

- Give high concentration oxygen 60% or greater via a venturi mask or non-rebreathing mask/reservoir system.
- Give sublingual GTN, 2 puffs immediately if SBP $\geq$ 100mm Hg.
- All patients with severe LVF should receive an intravenous infusion of nitrates (GTN 0.3-10mg/hr starting dose depending on baseline BP between 0.3mg/hr and 1mg/hr).
- Consider titrating morphine -1-5mg IV over 5-10 minutes preceded by prophylactic anti-emetic (metoclopromide 10mg IV). Reduce morphine dose in frail, elderly, chronic respiratory disease: give 1mg increments.

Morphine 10mg made up to 10ml with water for injection titrated slowly IV in 1mg increments, 2mg/minute.

- If bronchospasm is a major component nebulised salbutamol 2.5mg or 5mg may be benefical improving oxygenation and reducing work of breathing.
- IV diuretic: If normal renal function and diuretic naive use furosemide 20mg: if currently on diuretic or in renal failure may require higher doses e.g. 50-100mg. Slow IV $\leq$ 4mg/minute.
- Consider arterial blood gases **(caution with thrombolysis)**.
- Consider CPAP early for refractory hypoxia and respiratory fatigue.
- Consider early HDU/ICU referral.
- Monitor urine output: insert a urinary catheter.

Investigations

- ECG
- CXR
- Early Echocardiography
- Review the cardiac rhythm and blood pressure, treating tachy/bradyarrhythmias and hypertension appropriately.
- Consider and exclude **mechanical causes** e.g. acquired VSD, mitral regurgitation, left ventricular aneurysm, cardiac tamponade.

Echocardiography is of particular value in this situation and should be obtained as early as possible.

If patient becomes drowsy or obtunded, or if CO_2 retention is present, give an opiate antagonist and, if there is no immediate response, consider ventilatory support. Maintain high concentration oxygen therapy throughout.

Do not hesitate to seek a Cardiology opinion if there is no improvement and refer to ICU early.

- In severe or resistant cases support with intra-aortic balloon pump may be life saving.
- Consider insertion of an arterial line and pulmonary artery catheter to measure cardiac output, guide the administration of inotropes, and assess response. Particularly useful in hypotension.
- Vasoactive drugs may be required and should be administered under expert guidance.
- Digitalisation, for its inotropic effect, may be beneficial but 3-6 hours may elapse before there is any appreciable effect. Loading doses as per AF (caution in renal impairment).

RIGHT VENTRICULAR INFARCTION/FAILURE

Diagnosis

- Right Ventricular Failure (hypotension and elevated JVP/hepatic congestion) in the absence of clinical /radiological evidence of pulmonary congestion suggests the possibility of right ventricular infarction. This is more likely in association with acute inferior/ infero-posterior infarctions.
- The right ventricular leads on the 12 lead ECG (V3R & V4R placed in the equivalent positions but to the right of the sternum as V3 & V4) may show ST elevation, confirming RV infarction.
- Echocardiogram and/or the insertion of a pulmonary artery catheter will confirm the diagnosis.

Management

- **Diuretics or vasodilators/GTN should be avoided** as right ventricular function is dependent upon high filling pressures.
- If hypotension/oliguria persist, administer IV fluids and consider haemodynamic monitoring using a PA catheter.
- In the event of persistent hypotension/low cardiac output inotropic therapy may be required. Seek expert advice.

CARDIOGENIC SHOCK

Combined Cardiology and ICU referral early is appropriate.

Diagnosis

Cardiogenic shock should be considered if the following features are present:

- Hypotension
- Tachycardia or profound bradycardia.
- Poor peripheral perfusion.
- Oliguria
- Absence of haemorrhage or hypovolaemia.

Management

- High concentration oxygen, 60-100% humidified (35% initially in patients with severe COPD).
- Seek expert help (above).
- Treat any arrhythmias appropriately, wherever possible restoring sinus rhythm. Many anti-arrhythmics are myocardial depressant.
- In the setting of acute myocardial infarction consider the option of immediate PCI possibly with support from the intra aortic balloon pump.
- A urinary catheter should be inserted to monitor urine output.
- Check electrolytes and blood gases.
- Consider early insertion of a pulmonary artery catheter and arterial line.
- Vasoactive therapy may be required and is titrated to effect.
- An **immediate echocardiogram** should be performed to assess LV and RV function and to exclude cardiac tamponade, acute mitral regurgitation, ventriculo-septal defect.
- **Consider other causes** e.g. haemorrhage (especially retroperitoneal in anticoagulated patients), volume depletion or RV infarction.

1. Seek cardiology advice regardless of the time of day or night.
2. Make ICU referral early.

DVT

There is a policy for the prevention and treatment of DVT in ambulant patients. See the Prescribing Bulletin (on Intranet).

HYPOKALAEMIA

Potassium supplementation should be instituted in the following circumstances:

- Potassium <3.5mmol/l associated with any acute coronary syndrome.
- Any **arrhythmia** associated with hypokalaemia or low normal potassium.
- During insulin infusion in a diabetic patient.
- Take care to review drug therapy on a daily basis taking into

account any subsequently prescribed potassium-sparing diuretics or ACE-inhibitors.

- For intravenous replacement of potassium always use a pre-prepared bag for infusion.

DIABETIC CONTROL IN THE SETTING OF ACUTE MYOCARDIAL INFARCTION

Background:

Prospective randomised study of intensive insulin treatment on long term survival after acute myocardial infarction in patients with diabetes mellitus. DIGAMI (Diabetes Mellitus, Insulin Glucose Infusion in Acute Myocardial Infarction) Study Group. BMJ. 1997 May 24; 314 (7093):1512-5.

DIGAMI Protocol:

- All patients admitted with an acute myocardial infarction within the preceding 24 hours who are known to have diabetes mellitus or, although not known to have diabetes, who have a random blood glucose concentration >11 mmol/l should be started on an IV insulin/dextrose regimen for 24-48 hours.
- The diabetes team should be consulted regarding advice on management of diabetes/impaired glucose tolerance thereafter.

Infusion regime (RIE/WGH)

- Dextrose: start a drip infusion of 5% dextrose and run at 500mls per 12 hours.
- Insulin: use 50 i.u. of human actrapid or humulin S in 50mls of saline (0.9% NaCl) equivalent to 1u/ml via a syringe driver at a rate determined by the table below.
- Blood glucose levels monitored hourly by BM stix until stable, then 4-6 hourly during infusion.
- Potassium levels may fall rapidly and should be monitored closely during insulin infusion.

Blood glucose (mmol/l)	Insulin infusion rate (iu/hr)
0-4	0 (0.5 if known diabetic)
4.1-6.9	1
7.0-10.9	2
11.0-15.0	3
>15	6 (check pump + connections) + IV access

- This scale is flexible and should be adjusted according to individual patient response.

LATE MANAGEMENT OF ACUTE MYOCARDIAL INFARCTION

DRUG THERAPY AT THE TIME OF DISCHARGE

All patients with acute coronary syndrome should be discharged on:

- Aspirin 75 mg od

  Clopidogrel 75 mg od for 3 months (6 months where drug-eluting stent has been implanted)
- Statin (see below), such as simvastatin 40 mg daily
- Beta-blocker, titrated to achieve HR <70 /min
- ACE Inhibitor, up titrated to evidence based dose, such as ramipril 10 mg od or lisinopril 10 mg od. Patients intolerant of ACE inhibitor therapy should be considered for an angiotensin receptor blocker, such as valsartan 40-160mg bd or candesartan 4-16 mg od.
- All patients should be given a GTN spray to use as required for chest pain.

If any of these drugs are not prescribed, reasons for this should be clearly documented in the casenotes.

CARDIAC REHABILITATION

Additional secondary prevention strategies addressed as part of the rehabilitation program include:

- Smoking cessation.
- Dietary advice.
- Exercise
- Alcohol intake.

These are incorporated in the HEART MANUAL that is received by all patients with clinical myocardial infarction.

- Cardiac Rehabilitation Programme should be considered for all patients suffering clinical myocardial infarction. There is no age limit for referral. The cardiac rehabilitation co-ordinators are contactable by page and should be informed of all patients admitted with clinical MI regardless of the perceived need for rehab. Frail and infirm patients will be offered information and support.
- The Lothian Hospitals offer lifestyle education, smoking cessation advice and, for those who are suitable, group exercise programs. The majority of patients are given the 'Heart Manual': a six week home based program with support during the time by the hospital

rehab team or the BHF nurse, and/or the community heart manual facilitators. As a rough guide, patients referred for group exercise should be able to complete stage 1 (3 minutes) of full Bruce protocol. Treadmill testing.

Phase III programmes are offered at Astley Ainslie Hospital, Western General Hospital and St John's Hospital.

OTHER POTENTIAL PROBLEMS IN THE PERI-INFARCT PERIOD

ALCOHOL WITHDRAWAL

There is an alcohol withdrawal policy (see Lothian Joint Formulary) and chapter 12.

NICOTINE WITHDRAWAL

Evidence suggests that transdermal nicotine, and nicotine gum should not be withheld from patients who suffer an MI unless there is evidence of ongoing ischaemia (Goldstein, Niaura, 2000). The safety of NRT in those with unstable angina or post MI within 2 weeks has not yet been studied but cardiac complications should be lower than with smoking.

A risk/benefit assessment should be made with each individual patient. Patients struggling with the withdrawal effects of nicotine should be offered treatment for the first 48 hours, or until haemodynamically stable, using benzodiazepines, as for alcohol withdrawal. The risks of NRT should be explained using written information about the specific product they will use. **They should sign a statement in the case notes indicating that they have read this information and accept responsibility for its use. They should also agree not to smoke whilst on NRT**.

Patients should be seen by the smoking cessation nurse when considering starting NRT in the setting of a recent acute coronary syndrome.

OTHER MEDICAL EMERGENCIES ADMITTED TO CCU

OUT OF HOSPITAL CARDIAC ARREST

Acute myocardial infarction is the underlying cause in 40% of cases and the general principles of its management should be followed. Emergency coronary angiography and reperfusion therapy should be considered if the patient has recovered consciousness. Reperfusion therapy may also be considered in patients with impaired consciousness who show signs of awakening provided there is no evidence of head injury arising from the collapse.

In cases without definite evidence of acute myocardial infarction investigations should be directed towards other causes of ventricular arrhythmia:

- Electrolyte disturbance.
- Underlying bradycardia.
- Pro-arrhythmic effect of medication.
- Drug overdose (tricyclic antidepressants, amphetamines, cocaine).

Coma is present in approximately half of cases admitted to CCU with an out-of-hospital cardiac arrest. Coma is compatible with meaningful survival even if it persists for up to 72 hours. Management should be directed at maintaining oxygenation, circulation and renal fuction during this period. Patients should be considered for therapeutic hypothermia and this is indicated in the presence of:

- coma (unresponsive to voice, GCS <9)
- intubation and ventilation
- no other cause of coma
- negative pregnancy test
- haemodynamically stability

Mechanical ventilation should be considered for:

- Maintenance of oxygenation
- Normalisation of CO_2
- Shock
- Seizures
- Worsening acidosis

Intubation with spontaneous breathing is not ideal for optimisation of coronary and cerebral oxygen delivery. Mechanical ventilation is often appropriate.

Referral to ICU should follow discussion with the duty cardiologist. In those without acute myocardial infarction the indications for an ICD should be discussed.

MANAGEMENT OF ARRHYTHMIAS

The following are guidelines only. Any complex problems or arrhythmia unresponsive to treatment should be discussed with the Cardiologist on call at any time.

TACHYARRHYTHMIAS

NARROW COMPLEX TACHYCARDIAS

Sinus Tachycardia

Characterised by a narrow QRS (3 small squares or less, unless bundle branch block present) and normal 'P' waves. Rate >100bpm at rest. Consider other supraventricular tachycardias for any rate above 140bpm. Carotid sinus massage may help to differentiate.

Sinus tachycardia commonly results from underlying pathology outwith the heart e.g. sepsis, hypovolaemia, pain.

Management

- Treat possible causes (e.g. pain, anxiety, fever, cardiac failure, pericarditis).
- In acute coronary syndromes, consider beta-blocker unless contraindicated.
- Consider echocardiography to assess LV function.

ATRIAL FIBRILLATION

Characterised by irregular, narrow QRS complexes with no discernable P-waves.

AF may result from underlying pathology outwith the heart e.g. sepsis, hypovolaemia, pneumonia, pulmonary embolism.

Management

- For management refer to **UK Resuscitation Council guidelines** (see algorithm).
- Atrial fibrillation often accompanies left ventricular failure. Therapy may be ineffective unless it is given in conjunction with effective treatment of cardiac failure.
- Check TFTs.

TACHYCARDIA ALGORITHM (with pulse)

- Support ABCs: give oxygen; cannulate a vein
- Monitor ECG, BP, SpO_2
- Record 12-lead ECG
- Identify and treat reversible causes (e.g. electrolyte abnormalities)

Is Patient stable?
Signs of instability include:
1. Reduced conscious level
2. Chest pain
3. Systolic BP< 90 mmhg
4. Heart failure
(Rate related symptoms uncommon at less than 150 beats min^{-1})

unstable → **Synchronised DC Shock*** Up to 3 attempts
- Amiodarone 300mg IV over 10-20 min and repeat shock; followed by;
- Amiodarone 900mg over 24h

Stable → **Is QRS narrow (<0.12 sec)?**

Broad → **Broad QRS** Is QRS regular?

Irregular → Seeke xpert help → Possibilities include:
- **AF with bundle branch block** treat as for narrow complex
- **Pre-excited AF** consider amiodarone
- **Polymorphic VT (e.g.torsade de pointes** - give magnesium 2g over 10 min)

Regular → If **Ventricular Tachycardia** (or uncertain rhythm);
- Amiodarone 300 mg IV over 20-60 min; then 900 mg over 24 h

If previously confirmed **SVT with bundle branch block**:
- Give adenosine as for regular narrow complex tachycardia

Narrow → **Narrow QRS** Is rhythm regular?

Regular →
- Use vagal manoeuvres
- Adenosine 6 mg rapid IV bolus; if unsuccessful give 12 mg; if unsuccessful give further 12 mg;
- Monitor ECG continuously

→ Normal sinus rhythm restored?

Yes → Probable **re-entry PSVT**:
- Record 12-lead ECG in sinus rhythm
- If recurs, give adenosine again & consider choice of anti-arrhythmic prophylaxis

No → Possible atrial flutter
Control rate (e.g.β-Blocker)

Irregular → **Irregular Narrow Complex Tachycardia**
Probable **atrial fibrillation**
Control rate with:
- β-Blocker IV or digoxin IV
  If onset <48 h consider: via a large Cannula in a large vein
- Amiodarone 300 mg IV 20-60 min; then 900 mg over 24 h

Continuous infusion of amiodarone should be administered via a central venous catheter using an appropriate infusion device

Seeke xpert help

*Attempted electrical cardioversion is always undertaken with sedation or general anaesthesia

ATRIAL FLUTTER

Characterised by rapid regular or irregular narrow QRS complexes with a saw-tooth appearance to the baseline. A regular, narrow complex (unless BBB pattern present) tachycardia of 150 bpm should be suspected to be atrial flutter with a 2:1 block irrespective of whether or not flutter waves are obvious on the ECG.

Management

- Carotid sinus massage/vagal manoeuvres may slow the ventricular response revealing underlying flutter waves and assisting the diagnosis.
- **Adenosine** may also be used to help assist the diagnosis by slowing AV conduction and revealing flutter waves. Rapid IV bolus of 6mg followed by saline flush, up to 12mg IV a total of twice at 1-2 minute intervals may be given if tolerated. **Do not use in asthmatics** (bronchoconstriction) **or those taking dipyridamole, carbamazepine or with denervated (transplanted) hearts** (effects prolonged and potentiated). Administration may be accompanied by flushing and/or chest tightness but the half life is short (20 seconds) with clinical effects resolving in about 2 minutes. WARN THE PATIENT. Always run an ECG rhythm strip during administration. Adenosine is contra-indicated in 2nd or 3rd degree AV block.
- Atrial flutter tends to be sustained and does not respond readily to AV node blocking drugs. Therefore, every patient with persistent atrial flutter should be considered for early cardioversion.
- For immediate management consider using the management guideline for atrial fibrillation.
- Note that IV Flecainide cardioversion should **NOT** be used for atrial flutter. It can slow the flutter rate and cause a paradoxical rise in the heart rate to >200bpm. (Increased rate of conduction through a-v node).

SUPRAVENTRICULAR TACHYCARDIA

Characterised by regular narrow QRS complexes.

Three types exist:

1. AV Node re-entry tachycardia. Usually presents in young adults. Commoner in women. Usually no 'P' waves visible.
2. AV re-entry tachycardia (the tachycardia associated with WPW). Also presents in young adults. Inverted 'P' waves may be seen after the QRS and a pseudo-RBBB pattern in V1.
3. Atrial tachycardia due to enhanced automaticity in an atrial focus. 'P' waves visible before the QRS but with abnormal P wave morphology.

4. For acute treatment use ALS guidelines

BROAD COMPLEX ARRHYTHMIAS

VENTRICULAR PREMATURE BEATS - VPBs

Ventricular premature beats occurring in the early phase of acute myocardial infarction, are common and are not in themselves predictors of serious ventricular arrhythmias. However, in the presence of frequent VPBs combined with significant left ventricular impairment (ejection fraction <35%) consider a 24 hour ECG recording prior to discharge to exclude non-sustained VT.

IDIOVENTRICULAR RHYTHM

Characterised by regular, broad complex arrhythmia at a rate <120 bpm (a rate >120 bpm indicates VT). It is common during reperfusion after thrombolysis.

- Idioventricular rhythms are usually self-terminating and do not require anti-arrhythmic therapy.

BROAD COMPLEX TACHYCARDIA

Treat as ventricular tachycardia until proven otherwise. Characterised by regular broad QRS complexes >120 bpm. Differentiation between VT and SVT with a bundle branch block is aided by the diagnostic algorithm.

Diagnosis

- Where possible compare previous ECGs in sinus or previous arrhythmia.
- In a patient with previous myocardial infarction, IHD, cardiomyopathy, age >60 years, a broad complex tachycardia is nearly always ventricular in origin.
- Adenosine may be used in an effort to assist diagnosis.

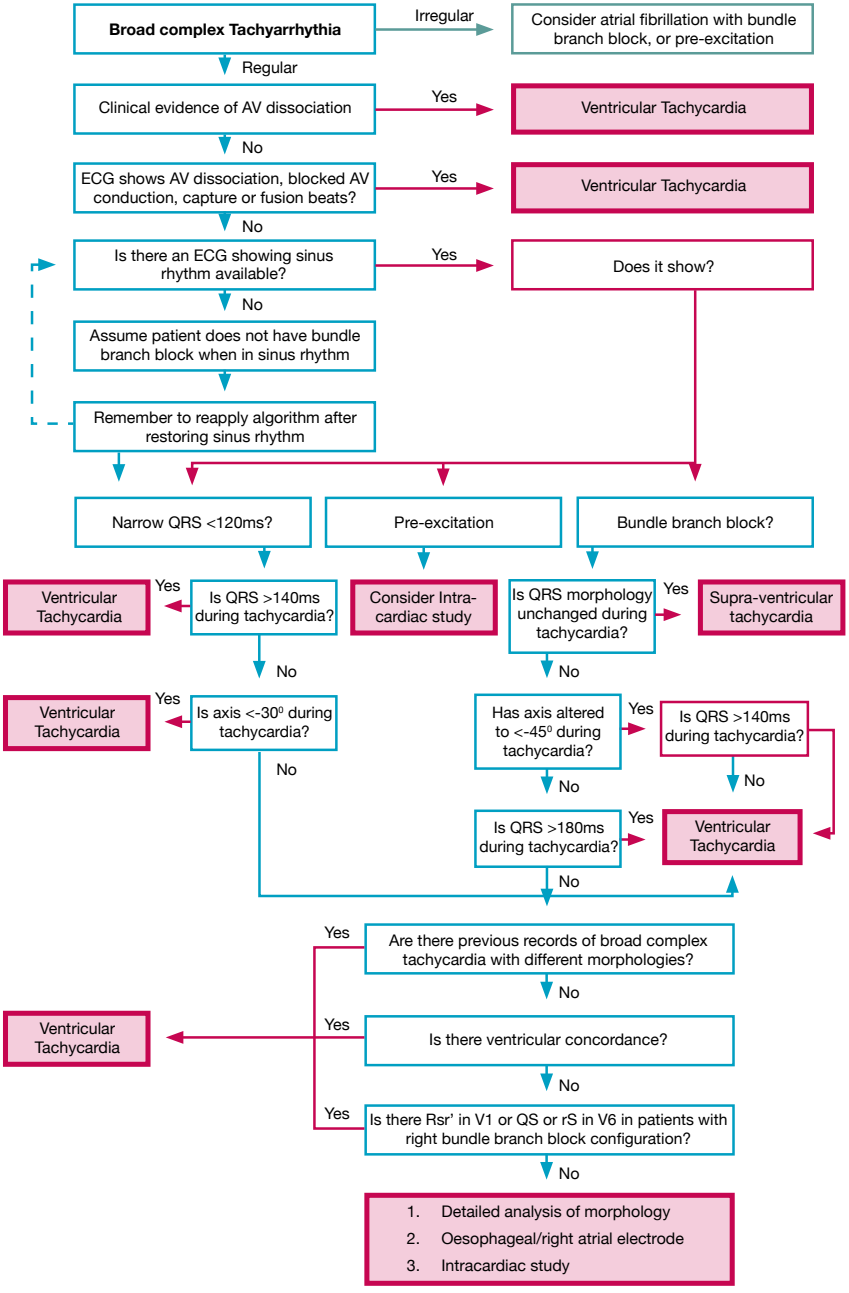
Do not use verapamil if VT is not excluded. It can cause haemodynamic collapse or asystole.

Management

- See algorithms
- Treatable factors should be identified e.g. persistent cardiac failure, hypokalaemia, hypomagnesaemia.
- Pro-arrhythmic effect of anti-arrhythmic drugs or inotropic agents may necessitate their reduction or cessation.
- Occasionally mechanical causes are responsible e.g. central lines or pacing wires.

Seek senior cardiology advice regardless of the time of the day or night and before proceding further through the algorithm.

DIAGNOSIS OF BROAD-COMPLEX TACHYCARDIA



- **Maintenance anti-arrhythmic therapy** following restoration of sinus rhythm depends on the arrhythmia substrate for SVT prophylaxis. VT prophylaxis centres around the use of beta-blockers and/or amiodarone. Some patients may require ICD implantation. Long-term management of these patients should always be discussed with a consultant cardiologist.
- Most anti-arrhythmic drugs can cause sinus bradycardia or AV block. For patients with impaired LV function, beta-blockers should be introduced at a low dose (e.g bisoprolol 1.25mg daily) and titrated gradually. Amiodarone is effective for VT treatment and prophylaxis in these patients. **Class Ic drugs such as flecainide and propafenone are contraindicated in heart failure/LV impairment.**
- Overdrive pacing may be considered for resistant or recurrent ventricular arrhythmias.

  VT or VF are commonly triggered within the first 48 hours of acute MI. In this situation recurrence after the acute event is uncommon and no specific prophylaxis is needed. VT or VF occurring more than 48 hours after acute MI is more sinister; this may indicate the development of a chronic arrhythmia substrate. These patients need assessment with a view to revascularisation and either anti-arrhythmic drug treatment or an ICD.

Do not hesitate to seek a senior cardiology opinion in the case of troublesome dysrhythmias - 'cocktails' of anti-arrhythmics cause more problems than they solve.

TORSADE-DE-POINTES TACHYCARDIA

Characterised by rapid, broad QRS complexes twisting around the baseline giving the appearance of changing QRS morphology and axis. It is a form of polymorphic VT and **can be mistaken for VF. It is often self terminating and recurrent**. Its recognition is important because the aetiology and treatment differs from monomorphic VT.

Diagnosis

Consider Torsade when the following are present:

- Polymorphic VT.
- Prolonged QT interval.
- Initiation of tachycardia with long-short coupling intervals.

Causes

- Bradycardia
- Electrolyte disturbances - hypokalaemia/hypomagnesaemia/ hypocalcaemia.
- Tricyclic antidepressants.
- Certain anti-psychotics (e.g. thioridazine).
- IV erythromycin.
- Antihistamines (e.g. terfenadine).
- Anti-arrhythmic drugs - amiodarone, sotalol, disopyramide, procainamide etc.
- Myocardial ischaemia.
- Inherited long QT syndrome (may be family history of synocope, sudden death or “epilepsy” in association with any of the above).

Management

- The primary treatment of drug induced Torsade is intravenous magnesium infusion
- Withdraw any drug known to prolong QT interval
- Consider the use of temporary atrial or ventricular pacing.
- Intravenous isoprenaline (2.25 mg isoprenaline sulphate in 500 mL 5% dextrose infused at 10-30ml per hour) is an effective short-term treatment. Use with caution in patients with angina or heart failure, and discuss management with cardiologist.

VENTRICULAR FIBRILLATION

Characterised by a chaotic electrical pattern with no discernible cardiac rhythm.

Follow cardiac arrest algorithm.

MANAGEMENT OF BRADYARRHYTHMIAS

SINUS BRADYCARDIA, JUNCTIONAL RHYTHM

Characterised by rate <60 bpm, 'P' wave present (sinus brady). 'P' wave inverted or buried within or after QRS in the case of junctional rhythm.

Management - see bradycardia algorithm. (Always consider and treat the cause e.g. hypothermia, drugs, ↑ intracranial pressure, hypothyroidism etc).

FIRST DEGREE ATRIOVENTRICULAR (AV) BLOCK

Characterised by one 'P' wave per QRS but with a PR interval >0.2 secs, is not uncommon especially after inferior MI. Those on beta-blockers may have an acceptable, marginal first degree AV block.

If a prolonged PR interval is associated with either new bifascicular block (RBBB +LAD or RBBB +RAD) or with complete LBBB DISCUSS WITH A CARDIOLOGIST, as a prophylactic pacing electrode may be required.

SECOND & THIRD DEGREE (COMPLETE) AV BLOCK

Second degree heart block

- Type I (Wenckebach) - characterised by lengthening PR interval with each successive beat until failure of conduction of the atrial impulse through the AV node occurs; this tends to occur in a cyclical pattern.
- Type 2 (usually 2:1 block) - characterised by a constant PR interval and the sudden failure of conduction of an atrial impulse through the AV node; this tends to occur in a cyclical pattern.

Third degree heart block

- Characterised by complete dissociation of atrial and ventricular activity with all atrial impulses blocked within the conducting system.

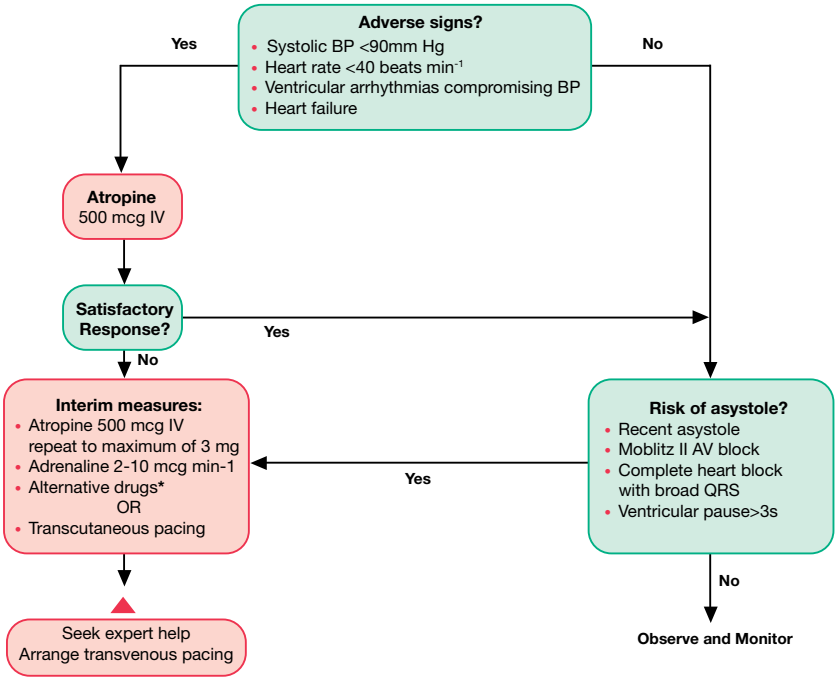
In **inferior infarction** only requires treatment if associated with hypotension, syncope, cardiac failure or 'escape' ventricular rhythms. Initially, IV atropine 500 micrograms should be given and repeated, if necessary, up to a maximum of 3mg. If AV block recurs a temporary pacing electrode should be inserted. AV block associated with inferior MI usually resolves within 10 days, therefore permanent pacing is not normally necessary.

In anterior infarction the development of second degree or complete heart block is an indication for insertion of a temporary pacing electrode. A permanent DDD system may be required before discharge.

- Transutaneous pacing can be used as a "safety net" until a pacing wire has been inserted.

BRADYCARDIA ALGORITHM

(includes rates inappropriately slow for haemodynamic state)



***Alternatives include:**

- Aminophylline
- Isoprenaline
- Dopamine
- Glucagon (if beta-blocker or calcium-channel blocker overdose)
- Glycopyrronium can be used instead of atropine

If bradycardia is a "secondary" phenomenon treat the cause hypothermia, hypothyroidism

EXTERNAL CARDIAC PACING

GET HELP

Main Indications *(as below pending transvenous pacing)*

- Complete heart block.
- Ventricular standstill.
- Symptomatic bradycardia unresponsive to atropine.
- Risk of asystole: see algorithm.

Equipment

- External pacing defibrillators are located in:
  WGH:- ARAU, ICU Ward 20, Ward 26 and some other wards.
  RIE:- A&E, ICU, CCU Ward 114 and some other wards.
  SJH:- A&E, CCU (spare machines are located in the resuscitation department and Medical Physics).
  See current cardiac arrest trolley list for full location list.

Method

- Appropriate gel pads are applied to the chest in the defibrillator paddle sites on front and back. There is a diagram on the outside of the bag in which they are provided.
- The ECG electrodes from the defibrillator monitor must be attached to the patient or it will not pace.
- The starting default settings which appear when you press the on button are
  - Mode is demand: don't change this.
  - Rate 70bpm: can be increased or decreased to achieve the optimal haemodynamic condition.
  - Power: 30mA: can be increased to gain capture. The lowest level which is effective should be selected.
  - External pacing can be uncomfortable, painful and distressing. Titrate IV morphine for comfort and add 0.5-1mg midazolam if distressed. Be careful with this potentially destabilising combination. Monitor continuously (ECG, SpO_2 and BP) and re-assess frequently.

INTRAVENTRICULAR OR BIFASICULAR BLOCK

Right bundle branch block plus left or right axis deviation (-30^0 or $> +90^0$) constitutes bifasicular block. Following anterior myocardial infarction, unless known to be long-standing, it is an indication for considering insertion of a temporary pacing electrode. If more severe conduction

abnormalities develop i.e. second or third degree AV block a permanent pacemaker is indicated prior to discharge. New left bundle branch block associated with first degree heart block should be treated similarly.

INTRA-AORTIC BALLOON PUMP (IABP)

May be useful in severe acute valvular disease, in severe unstable angina or in cardiogenic shock. Prior to insertion there should be a clearly agreed clinical management strategy. Discuss with senior cardiologist.

SPECIFIC DRUG POINTS

A full account of all drugs mentioned in the schedule is available in the BNF, which should be consulted. Further detail in CCU Therapeutic Schedule.

ACE-INHIBITORS

Reduce mortality after AMI by approximately 20-30%.

Most frequently used drugs: ramipril, lisinopril, enalapril.

- Following AMI, therapy is normally commenced when the patient is stable, within 24-36 hours after the acute event.
- Where significant hypotension might occur (e.g. pre-existing hypotension, reno-vascular disease), a test dose of captopril 6.25mg is normally used. The blood pressure and pulse should be monitored every 30 minutes for 2 hours following this.
- Where hypotension is unlikely to be a problem, low dose ramipril, lisinopril or enalapril are equally appropriate as initial therapy.
- It is important to titrate ACE inhibitors to appropriate doses as used in clinical trials - lisinopril 10mg od, ramipril 5mg bd (especially if signs of heart failure present), enalapril 10-20mg bd.
- Effects of potassium supplements or potassium sparing diuretics should be monitored closely by checking plasma potassium and adjusting prescription accordingly.

BETA BLOCKERS

Reduce mortality after AMI by ~25%

- Contra-indicated in asthma.
- Prescribe with caution in COPD.
- Stable chronic peripheral vascular disease is NOT a contra-indication.
- Beta blockers should also be considered in patients with heart failure associated with AMI **once stabilised**.

DIGITALIS TOXICITY

Digitalis toxicity is most often associated with bradycardia, ventricular bigeminy, paroxysmal atrial tachycardia (often with variable AV block), accelerated idioventricular rhythm and AV block, but almost any arrhythmia can be provoked. Visual disturbance, anorexia, nausea and vomiting are also common features - level should be measured.

CONTACT THE POISONS BUREAU AT RIE FOR ADVICE: 0131 242 1389.

ANTI-PLATELET THERAPIES

Clopidogrel

Indications: Patients with all ACS.

Following insertion of **intra-coronary stent** (3 months for Bare metal and 12 months for drug-eluting stent).

Cautions: Check FBC 7 days after initiation of combination therapy.

N.B. STOP treatment at least 7 days prior to major surgery including coronary by-pass.

Integrilin (Eptifibatide)

Indications: acute coronary syndromes (i.e. unstable angina or non Q-wave MI) regardless of whether they ultimately undergo PCI.

Tirofiban

Tirofiban is a non-peptide inhibitor of the platelet glycoprotein (GP) IIb/IIIa receptor, the final common pathway for platelet aggregation.

For details of pharmacology, dosing and administration please refer to the Coronary Care Unit Therapeutic Schedule.

VASCULAR EMERGENCIES

ACUTE THORACIC AORTIC DISSECTION

Acute Thoracic aortic dissection is a medical emergency and should be investigated and treated with the same urgency as acute MI. **Always discuss management with a senior cardiologist at first opportunity.** Risk factors are hypertension, Marfans syndrome, pregnancy, aortitis, coarctation of the aorta.

Presenting features include:

- Very severe anterior chest pain.
- Very severe posterior chest pain (interscapular pain).
- Ischaemic syndromes - coronary, cerebral, upper limbs, renal, lower limbs.
- Syncope
- Cardiac tamponade
- Acute aortic regurgitation
- Unequal limb pulses and blood pressures

Management

- Oxygen 60-100%
- IV access
- IV opiate analgesia and anti-emetic therapy
- Transfer to CCU if imaging assessment is delayed
- Urinary catheter
- Discuss with cardiac surgery consultant asap if diagnosis of Type A dissection is confirmed. **Mortality is as high as 5% per hour.**
- Intensive BP control with IV beta-blocker, such as labetolol. In patients with contraindication to beta-blocker, IV verapamil should be used. Additional vasodilators may need to be considered such as IV GTN. Target should be to maintain systolic blood pressure <120 mmHg.

Get expert help.

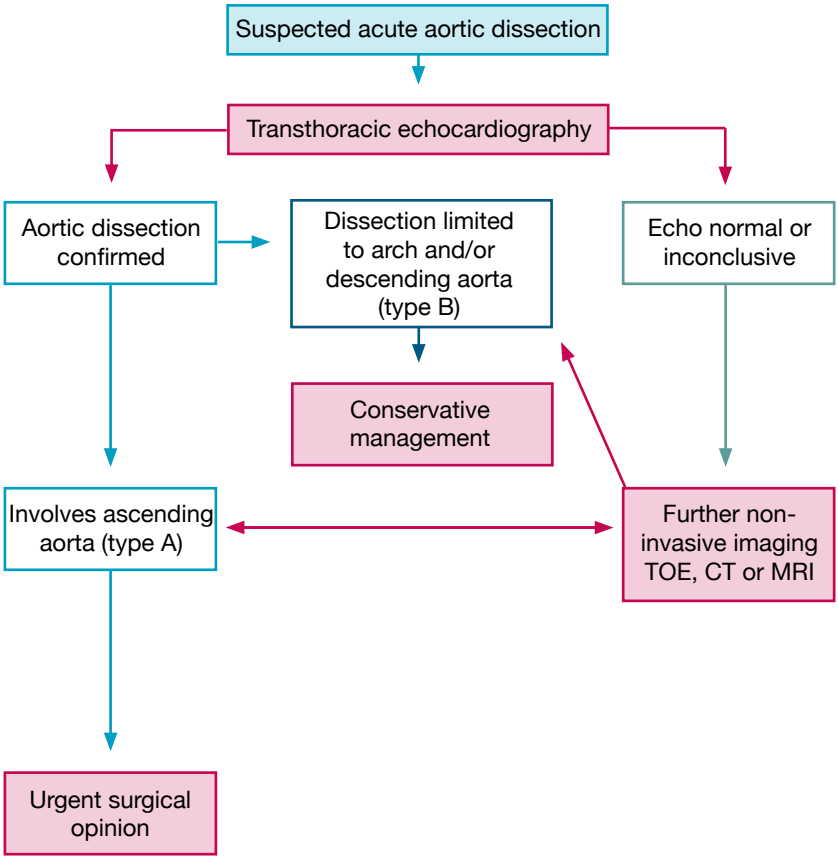
Investigations

- CXR - look for widened mediastinum, pleural effusions.
- ECG - may show ischaemia
- Transthoracic echocardiography as a rapid initial evaluation for type A dissections but has low sensitivity and cannot be relied upon.

- Emergency multislice computed tomography, magnetic resonance imaging or transoesophageal echocardiography should be considered to diagnose and define the extent of the dissection.

Early mortality in acute dissection of the ascending aorta is 10% per hour. Surgery can be life saving and should not be delayed. Never transfer a patient for surgery without adequate BP control with IV therapy.

INVESTIGATION ALGORITHM FOR ACUTE AORTIC DISSECTION



ACUTE STROKE

Stroke is a Medical Emergency: TIME IS BRAIN.

An acute stroke integrated care pathway should be initiated immediately on arrival at hospital. It will guide you through the initial management of the patient. If there is a known time of onset of symptoms, the patient presents within **4 hours** of onset (stroke thrombolysis is proven to be effective if given within 4.5 hours of symptom onset) and there are no contraindications to thrombolysis, ring the stroke team immediately for consideration for immediate thrombolysis.

If onset within 5.5 hours, ring stroke team immediately for consideration for randomisation into IST 3 (thrombolysis trial).

Thrombolysis is available 24 hours daily at WGH and from 9-5 Monday to Friday at RIE & SJH. During day, bleep the WGH Stroke SpR page 8699, out of hours the Neurology registrar.

Service at RIE from 9-5. At RIE contact on-call Stroke Consultant and Stroke Nurse on 07904 367811.

At SJH page Stroke Liason Nurse on 3986 or Dr Ramsay on 3822.

In any patient presenting with an apparent stroke, your management should centre on answering the following questions:

- Where is the brain lesion?
- Has this patient had a vascular event or not?
- If this is a vascular event is it a haemorrhage or an infarct?
- Why has this patient had a stroke?
- What are this patient's problems?

MANAGEMENT

- If possible, all patients admitted with an acute stroke should be directed to the Acute Stroke Unit in Ward 55 WGH or Ward 101 in RIE and at SJH to the Medical Admissions Unit in wards 23 & 24 or to CCU if thrombolysis is being administered.
- Perform standard acute initial assessment to ensure that the patient is maintaining an adequate airway, is breathing and has an adequate circulation.
- Check swallowing prior to allowing free fluids. Nursing staff on the acute stroke units have a protocol for swallowing assessment. A formal swallowing assessment may be organised within normal working hours by contacting a speech and language therapist on bleep 5221 WGH, ext. 21967 RIE or at SJH SALT on ext 54191.

- If there are doubts about the patient's ability to swallow safely the patient should be placed nil by mouth and given intravenous fluids.
- Urinary catheterisation should be avoided in the acute phase unless there is urinary retention, a high risk of pressure sores or unless the urine output needs to be monitored. Discuss with Nursing staff.
- DVT Prophylaxis: avoid Heparin.

INVESTIGATION

- Immediate BM to exclude hypoglycaemia
- U&E's, and glucose
- LFTs, cholesterol
- FBC, ESR
- ECG
- CXR

CT scan should be requested immediately & be performed as soon as possible after stroke onset.

- If clinical evidence of a cardiac source of embolism e.g. atrial fibrillation or significant cardiac murmur, request an echocardiogram.
- If the patient has had a minor stroke or TIA affecting the carotid territory arrange a carotid duplex to screen for significant carotid stenosis.

INDICATIONS FOR IMMEDIATE CT SCANNING

- Coma or reducing conscious level.
- Likelihood of important non-stroke diagnosis (e.g. subdural haematoma, subarachnoid haemorrhage).
- Patient on or requiring anticoagulants.
- Patient eligible for thrombolysis.
- Unusual presentation? Basilar artery thrombosis.

Young patients (< 60 years old) with a large middle cerebral artery infarct are at risk of significant cerebral oedema developing within 48 hours of stroke onset. GCS & neuro-observations should be monitored closely & if the clinical condition deteriorates further CT scanning is indicated & the patient should be discussed with the Neurosurgeon on-call to consider hemicraniectomy & surgical decompression.

STROKE DIFFERENTIAL DIAGNOSIS: CONDITIONS WHICH MAY MIMIC OR BE MIS-DIAGNOSED AS STROKE

Toxi-metabolic derangements

- Hypoglycaemia
- Alcohol intoxication
- Drugs e.g. tricyclic antidepressants
- Hyponatraemia

Other CNS disease

- Meningitis/encephalitis
- Subarachnoid haemorrhage
- Sub-dural haematoma
- Todd's paresis
- Tumour
- Cerebral vasculitis
- All patients with stroke who have not been admitted to the stroke units should be notified to Professor Dennis or Dr Keir (WGH) or Drs Hart, Mead, Chapman or Coull ext 26927 (RIE) or Drs Ramsay or Jackson via Stroke Unit ext. 54104 or Stroke Liaison Nurse on page 3986 (SJH) as early as possible.
- Once a cerebral haemorrhage has been excluded (by CT brain), aspirin should be initiated immediately at a dose of 300mg daily & continued at this dose for 14 days then reduced to 75mg maintenance treatment. If patient cannot swallow give by suppository. After that 75mg per day should be given (minimise GI side effects).
- Contact Stroke Registrar or Consultant via appropriate switchboard.
- If already on aspirin leave on aspirin until CT result known.
- For patients with ischaemic stroke dipyridamole MR 200mg daily should be given in addition to aspirin.
- If the total cholesterol is greater than 3.5mmol/l start patient on simvastatin 40 mg nocte or atorvastatin (consider pravastatin if on warfarin and digoxin). See Lothian lipid guidelines.
- Antihypertensive medication may be **continued** if the patient is able to swallow.
- New antihypertensive medication should not be initiated within the first week of an acute stroke unless there is accelerated phase hypertension.

- After the first week blood pressure lowering with an ACE inhibitor and thiazide diuretic should be considered even if blood pressure is “normal”.
- Patients with a proven ischaemic stroke who are in atrial fibrillation should be considered for anticoagulation after 2 weeks.
- If AF is symptomatic (e.g. palpitations or breathlessness) consideration should also be given to subsequent chemical or electrical cardioversion.
- All patients with ischaemic stroke who are shown to have a severe stenosis (>70%) of the ipsilateral internal carotid artery on the carotid duplex should be referred to Professor Dennis or Dr Keir (WGH), Dr Chapman or Dr Hart (RIE) or Dr S Ramsay on ext 53846 (SJH) for further consideration of carotid endarterectomy.

TIA

- TIA is a medical emergency with a 12% risk of stroke in the following days.
- Patients with TIA should be commenced immediately on secondary prevention with aspirin 300mg stat. then 75mg daily, dipyridamole retard 200mg bd and a statin. Consider addition of ACE inhibitor & thiazide diuretic if BP > 125/75 mmHg.
- Refer urgently for Neurovascular Clinic assessment where neuroimaging & carotid Doppler ultrasound will be performed.
- Contact the TIA Hotline for advice and clinic appointments on 0131-536-1019
- For West Lothian patients contact Dr Ramsay’s secretary Mrs Evans on ext 523846 or fax 01506-523842.

ACUTE STROKE INTEGRATED CARE PATHWAY (WGH version)

ICP for Acute Admission following **SUSPECTED STROKE** v3.5, post mdt 25/08/06 NHS Lothian

CRITERIA: **Initiate for ALL PATIENTS ATTENDING with a SUSPECTED STROKE**

date initiated: ___/____/___
site : St.John's □ , RIE □ , WGH □

Addressograph or
Name
Dob
Address
Unit number CHI

INSTRUCTIONS *Insert information into appropriate spaces as required.*
Circle Y or N to indicate status of patient or your actions. Do not initial until actually done!

This ICP is an immediate action checklist & a clinical record, & also requires a Kardex & SEWS chart

PHASE 1 - **IMMEDIATE PATIENT ASSESSMENT** – complete with Y or N

FAST criteria:
Facial weakness: [__] Can the person smile?
Arm weakness: [__] Can the person raise both arms?
Speech problems: [__] Can the person speak clearly & understand what you say?

Test all 3: If NO to any question, a Stroke is probable, continue with ICP date&time initial

If YES to all three, continue with full Medical Clerking & devise a Medical management Plan

Time of **Arrival** date ____/____/____ time ____:____hrs
Symptom Onset date ____/____/____ time ____:____hrs
Time difference ____:____ hrs

If Time Difference is < 3h call Stroke Consultant URGENTLY bl……..
Eligible for Thrombolysis? □ Yes - initiate Thrombolysis ICP □ No – state reason

GLASGOW COMA SCALE: *on arrival*: EYES ……. , MOTOR ……. , SPEECH …….. : total ……..

Airway:	**Is** airway compromised & / or GCS < 9	N	Y	IF YES, d/w HDU/ICU time: ……..	initial
Blood Pressure:	**SBP** >210 or <90	N	Y	IF YES, control hyper- / hypo-tension	initial
Cardiac rhythm:	**In** Atrial Fibrillation?	N	Y	IF YES, control heart rate	initial
Oxygenation:	**Is** O_2 sats. < 95%	N	Y	IF YES, prescribe O_2 & check ABG	initial

CT BRAIN SCAN:
date ___/____/___
time ___:___
RESULT
date ___/____/___
time ___:___

Arrange scan NOW (completed a request card & sent to X-Ray dept. Y / N) initial

Anticoagulated (INR>1.4) or Coagulopathy	N	Y	**IF YES to any question, ring Radiologist NOW for immediate scan (day or night)**
Suspected subarachnoid haemorrhage (SAH)	N	Y	
Eligible for thrombolysis	N	Y	
Deteriorating GCS or ??intracranial infection	N	Y	

Intracerebral Haemorrhage	N	Y	**IF YES,** if INR>1.4 - **r**everse anticoagulation NOW (NHSL VTE Guideline) & STOP all antithrombotics	initial
Infarction	N	Y	**IF YES,** give Aspirin 300mg stat oral/pr **NOW** (must be given < 48 hrs of presenting to hospital) & continue with 75mg daily Clopidogrel only if Aspirin allergic	initial
Posterior Fossa bleed, ? Hydrocephalus, ? or Malignant MCA infarct ?	N	Y	**IF YES,** d/w Stroke consultant [bl ……] NOW	initial
SAH	N	Y	**IF YES**, d/w Neurology Sp.Reg in DCN give Nimodipine 60mg oral 4hrly [iv if no swallow]	

☑ once **REQUESTED** these **ROUTINE INVESTIGATIONS** (if in **bold** to be performed in all patients) initial

FBC	□				initial
ESR	□	If > 50mmHg	N	Y: **IF YES,** consider endocarditis or arteritis	initial
U & E's, LFT's	□	If urea raised	N	Y: **IF YES,** adjust fluid regime	
		If **LFT > x**	N	Y **If YES, do NOT prescribe a statin**	initial
Random Glucose	□	If >7.0mmol/l	N	Y: **IF YES,** arrange fasting glucose	initial
ECG	□	If in AF	N	Y: **IF YES,** control HR	initial
Chest X-ray	□				initial

ICP for Acute Admission following **SUSPECTED STROKE** v3.5, post mdt 25/08/06 NHS Lothian

Phase 2 – planning for transfer to ward

		IF YES TO ANY QUESTION	initial when done
Hydration	Drowsy or unsafe swallow N Y	Prescribe IV 0.9% Saline depending on state of hydration. Avoid Dextrose in first 48hrs: 2/4/6 rule	initial
Temperature	Temp > 37.5°C N Y	Prescribe Paracetamol 1g 4-6 hrly oral / IV / PR Take blood cultures, look for & treat infection	initial
Blood Sugar (4hrly BM's)	Glucose >11mmol/L N Y	Prescribe dextrose / potassium / insulin infusion (see GKI ICP)	initial
DVT prophylaxis	Not mobilising independently N Y	Consider CLOTS trial enrolment (unless PVD, neuropathy or ulcers). Avoid Heparin	initial
Swallow screen	Swallow screen failed N Y	Referral to S. & L. T., consider need for medications, fluid & food	initial
Continence	Incontinent of urine N Y	Avoid urinary catheterisation unless renal failure, skin broken or acute urinary retention	initial
Positioning	Perform Moving & Handling Assessment ☐	Nurse 30° Head-up if drowsy or NG fed, & Physio referral prior to transfer (if not for transfer on bed)	initial
Nutritional screen	Complete nutrition screen ☐ Document weight ☐	Consider Modified diet or NG feeding at 24 hrs and referral to Dietitian	Initial
Clinical Trials	*consider* : CLOTS - Y / N/A Trial C - Y / N/A	Trial B - Y / N/A Trial D - Y / N/A	Initial

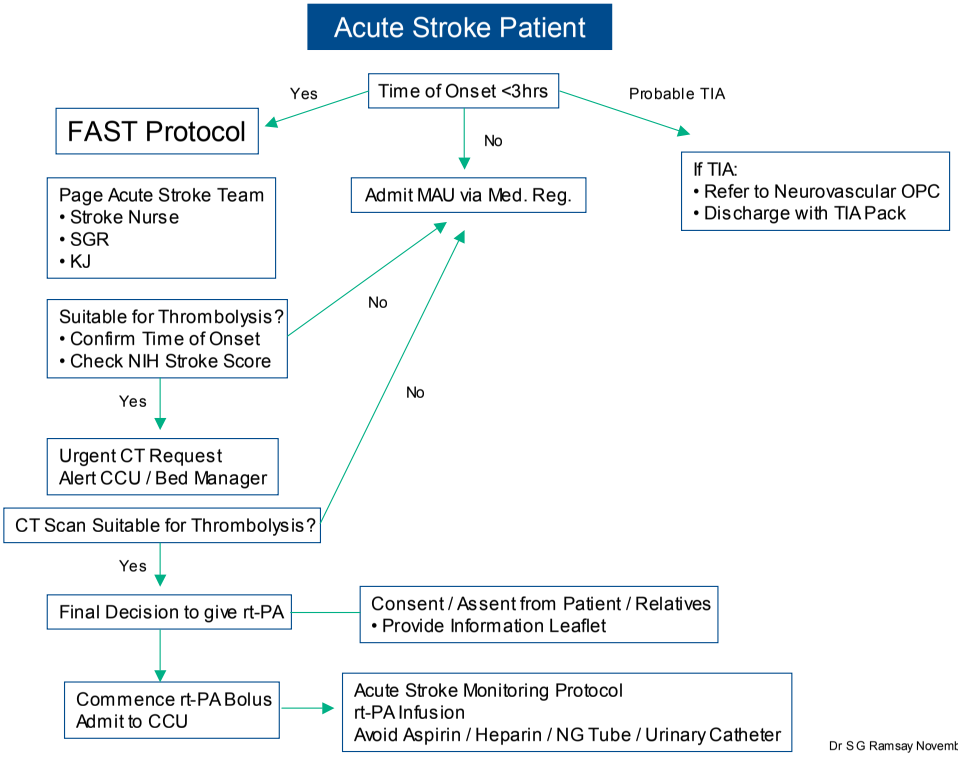
IF ISCHAEMIC STROKE	☒ or ☑ & include date / time sent	
Carotid Duplex scan	☐	If TIA or minor non-disabling stroke & considering endarterectomy — initial
Transthoracic Echocardiogram	☐	If in AF, recent MI, cardiac murmur or bilateral infarcts Bubble contrast echo if <55 yrs — initial
24 Hour ECG	☐	If arrhythmia suspected — initial
Secondary prevention	☐	75mg Aspirin, once daily + 200mg Dipyridamole, twice daily — initial
	☐	If ischaemic & total chol>3.5mmol/l N Y prescribe Simvastatin* 40mg first choice — initial
		* (Pravastatin if already stabilised on warfarin, as Simvastatin interacts)

IF <55yrs old consider the following investigations	☒ or ☑ & include date / time sent	
Lupus anticoagulant	3 Green & 1 Red tubes to Haematology RIE	sent ☐ , initial
Auto-antibody screen	1 White tube to Immunology RIE	sent ☐ , initial
Syphilis serology	1 White tube to Microbiology	sent ☐ , initial
Fasting Homocysteine	1 Red tube to Royal Hospital for Sick Children Biochemistry	sent ☐ , initial
Trans-oesophageal Echo	d/w stroke consultant	sent ☐ , initial

TRANSFER to ward & initiation of 'Continuing Stroke care' ICP: *date* ……/ ……../ …….. *time* …. : ……

Print name	*Designation*	*Initials*	*Signature*	*date*
1				
2				
3				
4				
5				

ST JOHN'S HOSPITAL CARE PATHWAY



Dr S G Ramsay November 2006

THROMBOEMBOLIC DISEASE

DVT and pulmonary embolism are a spectrum of the same disease and often co-exist. There are about 20,000 deaths per year from thromboembolic disease in the UK. The clinical diagnosis is difficult. It is therefore helpful to follow a process to assess clinical probability and have an agreed investigative pathway which includes:

Recognition of the symptom complex

- Breathlessness
- Pleuritic chest pain
- Cough
- Haemoptysis
- Syncope (usually indicates major PE).
- The symptoms in isolation are not diagnostic and merely help support the diagnosis or differential diagnosis.

Determination of the risk factors for thrombosis (risk increases with age)

Major (5-20)	**Minor (2-4)**
Surgery	Cardiovascular disease
Pregnancy	Oral contraceptive pill
Orthopaedic	Hormone replacement therapy
Malignancy	Obesity
Immobility, e.g. hospital	Travel (>5-6hrs)
Previous VTE	
FH of VTE	

Baseline investigations

All patients with suspected pulmonary embolism should have standard bloods, chest X-ray, ECG and arterial blood gases on admission.

The clinical probability of PE can then be determined:

High probability patients (>80% likelihood of PE)

- Risk factor present.
- Unexplained dyspnoea, tachypnoea or pleurisy.
- Unexplained radiographic changes or gas exchange abnormality.

Low probability (<20%)

- No risk factors.
- Dyspnoea, tachypnoea or pleurisy with possible alternative cause.
- **Alternative explanation** for radiographic changes or gas exchange.

Role of D-dimer

D-Dimer is helpful if used according to protocol.

It is not a routine screening test and is best used when there is suspicion of PE but this is low probability.

Only a negative result is of value and a Vidas D-dimer test < 500 is negative.

D-dimer tests should not be performed if there is a history of:

- Malignancy
- Recent trauma or surgery
- Active infection
- Pregnancy
- Bleeding

In patients with low probability of PE and a negative D-dimer then PE can be excluded and an alternative diagnosis determined.

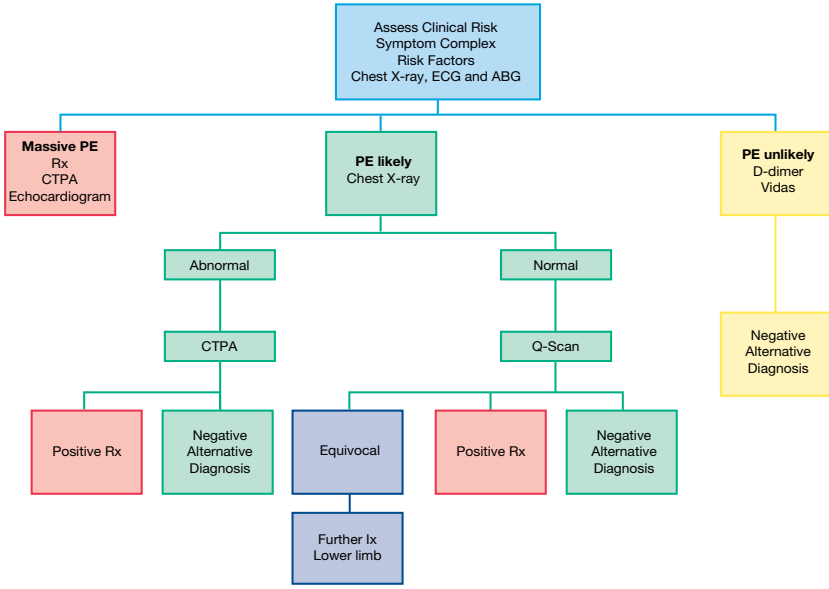
DIAGNOSTIC ALGORITHM

The commonest tests undertaken are CT pulmonary angiography and perfusion lung scan (occasionally plus ventilation lung scan). In patients with equivocal results particularly from perfusion lung scanning then leg imaging or CTPA should be considered to confirm or refute the diagnosis. CTPA has the advantage of providing an alternative cause for symptoms in a proportion of patients.

Echocardiography in massive PE may help confirm the diagnosis and support treatment stratification to thrombolysis if there is evidence of right ventricular strain.

Pulmonary angiography is now rarely performed and only after consultation with radiology and the Consultant involved with patient care.

SUSPECTED PULMONARY EMBOLISM



TREATMENT

The current recommended approach in uncomplicated PE is initiation of LMWH - currently weight adjusted S/C Enoxaparin 1.5 mg/kg once daily and oral warfarin (Fennerty regime). LMWH Heparin should be started immediately.

For patients with a high risk of bleeding eg post major surgery or in renal failure then unfractionated heparin should be considered because of the shorter half life. When unfractionated heparin is used then APTT must be measured regularly according to protocol.

Oral warfarin can be initiated on the first day and heparin should be overlapped for a minimum of 5-6 days and until INR has been therapeutic (>2.0) for 2 days.

Warfarin should be continued for 3 months in patients with PE with a precipitating factor eg surgery and for 6 months in those with idiopathic PE or extensive thromboembolic disease. Target INR is 2.5.

Patients with thrombophilia or recurrent disease should be referred to Haematology for ongoing management.

Thrombolysis should be considered in patients with massive pulmonary embolism after consultation with a Consultant and the patient should be managed in a critical care environment.

Thrombolysis bolus alteplase (rtPA) 10mg IV over 1-2 minutes followed by an infusion of 90mg over 2 hours (max dose 1.5 mg/kg if weight is <65kg). Start IV unfractionated heparin once APTT <2.0 at rate if 1000u/hour. Check APTT after 6 hours and aim for ratio of 1.5-2.5.

In the cardiac arrest or peri arrest situation 50mg of alteplase can be administered while resuscitation is on-going and attempts to confirm or refute the diagnosis are arranged.

Outlook is bleak but there are individual patients who have survived.

RUPTURED OR LEAKING ABDOMINAL AORTIC ANEURYSM

Presentation

- Severe back pain or abdominal pain.
- History of collapse (often with brief recovery).
- Hypotension.
- Large pulsatile mass in the abdomen.

Misdiagnosis

- Renal colic.
- Acute Pancreatitis.
- Perforated intra-abdominal viscus.

i In older patients presenting with renal colic for the first time or after many years disease free think of AAA.

Risk factors

- Elderly.
- Male sex.
- History of hypertension.

Initial Management

- Radiopage the Vascular Registrar (#6440).
- High concentration oxygen; analgesia - titrate IV morphine in 1mg increments.
- IV access in the upper limb (femoral lines should be avoided).
- Low volume resuscitation; aim for a systolic pressure of between 60 to 80mmHg (or enough to maintain conciousness).
- Monitoring ECG, BP and pulse oximetry.
- Bloods including x-match (The Vascular Registrar shall initiate the Major Haemorrhage Protocol).

WGH blood bank phone is 32419.
RIE blood issue phone is #27501/27502/27503.
SJH bloodbank phone is 53354

Investigations

- Plain CXR and AXR (loss of psoas shadow, calcified aneurysm).
- Portable ultrasound scan if there is any element of doubt regarding the diagnosis.

  (The use of CT scanning to establish the diagnosis of a ruptured/ leaking AAA is both time-consuming and unhelpful.)

Prognosis

Overall >75% mortality and 50% operative mortality.

Hardmans Criteria (*guide* to overall prognosis)

- Age >76
- Loss of consciousness
- Haemoglobin <9
- Creatinine >180
- ECG ischaemia

3 or more of the above on admission indicates a very poor outcome.

Transfer from WGH or SJH

- The patient should be transferred by the most senior middle-grade doctor of the receiving speciality. For patients referred to the waiting Surgeons this will be the SHO or SpR on call for General Surgery. For patients referred to Medicine (e.g. as renal colic) this will be the SHO or Specialist Registrar on call for Acute Medicine.
- If a patient requires transfer to the Royal Infirmary, there should be no delay and all transfers should be 'blue lighted' with an appropriate SHO/Registrar.

The only definitive management of these patients is early surgery. It is our aim to maintain cardiovascular stability using low volume resuscitation to allow transfer, but speed is pivotal to good outcome.

MANAGEMENT OF THE ACUTELY ISCHAEMIC LIMB

Presentation

- Pain
- Paraesthesia
- Pulseless
- Power reduced
- Pallor
- Perishing with cold

(all of the above may not be present simultaneously)

Initial Management

- Assessment of the affected and contralateral limb and pattern of pulses.
- IV access and analgesia - morphine titrated.
- Doppler assessment.
- Discuss with Vascular Registrar regarding heparinisation and further investigation.

  (In the absence of paraesthesia, significant pain and loss of power to the limb, many patients may be heparinised and avoid surgical embolectomy).

Investigations

- FBC, U & E's, CK, Clotting screen and G & S.
- Duplex examination.
- Angiogram.

  (Imaging is avoided if the site of the embolus can be determined clinically)

Further Management

- Correction of cause (if appropriate) e.g. atrial fibrillation

Prognosis

- Depends on ischaemia time and aetiology.

The diagnosis of an acutely ischaemic limb is a surgical emergency. A favourable outcome depends on the speed of limb reperfusion. Call Vascular Registrar #6440.

HYPERTENSION

Hypertension is common and most patients do not require admission. The key to its correct management is a **slow** reduction, even in hypertensive emergencies. Rapid reduction may result in cerebral infarction. Hypertension immediately following intracerebral events is not uncommon, and may aid cerebral perfusion. It does not usually warrant intervention. Seek expert advice on treatment. See the Lothian Guidelines for the treatment of hypertension.

Moderate Hypertension: diastolic BP 105-115mmHg

- Secondary hypertension is rare and should not be pursued unless there are clear clinical or biochemical clues.
- Check fundi, creatinine, ECG for end organ damage.
- Urine dipstick.
- Check for radiofemoral delay, and renal bruits.
- Identify cardiovascular risk factors and treat if necessary e.g. diabetes, hypercholesterolaemia, smoking.
- Follow Lothian Hypertension guidelines.
- Most patients will require more than one agent.

SEVERE: diastolic BP >115mmHg

- Management is similar to that for moderate hypertension although repeat measurement is less important.
- Patients with accelerated phase ('malignant') hypertension should be admitted to hospital.
- They have evidence of end organ damage.
- Atenolol 50mg oral od if no contraindication, an alternative would be Nifedipine LA 30mg orally od. The second drug could be added after 24 hours.
- Ix and Rx as above.

ENCEPHALOPATHY OR INTRACEREBRAL BLEED

- Seek expert opinion.

Chapter 4

RESPIRATORY EMERGENCIES

SEVERE ACUTE ASTHMA

Presentation

Breathlessness, wheeze, chest tightness and cough. Often in a patient known to have asthma, but first episode can occur at any age and may be severe. Onset may be rapid (minutes/hours) or gradual over a few days.

Severe Episode

- Too breathless to complete sentences in one breath.
- Respiratory rate of 25 or more.
- Heart rate of 110 or more.
- PEF <50% of predicted normal or best known (see table in ARAU, A&E and BTS guidelines). Inability to do PEFR indicates severe attack (if able to perform PEFR less than 33% predicted is a marker of life threatening disease).
- Oxygen saturation <92% (depends on FiO_2).

Life-threatening Attack

- Unable to talk.
- Sweaty, pale or cyanosed.
- Silent chest on auscultation.
- Feeble respiratory efforts.
- Bradycardia
- Hypotension
- Confusion
- Exhaustion

Management

Immediate treatment with oxygen, salbutamol nebulised with 8l/min oxygen and systemic corticosteroids (see below) should be given during assessment with ABGs etc. Aim for SpO_2 at least 92%. Contact Respiratory Registrar/Consultant IMMEDIATELY.

- High concentration humidified oxygen 60% via mask initially and adjust according to ABG. Aim to maintain SpO_2 94-98%.
- IV access.
- Arterial blood gas on oxygen in all patients with severe asthma (record inspired oxygen concentration).
- Management decisions depend upon clinical state and ABGs.

- Check peak flow and compare to predicted or previous best PEF: may be too ill to do this.

$PaCO_2$	PaO_2	$[H^+]$	SEVERITY
Low	Low	Low	Moderate
Normal	Low	Normal	Severe
High	Low	High	Life-threatening

Immediately contact Respiratory Registrar/Consultant and alert ICU if ABGs indicate life-threatening attack.

- Salbutamol 5mg nebulised in oxygen 8l/minute, repeated every 10-15 mins if necessary.
- Add nebulised ipratropium 500 micrograms (4-6 hourly) to salbutamol for patients with acute severe or life-threatening asthma or those with a poor initial response to salbutamol.
- Prednisolone 40mg orally or
- Hydrocortisone succinate 200mg IV (slowly) if unable to take orally.
- If no response to repeated nebulised bronchodilators, Respiratory/ Medical Registrar or ICU staff could consider IV magnesium sulphate 2.0g over 20 minutes or IV aminophylline 250mg (maximum 5mg/kg) by controlled infusion over 20 mins followed by a continuous infusion.

Do not use aminophylline without the advice of Respiratory or Intensive Care specialists.

Do not give loading dose of aminophylline to patients on oral therapy. Check the theophylline blood concentration.

Caution: Magnesium is a powerful vasodilator and may cause dangerous hypotension in the hypovolaemic or septic patient.

- Chest x-ray - all severely ill patients. Urgent if clinical signs suggest pneumothorax.
- Calm reassurance throughout is highly beneficial.
- U&Es, FBC, 12 lead ECG should be performed.

ASSESSMENT OF RESPONSE

Clinical Improvement

- Less distressed.

- Decreased respiratory and heart rates.
- Able to talk in sentences.
- Louder breath sounds on auscultation (may be more wheezes).
- Arterial blood gases must be repeated **within** 30 minutes **if no or poor response to treatment**.

ABGs should be regarded as a monitor and repeated early and again if required.

- Pulse oximetry may be used to assess response in patients who have clinically improved and did not have a high $PaCO_2$ initially. Aim for SpO_2 94-98%.
- PEF: repeat 15 and 30 minutes after starting treatment.
- Monitor heart rate and oxygen saturation continuously and measure blood pressure frequently.
- Respiratory Registrar/Consultant must be contacted (if not already done so).

Contact ICU if:

- Deteriorating or not improving.
- ABG worsening.
- Exhaustion
- Confusion, drowsiness, coma.

Transfer to ICU if respiratory acidosis worsens or develops in spite of treatment.

Further Management if Improved

- Continue oxygen titrating concentration against saturation/PaO_2. Aim for SpO_2 94-98%.
- Continue prednisolone 40mg daily orally.
- Regular nebulised salbutamol e.g. 2.5mg-5mg 4 hourly +/- ipratropium 6 hrly.
- If immobile thromboprophylaxis with subcutaneous heparin should be given: see local protocols.

COMMUNITY-ACQUIRED PNEUMONIA

IMMEDIATE MANAGEMENT GUIDELINES

Definition - Acute lower respiratory infection with recently developed radiological signs.

Diagnosis

Symptoms

- Specific: dyspnoea, chest pain (peripheral/pleuritic or dull central), cough, sputum (often absent early), wheeze.
- General: malaise, fever, rigors, myalgia.

Signs

- Tachypnoea
- Tachycardia
- Focal signs: dullness, crackles, bronchial breathing, pleural rub.
- Cough
- Sputum (mucopurulent, rusty or bloodstained).
- Cyanosis

LIKELY UNDERLYING CAUSES

Type	Organism	Approx. % cases
Typical	*Streptococcus pneumoniae*	31
	Haemophilus influenzae	7
	Influenza virus	7
	Staphylococcus aureus	2
	Gram negative eg Klebsiella	2
Atypical	*Mycoplasma pneumonia*	10
	Chlamydia psittica	4
	Legionella pneumophilia	2
	No organism found (most probably pneumococcal)	35

Travel history and animal contact may point to less common pathogens: seek advice from Respiratory/ID/Microbiology.

ASSESSMENT OF SEVERITY: CURB 65

Prognostic indicators (on admission) of high mortality:

C - new onset confusion.

U - Urea over 7 mmol/l.

R - Respiratory rate 30/minute or above.

B - BP systolic <90mmHg and diastolic <60mmHg.

- Age ≥65

Two or more of these gives 36 x risk of death: predicts requirement for Intensive Care or High Dependency Care.

- Co-morbidity.
- Multilobar involvement.
- Atrial fibrillation.

If none of these, consider outpatient treatment.

IMMEDIATE INVESTIGATIONS

- ABG (record inspired oxygen concentration).
- CXR
- FBC, urea & electrolytes.
- Blood cultures.
- Sputum culture.
- Urine for Legionella antigen.
- Throat swab (for virology and Mycoplasma in viral transport medium)

INITIAL TREATMENT

- **Oxygen -** high concentration is normally safe in pneumonia; use enough to relieve hypoxaemia. (monitor arterial pCO_2 in patients with pre-existing COPD and in those worsening).
- **IV fluids** to correct hypovolaemia and total body fluid deficits and prevent renal dysfunction.

i **Antibiotics: should be started immediately and related to likely organism and severity of illness.**

- Amoxicillin 500mg orally tds suitable for those with CURB-65 score 0-1 who would have been sent home but for social or other reasons and for elderly patients (as atypical organisms uncommon).
- If not seriously ill but unable to tolerate oral medication: amoxicillin 500 mg tds IV.
- If penicillin allergy: Clarithromycin 500 mg bd oral or IV.
- If severe CAPC CURB-65 score 2 to 5 Co-amoxiclav 1-2g 8 hr IV plus Clarithromycin 500mg bd orally or IV. If penicillin allergic, Ceftriaxone 1-2g IV/24h plus Clarithromycin.
- If strong suspicion of Legionella (eg travel history), add Ciprofloxacin 400 mg bd IV to Co-amoxiclav/Clarithromycin as above.

i **Signs and symptoms do not reliably distinguish pneumococcal pneumonia from "atypical" pathogens Legionella or Mycoplasma. Therefore patients with severe pneumonia CURB 65>3 should receive dual therapy. Dual therapy is not necessary in mild illness.**

Clarithromycin must be diluted to 250ml in 5% dextrose or 0.9% saline and given IV over 1 hour.

- If the patient has already had antibiotics from GP find out what and for how long. May need to modify treatment accordingly.
- If patient has unusual travel or animal contact history, seek advice from microbiology or ID.

Primary resistance to amoxicillin (amoxycillin) in *S pneumoniae* is very rare in Lothian (<1%). *H.Influenzae* causes relatively few cases and beta-lactamase resistance in this organism remains uncommon (around 7%), so the routine initial use of antibiotics stable to beta lactamase (e.g. Co-amoxiclav) is not justified.

- Intravenous therapy is expensive in materials, nursing and medical time and should only be used when oral therapy cannot be taken and in severely ill.

Consult Respiratory Registrar regarding appropriate further management and transfer to Respiratory Unit care.

REASON FOR FAILURE OF TREATMENT

- Incorrect diagnosis.
- Incorrect antibiotic, or too low a dose.
  Not treated for long enough: it takes 48-72h for antibiotics to start to improve pneumococcal pneumonia.
- Unusual or resistant pathogen: check laboratory report.
- Immunocompromised patient: have less common pathogens, eg has pneumocystis been considered?
- Complication:
  - empyema
  - lung abscess
  - pulmonary embolism
  - cardiac failure (LVF, RVF, both)

HOSPITAL - ACQUIRED PNEUMONIA

- Early onset (<5 days admission): Co-amoxiclav 625mg 8 hour oral **or** 1.2g 8 hour IV.
- Late onset (>5 days). Likely pathogen will depend on previous antibiotic therapy, whether the patient is MRSA - colonised and

other factors. Consult local antibiotic guidelines or microbiologist for advice.

ACUTE EXACERBATIONS OF COPD

Chronic obstructive pulmonary disease (COPD) is the preferred term. Acute exacerbations of COPD present as a worsening of the previous stable situation.

Symptoms

- Increased breathlessness.
- New or increased sputum purulence.
- Increased sputum volume.
- Increased wheeze.
- Chest tightness.
- New or increased ankle oedema.

Important features in the history

- Previous exercise tolerance.
- Social circumstances and quality of life, especially whether living alone/alone with support/with family; whether housebound.
- Current treatments, including home nebulisers and oxygen therapy.
- Number of previous admissions in past five years.
- Number of admissions to ICU.
- Previously ventilated?
- Time course of current exacerbation.
- Smoking history.

IMPORTANT SIGNS

- Frankly purulent sputum
- Tachypnoea, wheeze and use of accessory muscles with increased work of breathing.
- Pyrexia
- Cyanosis
- Confusion
- Peripheral oedema

Initial Investigations

Priority

- ABGs (record inspired O_2 concentration).
- CXR (exclude pneumothorax).

Less urgent investigations

- PEF and start PEF chart.
- FBC, U&Es.
- Sputum and blood cultures.
- 12 lead ECG.

INITIAL TREATMENT

- Oxygen: do not give an inspired O_2 of more than 28% via Venturi mask or 2l/min via nasal prongs until arterial blood gases are known.
- Check ABG within 20 mins of starting O_2 and within 20 mins of changing inspired O_2. Aim to achieve a PaO_2 of >6.6 kPa and H^+ of <55. If the PaO_2 is responding and the effect on H^+ is modest increase the inspired O_2 to achieve a PaO_2 >7.5 kPa.
- Oxygen should be prescibed to achieve a target SpO_2 88-92%.

This applies to this particular group of COPD patients and must not be extrapolated to other acute conditions such as asthma, pneumonia, LVF, sepsis and so on.

Bronchodilators

- Nebulised salbutamol 2.5mg and ipratropium bromide 500 microgram should be given on arrival and repeated 4-6 hourly.
- Consider using air compressor and 2l nasal O_2.
- For distressed patients more frequent salbutamol nebulisers may be given.
- If the patient is not responding to repeated nebulised bronchodilators the Respiratory Registrar/Consultant should be contacted. IV aminophylline may be considered by the Respiratory/Intensive Care Specialist. Controlled IV infusion of 250mg (maximum 5mg/kg) aminophylline over 20 mins only if patient **NOT** receiving oral theophyllines). Magnesium chloride has not been shown to be a benefit in this situation.
- NIV - non-invasive positive pressure ventilation via face mask - should be considered for decompensated patients with hypercapnoea and acidosis H^+>55nmol/l: discuss with Respiratory Specialist.

Antibiotics

- Amoxicillin (amoxycillin) 500mg oral tds **or** doxycycline 200mg start then 100mg (clarithromycin 500mg oral bd in penicillin allergic subjects).

  If patient has severe infection, or has bronchiectasis: seek specialist advice.

Other measures

- Prednisolone 40mg oral daily should be given unless there are contraindications to steroids.
- Hydrocortisone 200mg IV may be given initially if the oral route is not appropriate.
- Diuretics are indicated if there is peripheral oedema and/or raised JVP.
- Atrial fibrillation with an uncontrolled ventricular rate should be treated with digoxin.
- If immobile thromboprophylaxis with subcutaneous heparin should be given: see local protocols.

THE SICK PATIENT

The Respiratory Registrar (and as appropriate, Consultant) on call should be involved in the management of these patients. Ventilation (IPPV - intermittent positive pressure ventilation via ET tube - on ICU or NIPPV on the Respiratory Unit may be required for patients with a H^+ >55nmol/l and/or a rising $PaCO_2$.

FACTORS TO ENCOURAGE USE OF IPPV

- Demonstrable, remedial reason for current decline (e.g. pneumonia).
- First episode of respiratory failure.
- Acceptable quality of life or habitual level of activity.

FACTORS TO DISCOURAGE USE OF IPPV

- Previous severe COPD, fully assessed but unresponsive to therapy.
- Poor quality of life (e.g. housebound) despite maximal therapy.
- Severe co-morbidities.

Discuss with Respiratory and ICU Consultant on call if any doubt.

PNEUMOTHORAX

Tension pneumothorax is an EMERGENCY and requires immediate treatment by inserting a 14G cannula in the 2nd intercostal space in the mid-clavicular line on the affected side. A formal chest drain can then be sited. Only individuals who are trained and competent in chest drain insertion should perform it unsupervised.

SPONTANEOUS PNEUMOTHORAX

Respiratory Unit staff should be contacted from all A/E, admission units for advice and further arrangements.

If the lungs are normal:

- **Aspirate if complete collapse -** aspirate in 2nd intercostal space, mid-clavicular line with an 18G cannula, 50ml syringe and 3 way tap. This should follow explanation, skin cleansing and infiltration of the site with adequate 2% lidocaine (lignocaine). If the pneumothorax resolves or is rendered small the procedure has been successful. Repeat once only.
- **Moderate collapse** (degree of collapse: small = a rim of air; <2 cm air. moderate = 2cm rim; complete = airless lung).
- Admit to Respiratory Unit for observation.
- **If small**, uncompromised and a sensible patient discharge and review with CXR within one week. **Must** be advised to return immediately if less well or more breathless.

If the lungs are abnormal:

- Aspirate if moderate/complete collapse, or if smaller pneumothorax but breathless or compromised. Compromise includes tachypnoea, hypoxaemia/low SpO_2 and/or signs of tension.
- If <50% collapse and patient not dyspnoeic or compromised observe as an inpatient (refer to Respiratory Unit).

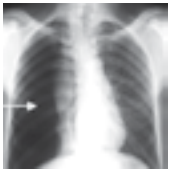
STOP aspiration if:

- More than 2.5 litres aspirated.
- Resistance is felt.
- Excessive coughing.

Chest drains are required for the following:

- Tension pneumothorax.
- Symptomatic patient with underlying lung disease.
- Failed aspiration (unsatisfactory resolution of pneumothorax or breathlessness).
- History of chest trauma

MANAGEMENT OF SPONTANEOUS PNEUMOTHORAX



MACDUFF, ARNOLD AND HARVEY ON BEHALF OF THE BTS PLEURAL GROUP

TENSION PNEUMOTHORAX

Signs

Diagnosis is **NOT** radiological but is clinical

- Cyanosis/low SpO_2/low PaO_2.
- Hypotension.
- Shock.
- Tracheal deviation away from side of other signs.
- Silent, resonant hemithorax.

Action

- 100% oxygen.
- 14G cannula inserted perpendicular to skin in 2nd intercostal space, mid-clavicular line.
- Give analgesia.
- Formal intercostal drain insertion.
- CXR to check position and re-expansion.

INTERCOSTAL DRAINAGE TUBE INSERTION

Respiratory Unit staff can be contacted for insertion of intercostal drain.

Respiratory Units, Western General Hospital and Royal Infirmary of Edinburgh. Practical guidelines for intercostal drain insertion and management. Final version 18/4/07

1. Preparation:

- Give oxygen as required and secure iv access.
- Atropine (600 micrograms) should be handy as profound vagal stimulation, with resulting bradycardia, can occur during pleural manipulation.
- Premedicate anxious patients with midazolam 1mg to 5mg iv or diazepam 5mg to 10mg sublingually (ordinary tablets dissolve) unless the patient is in respiratory failure. Flumazenil (300-600 micrograms) should be immediately available to reverse over-sedation. Morphine 2.5 to 10mg s/c is an effective alternative premedication, the lower dose being appropriate in the frail and elderly.

- Look at the CXR and mark intubation site with pen on patient's chest: 4th or 5th ICS just anterior to the mid-axillary line for pneumothorax, site directed by signs/ultrasound for effusion. A reference mark in the mirror image position on the opposite side is useful if the original mark is washed off during skin preparation, but must not lead to confusion about which side the tube is needed!
- Position the patient supine (20-30 degrees) with the patient's ipsilateral arm behind head
- Wash hands and put on a sterile gown and gloves. This is a messy, sterile procedure and a gown protects your patient and your clothes!
- Clean the lateral chest wall with antiseptic, drape it leaving free access to the drain site. Absorbent pads below the drain site are useful as fluid is often spilled during the procedure.

2. Selection of a suitable drain

- In general, small diameter drains (eg. 12 French) are preferred for simple pneumothorax, as they are more comfortable to insert and manage.
- If it is anticipated that talc pleurodesis will be needed after drainage, it is essential to use a larger diameter drain, (e.g. 20-24 French) otherwise it will not be possible to drain off excess fluid and talc, which may cause a florid inflammatory reaction.
- The largest sizes of drain (28 French) are used when empyema is suspected, to maximise the drainage of viscous fluid and debris.
- Small drains are generally of the Seldinger (Portex or Cook) variety, large drains may be conventional Argyle or Seldinger (Cook)

3. Optimum positioning of a chest drain

- For pneumothorax try to advance the drain upwards towards the pleural apex during insertion.
- For effusion, basally placed drains are best. If effusions are complex or loculated, seek chest ultrasound to guide positioning.
- Always insert drains a generous distance into the chest – position may be adjusted later by partial withdrawal but NOT by advancing the drain.
- Many drain related problems occur when drains are insufficiently advanced (or insufficiently secured) and drain side holes come to rest in the chest wall or subcutaneous tissues.

4. Procedure for conventional (Argyle) drain

- Prepare the water seal bottle with sterile water.
- Infiltrate the skin down to parietal pleura with 1% lidocaine 10-20ml, using a blue then subsequently a green needle aspirating intermittently (look for air or fluid in syringe to confirm that the pleural space has been entered). Maximum safe dose of lidocaine is 200mg = 20ml of 1% in total.
- A small transverse incision into skin and subcutaneous fat is made over the rib below the intercostal space selected for insertion of the tube.
- Two 2/0 silk stitches should be placed across the incision with the stitch ends left loose to close the wound after drain removal.
- Using blunt dissection (spreading forceps within the incision), form a track for the tube through the intercostal muscles to the level of the pleura. The size of the track is very important. Too small and excessive force will be needed for drain insertion, too large invites leakage of air and fluid around the drain. Work over the edge of the rib below (remember the neurovascular bundle runs in a groove on the inferior surface of the rib above). Finally, the parietal pleura is gently penetrated (Fig 1a).
- Insert the clamped chest drainage tube (with the trocar removed) through the prepared track using forceps to guide it in the desired direction (Figs 1a / 1b).
- Secure and connect the drain as below.

5. Procedure for Seldinger (Cook) drain insertion

- Check pack contents before starting, and prepare the water seal bottle with sterile water.
- Infiltrate the skin at the drain site with 2ml 1% lidocaine (orange needle) waiting 2 mins for adequate effect, then make a skin incision large enough for the chest drain using the scalpel provided (Fig 2)
- Attach a green needle to a 10ml syringe filled with 1% lidocaine and advance it through the tissues in the direction you wish the tube to go, infiltrating as you go. Stay just above the superior border of the rib below, and pause periodically to aspirate - air or fluid, depending on situation, indicates pleural penetration (Fig 3). Maximum safe dose of lidocaine is 200mg = 20ml of 1% in total. Remove syringe and needle.
- After waiting at least 2 mins to ensure anaesthesia, change the green needle for the blunt introducer needle from the Seldinger

pack. Advance slowly along the infiltrated track until you can aspirate air or fluid.

- Remove the syringe and pass the soft "J" curled end of the guide wire through the needle at least 10 centimetres into the chest – it should pass without resistance (Fig 4). Remove the needle leaving the guide wire in place.
- While maintaining the guide wire in position, dilate the tract and pleural opening by advancing, in sequence small to large, the dilators over the wire. Gentle rotation of the dilators around the central wire will facilitate introduction (Fig 5). Make sure each dilator is passed just until its maximum diameter is through the tract. There should be enough guide wire in the chest to prevent the dilator advancing beyond the end of the wire.
- With the wire still positioned, pass the chest tube/chest tube inserter assembly over the wire and into the chest, keeping the tube in the same alignment as the original wire insertion, to avoid kinking the wire. Make sure you advance far enough that the tube side holes are fully within the pleural cavity (Fig 6).
- Remove the guide wire and chest tube inserter leaving the chest tube in place (Fig 7).
- Secure and connect the tube as described below:

6. Connection to underwater seal, securing and dressing

- Connect drain to water seal bottle, release clamp and look for bubbling (pneumothorax) or fluid (effusion) and swinging of water column to confirm position in the pleural space.
- Secure drain with a 2/0 silk suture. Make one generous loop through the skin next to the insertion site and immediately tie several knots. Then take the loose ends, encircle the drain tightly next to the skin and tie with several knots. Encircle the drain and tie again. Do not coil the suture along the length of the tube ("fishnet" style), this merely allows the suture to work slack, then the tube falls out!
- Apply dressing. 2-3 gauze swabs cut to the centre are first placed over the insertion site. Long strips of adhesive bandage are then applied firstly lengthwise along the tube then along the skin in line with the ribs (Fig 1b). Shorter cross strips complete this dressing, which is effective in resisting accidental pull on the drain. Push all tube connections firmly home and secure them with adhesive tape.
- Check correct drain placement with a chest x-ray

7. Care of patient with an intercostal drain

- Rapid full expansion of a completely collapsed lung may lead to pulmonary oedema. For very large effusions, clamp the tube for 1 hour after 1.5 litres have drained, before allowing free drainage. Make sure all staff are aware the tube is clamped and what time the clamp is to be removed.
- Instruct the patient to keep water bottle below waist level, to remember it is attached and not to pull it accidentally.
- For mobile patients, a weighted metal stand should be used to carry the bottle and to prevent it falling over.
- Prescribe adequate analgesia (pethidine or morphine may be required) – remember the surgical "injury" you have caused is equivalent to a stab wound.
- Adjustment of position: If drain is too far in, it is acceptable using sterile technique and after careful antiseptic swabbing, to loosen the retaining stitch and retract the drain a few cm before re-securing it, taking care not to withdraw so far that the side holes leave the pleural space.
- The drain should NEVER be advanced further into the chest after the initial insertion – this carries infection forward into the pleural space.
- Only clamp a chest drain if draining a very large effusion (see above), if the bottle breaks or the tube becomes disconnected.
- If a patient with a chest drain in situ requires transfer by ambulance a trained nurse with experience in the management of chest drains must be part of the escortAlastair Innes, April, 2007

Figure 1a - preparing to insert a conventional drain

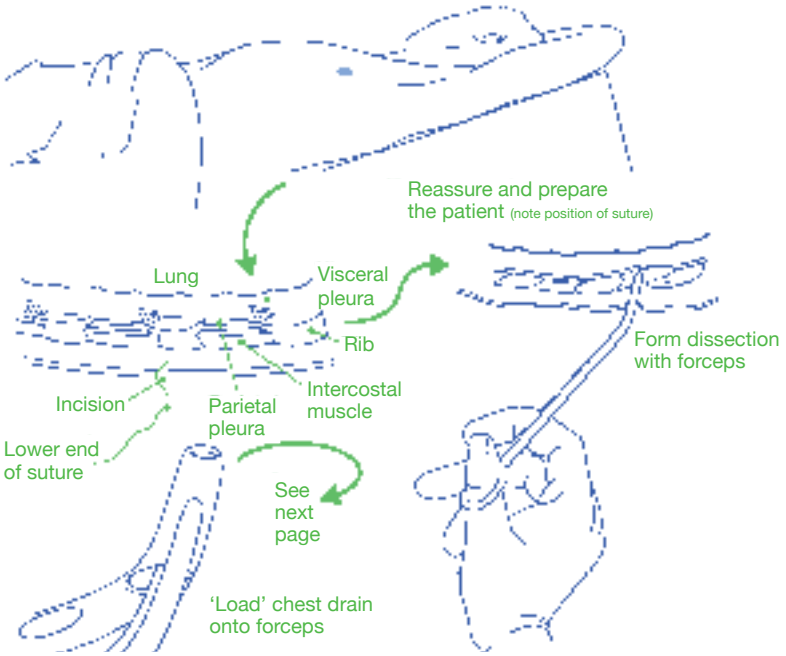


Fig. 2

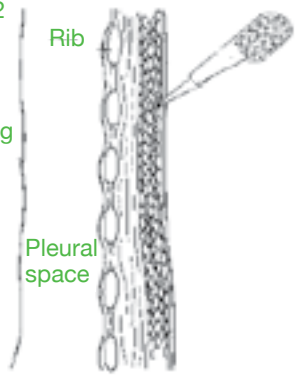


Fig. 3

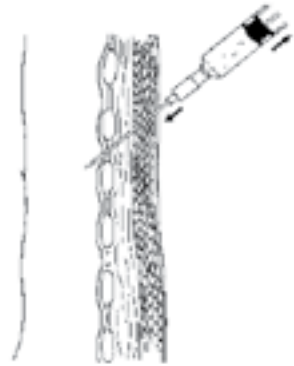


Fig. 4

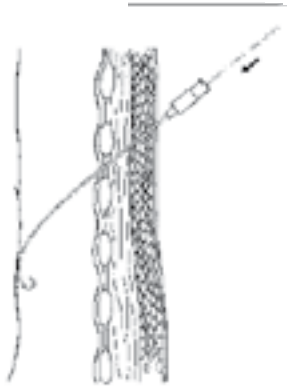


Fig. 5

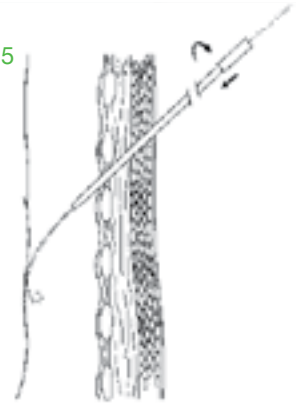


Fig. 6

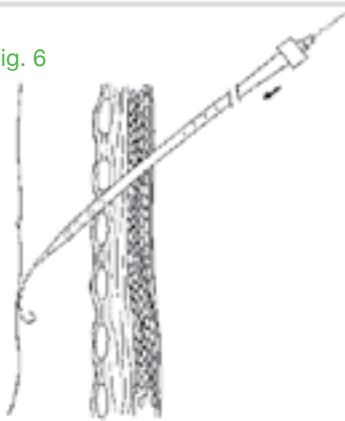
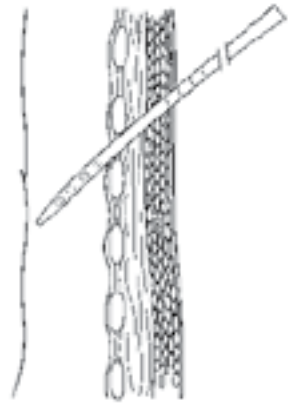


Fig. 7



MANAGEMENT OF CHEST DRAINS

- CXR post-insertion to check position and ensure re-expansion.
- Once bubbling has stopped for 24hrs **AND** CXR shows lung re-expansion remove the drain.

NEVER routinely clamp a chest drain: only clamp a chest drain if the bottle breaks or the tube becomes disconnected.

- Repeat CXR after removal and if lung collapsed again discuss with Respiratory Registrar (if not already).
- If lung not re-expanded repeat CXR next morning. If still not re-expanded and drain bubbling discuss with Respiratory team.
- If drain not swinging or bubbling then it has either come out or is blocked: check the drain. If drain has come out and is still needed the drain tube should be removed and a new drain inserted with full aseptic technique.

Never replace the drain through a previous insertion site.

- If still bubbling at 24hrs consult Respiratory Registrar. Consider low-grade suction (5-10cm H_2O). Do **not** use a standard wall kPa suction pump.
- If subcutaneous emphysema check the drain is not blocked.
- Great care should be taken to insure that tubing between the chest drain and the underwater seal bottle does not disconnect.

TROUBLESHOOTING

Fails to swing

- Check connections.
- Check CXR and if drain blocked or outside pleural cavity remove.
- Replace only if lung not up.

Bubbling at 24hrs

- Check position (as above).
- Check connections.
- Check entry wound is not sucking in air.

If a patient with a chest drain in situ requires transfer by ambulance a trained nurse with experience in the management of chest drains must be part of the escort.

Discuss with Respiratory team if requiring suction or any problems.

Chapter 5

GASTROINTESTINAL EMERGENCIES

ACUTE UPPER GASTROINTESTINAL BLEEDING

- Common emergency.
- 10% mortality in the UK.
- Presentation with haematemesis and/or melaena, and with shock or collapse.
- Syncopal symptoms such as dizziness or weakness may be present.

AETIOLOGY	FREQUENCY
• Peptic ulcer	50%
• Varices	5-10%
• Oesophagitis	10% *
• Mallory-Weiss tear	5%*
• Vascular malformation	5%*
• Gastritis	15%*

* usually respond to conservative therapy and are not life-threatening.

MANAGEMENT OF HAEMATEMESIS AND MELAENA

Standard initial assessment and management of the ill patient as described in Chapter 2.

Immediate action for all

- Oxygen
- Secure adequate IV access.
- IV fluids: 0.9% saline or colloid.
- Avoid saline in liver disease.
- Send bloods (below) including cross-match.
- 12 lead ECG in elderly/history of cardiac disease.
- Keep NBM. Consent for endoscopy will be obtained by endoscopist or other GI staff. Note any previous history of DU or GU, NSAID, anticoagulants, liver disease or dyspeptic symptoms.
- Look for evidence of chronic liver disease such as jaundice or spider naevi. If present refer to the GI Registrar and commence resuscitation (below).

i **In all patients ascertain the severity of the bleed and at risk factors: risk stratify.**

Features of a major bleed?

- Tachypnoea
- Tachycardia >100 bpm.
- Hypotension SBP <100mmHg supine or postural drop at any stage. Relate BP to the patient's normal e.g. hypertensive.
- Clammy, cold and peripherally shutdown.
- Conscious level reduced/confusion.
- History of syncope.

Is the patient at Significant Risk of Death?

- Hypotensive after initial resuscitation.
- Variceal bleed likely.
- Obvious signs of chronic liver disease or deranged clotting indicative of liver disease.
- Continuing melaena, haematemesis, or rebleed.
- Existing co-morbidity e.g. IHD, renal failure, disseminated malignancy.
- Age >60 years.

Complicating factors

- Co-morbid disease e.g. cardiovascular, respiratory, renal, malignancy.
- Rate limiting drugs prevent compensatory tachycardia e.g. ß-blockers, verapamil.
- Vasodilators prevent compensatory vasoconstriction, e.g. ACE inhibitors.

TREATMENT AND ASSESSMENT

SHOCKED PATIENT

- High concentration oxygen, at least 60%.
- IV access with two large bore cannulae 16G or bigger.
- Draw blood for FBC, PTR/clotting, U&E, LFTs, blood for CROSS MATCH at least 4 units of red cells. Alert BTS: consult Major Haemorrhage protocol (Appendix 3).
- Commence IV fluids: 0.9% saline or Gelofusine 10-20 ml/kg (500-1000ml).
- Use O negative blood if patient exsanguinating or unable to keep BP above 100mmHg systolic, and more than 1 litre of colloid given (see next page).

- Monitor closely: ideally ECG and pulse oximeter for continuous heart rate and oxygen saturation readings with frequent BP measurement e.g. every 5 mins. Consider need for HDU/ICU referral and invasive monitoring: elderly, co-morbid disease and severe bleed are indications.

A large bore femoral venous line can be invaluable for rapid fluid infusion.

- Refer to GI Registrar.
- ABG for oxygenation and base deficit (i.e. the severity of bleed).
- Get Hb and K^+ results early.
- A urinary catheter should be inserted.
- Nasogastric intubation is not necessary.

If features of circulatory compromise persist after the initial bolus of fluid commence blood transfusion. If available use type-specific or cross-matched blood. If not, use O Negative blood: this is kept in the blood fridge in clinical chemistry, WGH and in A&E in RIE and in Haematology laboratory at SJH. Inform Blood Transfusion that it is a significant bleed: consider triggering Major Haemorrhage protocol.

- Use a blood warmer if large volumes are to be given. A 'Level One' blood warmer is available from main theatre WGH, and A&E and Theatres, RIE; A+E and Theatres at SJH.
- Coagulopathy should be corrected using FFP.
- Early endoscopy should be performed for all large bleeds and suspected varices but the patient must be adequately resuscitated first. Guidelines for endoscopy in high risk patients are available in theatre.

Rebleeding is a major predictor of death.

Modified Rockall Score is a means of assessing risk of rebleed and mortality following non-variceal upper GI bleeding. Total (pre-endoscopic + endoscopic) score of 0 or 1 implies 0% mortality and therefore discharge should be safe. Calculation of the pre-endoscopic score is as follows: (add scores for each line).

ROCKALL SCORE

	0	1	2	3
Age	<60	60-79	≥80	
Shock	Systolic>100 Pulse<100	Systolic>100 Pulse>100	Systolic<100	
Co-morbidity	None		Heart failure IHD Major Co-morbidity	Renal failure Liver failure Disseminated Malignancy

- A Rockall score of 1-2 suggests a mild bleed and a score of greater than 2 a major or severe bleed. There is 50% mortality with a Rockall score of 7.
- In SJH if Rockall score is 0 or 1 the patient is admitted there and OGD performed at the latest the next day. If the Rockall score is 2 or greater the patient is transferred to RIE (following appropriate assessment and resuscitation).

VARICEAL BLEEDING

Contact GI Registrar.

- Resuscitate as above: avoid saline, use colloid and IV dextrose 5% and FFP as required.
- Monitor cardiac rate and rhythm, BP and oxygen saturation.
- Give terlipressin 2mg IV then 1-2mg IV every 6 hours until bleeding is controlled, for up to 72 hours. Caution in ischaemic heart disease, peripheral vascular disease and unresuscitated patients.
- A Sengstaken-Blakemore tube may be necessary for massive or ongoing bleeding. It is available in the Resuscitation room in A&E and ARAU.

Sengstaken-Blakemore tube is only for use in dire situations. It should be placed only by the GI team or other senior staff experienced in its use, therefore get help. The patient should be discussed with anaesthetics re intubation prior to placement of tube if possible. In general patients with Sengstaken tubes in situ, should not be transferred between hospitals unintubated.

- The gastric balloon is inflated with 300mls of air and the tube held in place with two tongue depressors taped together and padded (to avoid pressure on lips). CXR should be performed to confirm correct position.

- Inadequate placement of Sengstaken tube confers no benefit but has risk of major complications e.g. oesophagael perforation.
- Prophylactic antibiotic: Ceftriaxone 1g od IV
- Discuss further interventions e.g. TIPSS with GI Registrar/ Consultant if not already referred.

MANAGEMENT OF UPPER GI HAEMORRHAGE: SUMMARY

MAJOR BLEED: HIGH RISK

Pulse > 100
Systolic BP < 100mm Hg
Hb < 100 g/L

RESUSCITATE
As above

EMERGENCY (OUT OF HOURS) ENDOSCOPY
Contact GI Registrar

LIKELY VARICEAL: HIGH RISK

Stigmata of liver disease
Abnormal LFTs, clotting

RESUSCITATE
As above

EMERGENCY (OUT OF HOURS) ENDOSCOPY
Contact GI Registrar

MINOR BLEED: LOW RISK

Pulse < 100
Systolic BP > 100mm Hg
Hb > 100 g/L

OBSERVE
2 hrly observations

ENDOSCOPY ON NEXT ELECTIVE LIST
Contact GI Registrar

An intravenous proton pump inhibitor is only indicated in patients who have active bleeding or stigmata of recent haemorrhage at endoscopy.

ACUTE ON CHRONIC LIVER FAILURE

General points

- Avoid hypoxaemia, hypotension, and hypoglycaemia (2-4hrly BM measurement).
- Lactulose 30ml oral tds is beneficial in early encephalopathy. Titrate to produce 2 to 3 bowel movements daily. Use phosphate enemas in more severe cases or if unable to take lactulose.

- Blood, urine and ascitic fluid cell count and culture if encephalopathic and in all cases on admission.Cell count: WBC>250/microlitre is suggestive of spontaneous bacterial peritonitis.
- Establish if there is a history of drug misuse, blood product transfusions, hepatotoxic drug ingestion, alcohol abuse or foreign travel.
- Clinical assessment: note the presence of jaundice, ascites, encephalopathy, spider naevi, pruritis, bruising, splenomegaly, rashes or arthritis.
- Try to ascertain what has precipitated this episode.

  Consider: bleeding
  infection
  drugs, particularly diuretics or sedatives
  electrolyte disturbances e.g. hyponatraemia, hypokalaemia

Investigations to consider

- FBC, U&E, glucose, phosphate, LFT, PT, AFP.
- Venous blood cultures, MSSU.
- Viral hepatitis screen.
- Autoantibody profile.
- Paracetamol level.
- Ascitic tap for bacteriology (Gram stain, cell count and culture), protein.
- USS of abdomen.

FULMINANT HEPATIC FAILURE

Always check for PARACETAMOL OVERDOSE in patients presenting with acute liver failure or unexplained metabolic acidosis.

The commonest causes of acute liver failure are paracetamol poisoning and viral hepatitis. Patients with liver failure may present in a variety of ways. They may show non-specific features such as confusion, sepsis, or shock. Specific modes of presentation are with ascites or encephalopathy, and the management of these is detailed below.

Early ICU involvement for airway protection, ventilation, haemodynamic monitoring and resuscitation may be necessary. At the same time early referral to the Scottish Liver Transplantation Unit is crucial (22068 in RIE). GI/Liver registrar on bleep #6361 or via switchboard RIE. Referral criteria in ARAU/ WGH, A&E and Combined Assessment Units.

DEFINITIONS

Hepatocellular failure is the result of impairment of hepatocyte function, which manifests itself in a variety of ways, either encephalopathy, in acute liver failure, or encephalopathy or ascites in chronic liver failure.

Acute liver failure

- Presents as hepatocellular jaundice, elevated transaminases, and prolongation of the INR, in the context of acute liver injury, e.g. acute viral hepatitis.
- This is complicated by hepatic encephalopathy.
- Encephalopathy occurs within 8 weeks of onset of jaundice (first illness).
- Risk of hypoglycaemia and raised intra-cranial pressure (ICP).

Chronic hepatocellular failure occurs when there is decompensation in chronic liver disease, presenting either with ascites or encephalopathy.

ENCEPHALOPATHY: Grading of Hepatic Encephalopathy

- Grade 1 Mildly drowsy with impaired concentration/number connection test.
- Grade 2 Confused but able to answer questions.
- Grade 3 Very drowsy and able to respond only to simple commands.
- Grade 4 Unrousable.

DECOMPENSATED CHRONIC LIVER DISEASE

- Hypoglycaemia and raised ICP uncommon.
- Causes and management differ.
- Repeated assessment and documentation of GCS is very useful.
- Identify and treat infection or bleeding, and stop precipitant drugs.
- Paracentesis or diuretics can precipitate encephalopathy (hypokalaemia, hyponatraemia).
- Diagnostic paracentesis to exclude spontaneous bacterial peritonitis (i.e. >250 polymorphs per microlitre) of ascites.
- In patients with encephalopathy treat with lactulose 30ml oral tds titrated to produce 2 to 3 bowel movements daily, and use phosphate enemas if patient unable to take oral lactulose.
- Ensure good nutrition, correction of hypoxaemia and electrolyte abnormalities (including hypophosphataemia).

- For alcoholic liver disease: thiamine 300mg oral daily is given. In acute/imminent Wernicke's encephalopathy or Korsakoff's psychosis, and in patients unable to take orally, IV vitamins are given as Pabrinex IV two pairs (No1 and No2 mixed) by IV infusion in 100ml 5% dextrose over 15-30 mins 8 hourly.

  N.B. Risk of anaphylaxis.
- In patients with altered conciousness exclude focal neurology e.g. subdural haematoma.
- Sedation should be avoided if possible. Small doses of haloperidol e.g. 1-2mg IV may be used in severe agitation.
- Monitor renal function closely as there is a high risk of renal failure.

TENSE ASCITES

- Large volume paracentesis can be performed with IV 20% Albumin 'cover', 6g per litre drained or 400ml 4.5% Human Albumin solution every 3 litres ascites drained.
- Correct intravascular volume before paracentesis: stop diuretics.
- Close monitoring of renal function is required: hourly urine volumes, daily U&Es.
- Exclude spontaneous bacterial peritonitis by diagnostic paracentesis cell count, Gram stain, culture and protein.

ACUTE BLOODY DIARRHOEA

Bloody diarrhoea tends to occur in two groups of patients: those with known inflammatory bowel disease and those in whom bleeding arises de novo.

- In severe cases hypovolaemia and/or sepsis may result in shock which should be managed as described in Chapter 2.
- A history of inflammatory bowel disease should be sought. If this is positive refer to the GI registrar having secured adequate IV access and sent blood for FBC, ESR, U&E, glucose, albumin, CRP and LFTs.
- Duration of symptoms: this is an important point as a history of less than 7-10 days suggests an infective aetiology. Ascertain the frequency of motions/amount of blood, any recent foreign travel, a similar history amongst friends and family, any recent antibiotic or NSAID use (in last 2 weeks) or abdominal pain. Take a sexual history.
- Examine for abdominal tenderness or distension, arthritis, erythema nodosum and iritis.

INITIAL MANAGEMENT

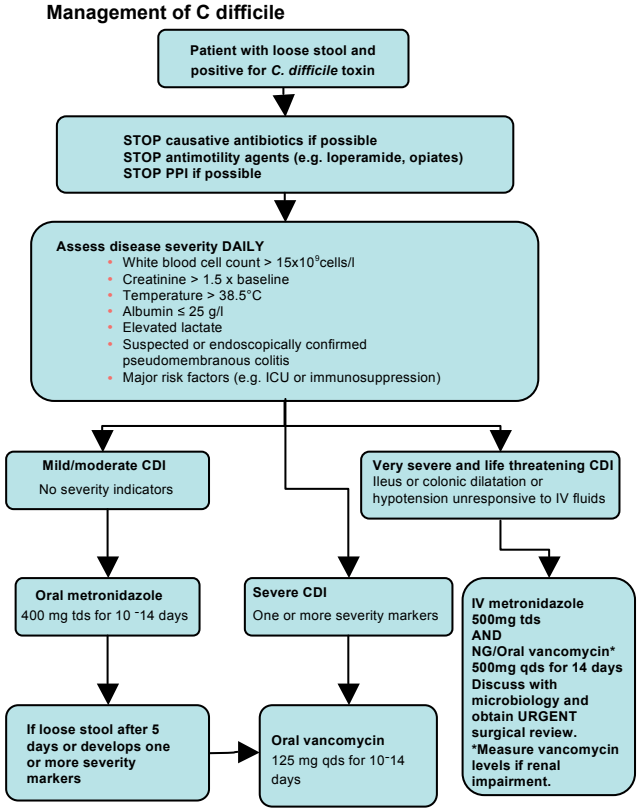
- IV access.
- FBC, ESR, U&Es, glucose, albumin, CRP, LFTs. Group, screen and save or cross match if appropriate.
- Stool for culture/C.difficile
- C. difficile toxin if: **a.** any antibiotic in last eight weeks or
  b. hospitalised within last eight weeks

SPECIFIC MANAGEMENT

Infective/gastroenteritis

- Short history, no antibiotic usage.
- Isolate patient.
- FBC and culture stool (and C. diff toxin).
- Maintain "hydration" and observe.
- Ciprofloxacin 500mg oral bd if unwell. Use antibiotics with caution in probable infective diarrhoea (may worsen outcome in E Coli 0157 infection).

Clostridium Difficile (likely if antibiotic therapy in last eight weeks)



Known IBD

- Exclude infection.

Mild colitis (<4 stools per 24 hours)

- Apyrexial, pulse <90/min, Hb >120g/l, ESR <10mm/hr, small amount of blood in motion.
- Known IBD: steroid enemata.
- Diagnosis uncertain: await histology and stool cultures; consider flexible sigmoidoscopy or colonoscopy.
- DVT prophylaxis (exclude coagulopathy first).

Severe colitis - Refer to GI Unit(>8 stools per 24 hours)

- Febrile >37.5 C, pulse >100/min, Hb <110g/l, ESR >30mm/hr, blood in motion +++.
- Inform GI Registrar.
- AXR
- Sigmoidoscopy
- Stool cultures.
- IV methylprednisolone 60mg/24hr, given by continuous IV infusion (can cause dysrhythmias) in WGH or hydrocortisone 100mg IV QDS in RIE.
- DVT prophylaxis as per local policy.

ACUTE DIARRHOEA

CAUSES

- Infective
- Inflammatory bowel disease
- Irritable bowel syndrome
- Overflow
- Antibiotic associated
- *Clostridium difficile*
- Malabsorption
- Thyrotoxicosis
- Laxative abuse
- Alcohol
- Other drugs e.g. NSAIDs, PPIs, chemotherapy

INVESTIGATIONS

- FBC, U&E's, LFT's, ESR, CRP; endomysial antibodies, and haematinics if coeliac disease suspected.
- Stool culture
- Cl difficile toxin if recent antibiotics or hospitalisation. Microscopy for amoebae and other GI pathogens, (if at risk 3 samples).
- Blood cultures if febrile or features of sepsis.
- Plain abdominal x-ray
- Rectal examination
- Sigmoidoscopy and rectal biospy
- Thyroid function tests

Travel history and suspected food sources must be stated on lab request form - some pathogens eg Vibrio cholerae are only looked for if appropriate clinical information

MANAGEMENT

- Rehydrate, replacing sodium, potassium, and chloride loss using oral rehydration fluids.
- Isolate if infection is suspected.
- Notify suspected food poisoning cases to Lothian Public Health: 7720.
- In general infective diarrhoea is not treated with antibiotics.
- Consider *C.difficile* especially if any antibiotics last 8 weeks, see above.
- If inflammatory bowel disease - refer to GI.
- If recent cancer chemotherapy – refer to oncology – patients can deteriorate rapidly with chemotherapy-related diarrhoea and need aggressive inpatient management and iv volume resuscitation

CONSTIPATION

- A rectal examination must be performed
- Evidence of obstruction? → Clinical examination
- Plain abdominal X-ray only if suggestion of intestinal obstruction.
- Is this acute/recent or chronic?
- Check U&E's, calcium, TFT's.

- Are any drugs implicated e.g. opiates?
- Refer to surgeons if obstruction (clinical evidence or on abdominal X-ray). AVOID stimulants. Use lactulose.
- Barium enema to exclude megacolon.
- Refer to GI team for advice.
- Disimpact with → Glycerine suppositories
  Phosphate enema
  Arachis oil enema
  Picolax
  Manual disimpaction (with care)
- Maintain with → Fybogel or lactulose
- Stimulate with → Senna
  Codanthrusate (Potentially carcinogenic. So only use long-term in the elderly, or terminally ill)

(Stimulants are best avoided except in terminal care)

- In refractory cases PEG-based agents → Movicol 1/2-1 sachet/day titrated

ASSESSMENT OF THE ACUTE ABDOMEN

- Definitions vary but a general one would be disabling abdominal pain of less than two weeks duration.
- Take a careful history about the onset and progression of pain, site and radiation, exacerbating and relieving factors, associated symptoms.
- In general visceral pain is ill-localised and felt in the area corresponding to the organ's origin- foregut, midgut or hindgut.
- Irritation of the parietal peritoneum is well localised and responsible for features of peritonism found on examination- guarding and rebound or percussion tenderness.
- Any inflammatory pathology will give rise to symptoms of peritoneal irritation e.g. pain exacerbated by movement; obstruction of a tubular structure gives rise to colic type symptoms.
- Examine carefully for signs of shock- increased respiratory rate is a useful early indicator.
- Lie the patient flat and expose the whole abdomen, watching for excursion with respiration.
- Remember to include examination of hernial orifices and genitalia and PR.

If the patient is shocked, begin resuscitation at the same time as undertaking investigations- O_2, fluids and iv access, analgesia, catheter as necessary and call for senior help. See chapter 2.

Diagnosis and resuscitation are simultaneous processes in the shocked patient

Baseline investigations :

- FBC, U&E, glucose, LFTs, amylase, G&S
- ABG, lactate
- Urinalysis
- Exclude pregnancy if relevant
- Erect CXR- if possibility of perforation (only positive in 50%)
- AXR- if obstructed
- CRP- remember can lag behind clinical features

Decisions to be made

- Does the patient require a laparotomy?
- What is the timescale of this?
- Is more resuscitation or investigation required?

If the patient is bleeding this will usually need surgical control, but if the patient is obstructed with metabolic derangement there is normally time for fluid replacement. This process of preoptimisation needs to be actively managed and will benefit from management in HDU/ICU.

PITFALLS

- Medical causes of abdominal pain including DKA, pneumonia and Herpes Zoster.
- Much of the abdominal cavity is not easily accessible to palpation – the pelvis and much of the supracolic compartment

URGENT SURGERY

- Ensure blood is cross matched if required.
- Operating surgeon should liase with theatre and anaesthetist and obtain consent from patient if appropriate.
- Make plans for post op care early- will the patient need management in ICU or HDU?

ICU and Anaesthetics opinions should be sought early to allow planning of and delivery of optimal perioperative care.

ACUTE PANCREATITIS

Determine severity of pancreatitis on all patients using modified Glasgow Score* (see below).

The following investigations should be undertaken daily on all patients with SEVERE PANCREATITIS for at least 3 days:

- FBC
- U&E's, creatinine
- Blood glucose
- Serum calcium
- LFT's (LDH must be specified)
- Serum albumin
- Arterial blood gas (on air initially) but only if well enough to tolerate this.
- CRP

Initial management in all patients involves:

- nil by mouth
- IV fluids
- urinary catheter and measurement of hourly urine volumes.

Patients with severe pancreatitis may need to be managed in HDU/ICU and often warrant invasive haemodynamic monitoring.

FURTHER INVESTIGATIONS

- U/S Scan as soon as possible after admission.
- CT Scan is usually needed in all patients with severe pancreatitis within 10 days of admission and must be a **dynamic contrast-enhanced scan**.
- **ERCP** should be considered in all patients with severe pancreatitis thought to be due to the gallstones who do not settle promptly on conservative management **and have evidence of cholangitis**.

* modified GLASGOW criteria: a severe attack is predicted if 3 or more criteria are positive.

AGE	> 55 years
arterial PO_2	<8.0 kPa (on air)
albumin	<32 g/L
calcium	<2.0 mmol/l
WBC	>15 x 10^9/l
LDH	>600 U/l
ALT	>100 U/l
glucose	>10 mmol/l (in absence of diabetes)
urea	>16 mmol/l

(A C-reactive protein level over 100 mg/l may also reflect the presence of a severe attack and can be used to monitor progress and the need for CT scan).

INTER HOSPITAL TRANSFER BETWEEN UPPER GI (RIE) AND LOWER GI (WGH) UNITS IN EDINBURGH

- Both units receive "General Surgery" where the diagnosis is either uncertain or outwith the GI tract. Allocation will depend on bed availability and patient location. Bed Bureau will usually decide destination.
- Patients assessed in either hospital should have appropriate first line investigations carried out in that hospital, if feasible, to confirm diagnosis before transfer, e.g. abdominal ultrasound for suspected biliary colic and CT abdo/pelvis for acute diverticular disease etc.

Discussion must take place at Registrar or Consultant level only.

- Patients must be stable before transfer and the "transfer form" (attached) must be completed in all cases. Between arranging transfer and the patient leaving, the referring team must continue to ensure resuscitation and ongoing monitoring is taking place, with regular review and reassessment.
- Patients who are unstable and therefore unsuitable for transfer should be discussed between consultants.
- In-patient emergencies arising in St John's Hospital outside those hours where there are surgeons on site (8am – 6 pm Monday – Thursday and 8 am – 2 pm Friday) should be discussed initially with the consultant on-call at the Western General Hospital. Clearly if the problem is upper gastrointestinal/biliary pancreatic

then it would be more appropriate to contact the consultant at the Royal Infirmary. If the patient is considered unsuitable for transfer then the consultant at the Western General Hospital will arrange for that patient to be seen and assessed at St John's Hospital. At times discussion may need to take place between the consultant at the Western General Hospital and the consultant at the Royal Infirmary to ascertain who would be best to go to St John's and what cover we would put in place in Edinburgh while that consultant is at St John's.

- Stable patients should not be transferred (where possible) overnight.

GUIDELINES FOR THE ASSESSMENT OF SURGICAL PATIENT SUITABILITY FOR TRANSFER BETWEEN RIE AND WGH

Patients present to RIE and WGH. To ensure optimal management and avoid morbidity some of these should not be transferred but should be resuscitated, analgesed and operated on where they present e.g perforated intra-abdominal viscus.

Remember : Identification of the sickest patient is usually straightforward, but the patient who is 'compensating' physiologically may appear much better than he/she really is.

TRANSFER GUIDELINES FOR ILL PATIENTS

Patient Assessment

- Respiratory rate
- Pulse
- BP and peripheral perfusion
- SpO_2
- Metabolic state: potassium, base excess/deficit, lactate
- Haemoglobin, presence of active bleeding
- Pain

ASSESS USING CRITERIA IN BOX BELOW:
IF ALL ACHIEVED OK TO TRANSFER

- RR >10 and <25/min
- Pulse <110/min BP > 110mm Hg systolic Hg (systolic no more than 30 mmHg lower than normal for patient), not peripherally shutdown
- SpO_2>96% (on <60% oxygen)
- K^+ 3 to 5.5mmol/l
- Base deficit better than -7 (if unwell arterial blood gases should be done)
- Pain controlled adequately
- Appropriate IV access
- Hb>100g/l, not actively bleeding
- The patient should be cardiovascularly stable

If not achieved not ok to transfer

Can correct to figures in box
Do so then Senior opinion
about safety of transfer

Cannot correct easily to
figures in box. Senior
assessment and keep in
that hospital, resuscitate and
operate there as appropriate.

Minimum treatment and monitoring

- Oxygen to achieve sats >96%
- IV access and fluids to restore perfusion; x-match and transfuse as required
- Adequate analgesia with iv opioids and iv anti-emetic
- Correction of potassium imbalance
- Monitor ECG, pulse oximetery, cuff BP, urinary catheter and output.

- **If the patient is considered unstable enough to require the above then it is questionable that they should be transferred.**
- **If diagnosis is unclear transfer is unwise.**
- **A senior surgical opinion should always be sought before transfer.**
- **If you are not 100% happy don't transfer the patient.**
- **A specific protocol for management of AAA presenting to WGH is in chapter 3.**

Guideline developed by Dr Graham Nimmo with surgical and anaesthetic cross site group RIE/WGH 1998.

RIE/WGH ACUTE SURGICAL ADMISSION INTERHOSPITAL TRANSFER PROFORMA

Must be completed by clinician arranging transfer

PATIENT ID **DATE:**

Assessing hospital: RIE / WGH

DIAGNOSIS

Criteria to be achieved for transfer		**Patient**	**Criteria fulfilled?**
Temp	<40C, no rigors		
Pulse	pulse <110		
BP	systolic >110		
Peripheral perfusion	warm		
Resp Rate	RR>10 or <20		
SpO_2	SpO_2>96% on <60% O_2		
Hb	>100g/l		
K	3-5.5		
BM	4-10		
BHCG	Negative		
H^+	>35 or <45		
pO_2	>9 on air		
pCO_2	<6 on air		
BE	-2 to +2		
Adequate IV access?	Yes (18G or greater)	Y/N	
Fluids running?	Yes	Y/N	
Pain controlled?	Yes	Y/N	
Active bleeding?	No	Y/N	
Anticoagulated?	INR<4	Y/N	
Perforation?	No	Y/N	
Time of transfer			

GUIDELINES FOR TRANSFER

IF CRITERIA ACHIEVED, for transfer after discussion specialist registrars at each hospital or consultants.

IF CRITERIA NOT ACHIEVED, **NOT** FOR TRANSFER

Can correct parameters to acceptable range. Then **Consultant Opinion** about safety of transfer	Cannot correct parameters easily **Senior** assessment **Keep** in original hospital **Resuscitate** & operate as appropriate

Clinician accepting transfer:

Name Designation

Clinician arranging transfer:

Name Designation Signature

Chapter 6

RENAL, METABOLIC AND ENDOCRINE EMERGENCIES

ACUTE RENAL FAILURE

Acute renal failure (ARF) is an abrupt decline in renal function which is usually reversible. It is recognised by the accummulation of waste products (urea, creatinine), with the development of electrolyte disturbance (hyperkalaemia) and metabolic acidosis. A decline in urine output (oliguria) is usually found. ARF is commonly caused by acute cardiovascular failure.

CLASSIFICATION OF ARF

PRERENAL: compromise to renal perfusion and oxygen supply commonly due to hypovolaemia or hypotension. Reversible with early resuscitation. Effects can be potentiated by a number of medicines including non-steroidal agents and ACE inhibitors or aII antagonists which should be stopped. If strong indication for ACE consider restarting following recovery with close monitoring of renal function.

OBSTRUCTIVE: blockage to urinary flow.

- Ureteric/urethral as in prostatic hypertrophy or bladder/ureter blockage as a result of tumour, stone, clot or stricture.
- Renal tubules/pelvis, ureters with myoglobinuria, haemoglobinuria, crystal formation, myeloma and papillary sloughing (e.g. diabetes). Uncommon.

INTRINSIC: damage to the renal parenchyma.

Intrinsic Causes of ARF

Nephrotoxins

- Drugs: NSAIDs, aminoglycosides, paracetamol in overdose.
- Poisons: methanol, ethylene glycol.
- Contrast media.

Specific conditions

- Vasculitis/glomerulonephritis: is there a history of skin rash, arthralgia/arthritis, rigors?
- Accelerated phase hypertension.
- Interstitial nephritis: follows a period of drug exposure in most instances.
- Infections: legionella, leptospirosis, malaria.

VASCULAR: renal artery disease and aortic atheroma/cholesterol emboli. Cholesterol emboli commonly follow intervention e.g. angiography or on commencement of anticoagulation.

MANAGEMENT

Approach to ARF

- Stabilise the patient whilst trying to improve or protect renal function by identifying potentially reversible factors.
- Seek underlying cause of ARF.
- Immediate concerns are hypoxaemia, blood volume abnormalities (hypovolaemia or fluid overload), hyperkalaemia, metabolic acidosis.

IMMEDIATE TREATMENT

- Correct hypoxaemia.
- IV access. Remember sites in upper limbs may be required for fistulae and consider using only one arm for cannulae and blood sampling (remembering potential pitfalls of blood dilution).
- Treat hyperkalaemia (see below).
- Correct volume status. If shocked commence resuscitation and refer to ICU.

The combination of shock and acute renal failure has a high mortality.

- Insert a urinary catheter and measure hourly volumes.
- CVP measurement may help in monitoring volume replacement.

Do not give loop diuretics unless there is a positive reason such as severe fluid overload.

- Stop nephrotoxins including drugs which may be a factor in ARF and hyperkalaemia.
- Treat metabolic acidosis: discuss with senior medical staff.
- In WGH/SJH if hyperkalaemia requires urgent renal replacement therapy (haemodialysis/haemofiltration) the first treatment should be performed in ICU before transfer to Renal Unit RIE. Contact ICU.

Indications for urgent dialysis or haemofiltration: the clinical state of the patient should be taken into account before commencing renal replacement therapy.

- Refractory and severe hyperkalaemia.

- Fluid overload with pulmonary oedema, refractory to diuretics.
- Severe metabolic acidosis.
- Pericarditis
- Renal replacement also indicated if urea and/or creatinine are markedly elevated. Discuss with the renal registrar.

Call Renal Registrar page #6394 in RIE, ICU in WGH or SJH - seek advice early.

INVESTIGATIONS

- U&E (including total CO_2), creatinine, glucose, FBC, clotting screen, group, screen and save, blood cultures.
- Plasma CK and urinary myoglobin (if available).
- ABGs
- Blood film for red cell fragments.
- Ca, PO_4, LFTs, albumin.
- Urate
- Glomerulonephritis screen where appropriate.
- Viral screen.
- Urinalysis
- Urine sodium and osmolality: interpretation is complicated by prior administration of IV fluids or diuretics.
- Urgent ultrasound of kidneys: size, number, obstruction, aorta.

All patients with acute renal failure should have USS of renal tract. Timing will depend on clinical presentation.

FURTHER MANAGEMENT

- If oliguria persists or biochemistry worsens renal replacement therapy (haemodialysis or haemofiltration) may be required: discuss with the Renal Registrar RIE or ICU in WGH/SJH.
- Scrutinise the notes, drug charts and review the history.
- Fully examine the patient.
- Look for infection and treat it.

Remember rhabdomyolysis. Muscle signs and symptoms are only seen in 50%, and myoglobin is absent from urine in about 30%. Causes include trauma, burns, compartment syndrome, epilepsy, drugs (including self-poisoning), coma with hypotension, falls and ischaemic limbs.

- Examine the urine: proteinuria and haematuria may indicate glomerulonephritis and urgent renal referral is obligatory. Look for skin rash, nail changes, arthralgia and history of rigors.
- Don't delay referral as early diagnosis and appropriate treatment such as immunosuppression/plasma exchange may save renal function. GN bloods include anti-nuclear factor, anti neutrophil cytoplasmic antibody, anti-glomerular basement membrane antibody, rheumatoid factor.
- Fluid balance: once volume depletion corrected, and in the absence of fluid overload, give previous hour's output (urine and other losses) plus insensible (about 20-40ml/hr).

DANGEROUS HYPERKALAEMIA

May cause sudden death with no warning features. Symptoms include paraesthesiae, circumoral tingling, muscle weakness, malaise. There may be no clinical signs.

Diagnosis: elevated potassium: absolute level **and** rate of rise are important. An abrupt rise of 2 mmol e.g. from 4 mmol/l to 6 mmol/l may cause arrhythmias whilst some patients with chronic renal failure tolerate higher levels. Consider level >6mmol/l as potentially dangerous.

ECG changes may provide the first clue to hyperkalaemia and its severity. ECG may be NORMAL in presence of dangerous hyperkalaemia.

CAUSES OF HYPERKALAEMIA

1. Reduced excretion

- Renal failure

Drugs:

- Potassium sparing diuretics: Spironolactone, Triamterene, Amiloride
- ACE inhibitors, angiotensin II antagonists
- NSAIDs
- Hypoaldosteronism: adrenal insufficiency

2. Shift of K^+ from cells

- Tissue damage: rhabdomyolysis, trauma, burns, haemolysis, internal bleeding
- Drugs: suxamethonium, digoxin, ß-blockers
- Acidosis
- Others: hyperosmolality, insulin lack, periodic paralysis

3. Excessive intake

4. Pseudohyperkalaemia

- Thrombocytosis, leukocytosis
- Haemolysis: in vitro or sampling
- Delayed analysis

ECG CHANGES OF HYPERKALAEMIA

- Prolonged PR interval.
- Peaked T waves.
- Widening of QRS interval and flattening/loss of P waves.
- Sine wave proceeding to ventricular fibrillation or asystole.

1. IMMEDIATE ACTION: STABILISATION

- Assess ABCDE and treat accordingly.
- Correct hypoxaemia.
- IV access.
- Continuous ECG monitoring is mandatory.
- Monitor oxygen saturation.
- Specific treatment depends on ECG changes and potassium concentration.
- If ECG shows peaked T waves or more severe changes titrate IV calcium gluconate 10% or calcium chloride 10% **in 1 ml aliquots watching the ECG**. The trace will normalise as the calcium takes effect. If too much IV calcium is given it can result in cardiac arrest in asystole. The required amount varies from 2 or 3 mls to 20mls. This simply stabilises the myocardium giving time to institute therapy to reduce the potassium. This may need to be repeated.
- In cardiac arrest follow ALS algorithm and give 10mls 10% calcium chloride IV. VF will be resistant to defibrillation if calcium not given.

2. REDUCING THE POTASSIUM

- Bolus IV dextrose 50ml 50% solution with 5-10iu Actrapid (or equivalent e.g. Humulin S). Takes 20-30 mins to work.
- This can be followed with a slow infusion of 10% or 20% dextrose running at between 10ml/hr and 50ml/hr. Monitor blood sugar regularly and add insulin as required.
- Nebulised salbutamol 5mg and repeated.
- Sodium bicarbonate 1.26% IV infusion. Start at 100ml/hr and titrate to HCO_3 and K^+ levels. Not for routine use. May help: discuss with renal registrar RIE or ICU, WGH/SJH.

3. ELIMINATING THE POTASSIUM

- The best way of removing potassium is to restore urine output and recover renal function.
- Failing this potassium **removal** by haemodialysis or haemofiltration may be required.

Stop dextrose and insulin infusions to allow potassium to re-enter the blood, thus making it available for removal in the dialyser.

- In WGH or SJH haemofiltration should be arranged with ICU pre-transfer to Renal Unit RIE if the level is high or the patient at risk.
- In potassium poisoning with normal renal function give IV fluids and furosemide (frusemide) to secure renal potassium loss.
- Ion exchange resins are difficult to administer orally or pr in the ill patient and take several hours to work. Most useful in chronic situations or if the patient needs to be transferred a long distance. Calcium resonium 15g stat oral, then 15g 2 to 3 times daily. An oral laxative should be prescribed at the same time.

Use the femoral vein for insertion of dialysis access as cardiac arrest in VF can be precipitated by the guidewire when using the internal jugular or subclavian routes.

METABOLIC ACIDOSIS

CAUSES OF METABOLIC ACIDOSIS (MA)

- Tissue hypoxia: shock with lactic acidosis.
- No tissue hypoxia: loss of or impaired generation of bicarbonate. acid accumulation (other than lactate).
- Anion gap: $Na^+ + K^+ - (Cl^- + HCO^-_3)$: normal up to 18mmol.

RAISED ANION GAP MA: *'KUSSSMALE'*

- ***K***eto-acidosis
- ***U***raemia
- ***S***alicylate poisoning, paracetamol poisoning
- ***S***evere losses of bicarbonate e.g. diarrhoea, GI fistulae
- ***S***tarvation
- ***M***ethanol poisoning
- ***A***lcohol i.e. ethanol
- ***L***actic acidosis
- ***E***thylene glycol poisoning

Severe elevation of anion gap >35mmol is usually due to:

- Toxin ingestion e.g. methanol, ethylene glycol.
- Severe shock or cardiac arrest (lactic acidosis).

NORMAL ANION GAP MA

- Subsiding DKA.
- Renal tubular abnormalities (renal tubular acidosis).
- Hypoaldosteronism.
- Acute diarrhoea.
- Ureterosigmoidostomy.
- Acetazolamide.

CLINICAL FEATURES

- Hyperventilation of Kussmaul type.
- Circulatory insufficiency: may be a late feature e.g. in DKA.
- Confusion, stupor, coma.
- Signs and symptoms of underlying cause.

Diagnosis

H^+ >45 pH <7.35, standard base deficit > -5mmol/l.

Diagnostic investigations: will depend on circumstances

- Glucose
- U&Es
- Blood for ketones.
- Blood lactate.
- Toxins: ethylene glycol, methanol, paracetamol, salicylate, ethanol.

MANAGEMENT

- ABCDE
- Correct hypoxia.
- Correct circulatory abnormalities: see Chapter 2.
- Treat specific causes (see below) e.g. infection, DKA.
- Poisoning: methanol, ethylene glycol, salicylate, paracetamol seek expert advice.
- IV sodium bicarbonate is seldom indicated unless renal failure or specific poisoning.
- Bicarbonate loss from gut or in renal tubular acidosis: correct cause, replace fluid and electrolyte losses (especially potassium) and infuse sodium bicarbonate 1.26% titrated.

Sodium bicarbonate use should be limited to patients WITHOUT tissue hypoxia as it has many detrimental effects in anaerobic lactic acidosis.

MANAGEMENT OF DIABETIC KETOACIDOSIS

DIAGNOSIS

- Elevated plasma and/or urinary ketones.
- Metabolic acidosis (raised H^+/low serum bicarbonate).

Remember that hyperglycaemia, although usually marked, is not a reliable guide to the severity of acidosis, and in children, pregnant women, malnourished or alcoholic patients, blood glucose may not be very raised.

i The degree of hyperglycaemia is not a reliable guide to the severity of the metabolic disturbance in DKA.

The presence of the following features should alert you to the possibility of DKA:

- Intra- and extra-vascular volume depletion with reduced skin turgor, tachycardia and hypotension (late feature).
- Rapid and deep sighing respirations, smell of ketones.
- Ketonuria
- Vomiting/abdominal pain.
- Drowsiness/reduced conscious level.

Remember:

- Consider DKA in any unconscious or hyperventilating patient.
- Patients with adverse clinical signs (on the SEWS chart) or signs of cerebral oedema (see below) should be discussed immediately with senior medical staff.
- These guidelines refer to adult patients. All patients under the age of 16 should be discussed with the paediatric diabetes team at the Sick Children's hospital and arrangements made for transfer when clinically appropriate.

RIE/WGH/SJH have an integrated care pathway which should be adhered to. The following is the RIE/WGH protocol. The SJH protocol differs slightly.

IMMEDIATE MANAGEMENT - WITHIN THE FIRST HOUR

Initial Assessment and Treatment

- Airway and breathing - correct hypoxaemia.
- IV access.

- Monitor respiratory rate, ECG, O_2 saturations, pulse rate, BP, respiratory rate, conscious level and fluid balance.
- Perform laboratory blood glucose, bedside BM, urea and electrolytes, serum bicarbonate, arterial blood gases.

Fluid Replacement

- Commence fluid therapy with 0.9% saline 1 litre over 1 hour. A specimen IV fluid regime is shown below.

Intravenous Insulin

- Prepare intravenous insulin infusion (see below) and commence at 6 units/hr.

Other Interventions/Actions

- 12 lead ECG
- NG tube if impaired consciousness or protracted vomiting.
- Urinary catheter if oliguric.
- Admit patient to a high dependency area.
- Consider need for central line if clinically indicated.
- **Call the diabetes registrar and/or senior medical staff.**

ONGOING MANAGEMENT - HOURS 2-4

Reassess patient regularly and monitor vital signs

Intravenous fluids

- Aim to rapidly restore circulating volume and then gradually correct interstitial and intracellular fluid deficits.
- Use isotonic saline (see example below) - infusion rates will vary between patients, remember risk of cardiac failure in elderly patients.
- If hypotension (SBP <100mmHg) or signs of poor organ perfusion are present, use colloid to restore circulating volume.

1000mls 0.9% NaCl over 2nd hour
500 mls 0.9% NaCl over 3rd hour
500 mls 0.9% NaCl over 4th hour

- Add in 10% dextrose once blood glucose ≤14mmol/l. Infuse at 100 mls/hr. **Do not alternate saline and dextrose**.
- Measure U&Es and *venous* bicarbonate at the end of hour 2 and hour 4.

Electrolyte replacement

- Despite a considerable total body potassium deficit (300 - 1000 mmol/l), plasma potassium levels are usually normal or high at presentation because of acidosis, insulin deficiency and renal impairment.
- Potassium concentration **will** fall following commencement of treatment; expect to have to give plenty of potassium.
- Target potassium concentration is 4.0-5.0mmol/l.

Severe hypokalaemia complicating treatment of DKA is potentially fatal and is avoidable.

Potassium Replacement

No potassium in the first litre unless known to be < 3.0 mmol/l. Thereafter, replace potassium as below:

plasma potassium	potassium added
< 3.5 mmol/l	40* mmol/l
3.5 – 5.0 mmol/l	20 mmol/l
>5.0 mmol/l, or anuric	No supplements

* must be given in one litre of fluid; avoid infusion rates of KCL >10mmol/hr

- Occasionally infusion rates of over 10mmol/hr may be required. If so senior medical staff should decide this and ECG monitoring is mandatory.
- 40mmol of potassium should be diluted in 1 litre of fluid if given by peripheral cannula. *Use pre-prepared bags with KCl*.

Blood Glucose and Insulin

- Hourly *laboratory* glucose.
- Aim to ensure a gradual reduction in blood glucose over the first 12-24 hours. There is no specific evidence to avoid rapid rates of fall (e.g. >5mmol/hr), but there are some observational data to suggest that excessive rates of fall may be associated with cerebral oedema.
- The target blood glucose concentration for the end of the first day is 9-14 mmol/l.
- Make up an infusion of 50 units of soluble insulin (e.g. Humulin S or Actrapid) in 50 mls 0.9% saline (1 unit/ml) and infuse using a syringe driver.

Rate of Insulin Infusion

- 6 units/hr initially.
- 3 units/hr when blood glucose ≤14 mmol/l.

If plasma glucose does not fall in the first hour, the rate of infusion needs increased **- phone the diabetes registrar and/or senior medical staff for advice.**

- If blood glucose falls below target (i.e. <9 mmol/l) on 3 units/hr, reduce insulin infusion to 2 units/hr. **Do not reduce the insulin infusion rate below this.** If glucose continues to fall, increase the infusion rate of dextrose or the concentration. Discuss with the diabetes registrar and/or senior medical staff.
- Remember that intravenous insulin has a half-life of 2.5 minutes. It is important that the insulin infusion is not interrupted.

Consider Precipitating Factors:

If indicated check:

- FBC
- CXR
- ECG
- urine dipstick for leucocytes and nitrites and culture (urgent lab microscopy is not necessary)
- blood cultures and other infection screen

Correction of acidosis

- Volume resuscitation and insulin infusion will correct metabolic acidosis in the majority.
- Ketonaemia typically takes longer to clear than hyperglycaemia.

Intravenous sodium bicarbonate should not be used routinely and certainly not without discussing with a senior doctor (no evidence that it is effective).

Other measures

- Urinary catheter: if cardiac failure, persistent hypotension, renal failure or no urine passed after 2 hours.
- CVP line: consider if elderly with concomitant illness, cardiac failure or renal failure.
- Give standard venous thromboembolism prophylaxis according to local protocols: but first exclude coagulopathy.
- Antibiotics: only if infection is proven or *strongly* suspected. Remember that raised WBC and fever occur with metabolic acidosis.

- Screen for myocardial infarction if > 40 years old.

SUBSEQUENT MANAGEMENT - 4 HOURS+

Fluids and Electrolytes

- Allow oral intake if swallowing safe and bowel sounds present.
- Measure U&Es and venous bicarbonate twice daily, until bicarbonate within the normal reference range.
- Continue with 0.9% saline ≤250ml/hour until bicarbonate is in the reference range and the patient is eating.
- Continue potassium infusion until target is maintained.

Insulin and Dextrose

- A blood glucose meter can be used to monitor blood glucose concentration if the previous laboratory blood glucose is <20 mmol/l.
- Pre-meal subcutaneous soluble insulin should be administered to patients who are eating, even when on intravenous insulin. Discuss the doses with the diabetes team.
- Maintain IV insulin (minimum rate 2 units/hr) and 10% dextrose infusion (100ml/hr) until biochemically stable and patient has eaten at least two meals. In such circumstances, stop IV insulin 30 minutes after subcutaneous insulin.

CONTINUING CARE

- Ensure patient is reviewed by the diabetes team on the day following admission (at the very latest), so that the cause of the DKA can be elucidated, appropriate education be given and follow up arranged.
- Patient should not be discharged until biochemically normal, eating normally and established on subcutaneous insulin.
- Ensure that a copy of the discharge summary is sent to the diabetes team.

ACUTE COMPLICATIONS OF DKA

- Hypokalaemia: due to inadequate potassium replacement and predictable due to insulin and fluid administration and resolution of acidosis. Avoid by regular monitoring of electrolytes and appropriate potassium replacement.
- Hypoglycaemia: due to over treatment with insulin.
- Hyperglycaemia: due to interruption or discontinuation of

intravenous insulin after recovery without subsequent coverage by subcutaneous insulin - **always ask advice of diabetes team**.

- Cerebral oedema: rare but potentially fatal. More common in children, but is seen in young adults. Characteristically, the patient has initially responded well to treatment prior to the development of severe headache and neurological deterioration. **Get urgent senior help: call ICU**. Treatment depends on clinical state and includes mannitol 0.5 - 2 g/kg body weight.
- ARDS: suspect if dyspnoea, tachypnoea, central cyanosis and non-specific chest signs. Manage ABCDE and call ICU.
- Thromboembolism - prevention and management as standard.

MANAGEMENT OF DIABETIC HYPEROSMOLAR NON-KETOTIC SYNDROME

- Common in frail elderly.
- High mortality (30%).
- May be previously undiagnosed diabetes, but can also develop in people with known type 2 diabetes.
- Significant hyperglycaemia: ketonuria and acidosis are usually absent.
- Acute intercurrent illness is common.

DIAGNOSIS

Typical features include:

- Severe hyperglycaemia (>50 mmol/l).
- Hyperosmolarity (>320 mosmol/kg) with profound dehydration and prerenal uraemia.
- Depression of the level of consciousness; coma is well recognised.

Plasma osmolality

2 x (Na + K) + urea + glucose (all mmol/l)

normal range is 280 – 300 mosmol/kg

IMMEDIATE MANAGEMENT - WITHIN THE FIRST HOUR

Initial Assessment

- Airway and breathing ensure airway and correct hypoxaemia.
- IV access.

- Monitor respiratory rate, ECG, O_2 saturations, pulse rate, BP, conscious level and fluid balance.
- Laboratory blood glucose, bedside BM, urea and electrolytes, serum bicarbonate, arterial blood gases.

Fluid Replacement

- Commence rehydration with 0.9% saline 1000 ml over one hour.

Intravenous Insulin

- Prepare intravenous insulin infusion (see below) and commence at 3 units/hr.

Other Interventions/Actions

- Admit patient to a high dependency area.
- **Call the diabetes registrar/senior medical staff.**
- NG tube if impaired consciousness or protracted vomiting.
- Catheter if oliguric.
- Consider central line if clinically indicated.

ONGOING MANAGEMENT - HOURS 2-4

Reassess patient regularly and monitor vital signs

Intravenous fluids

- Aim to rapidly restore circulating volume and then gradually correct interstitial and intracellular fluid deficits.
- Use isotonic saline (see example below) - infusion rates will vary between patients, remember risk of cardiac failure in elderly patients.
- If serum sodium exceeds 155mmol/l, use 0.45% saline instead of isotonic. **Discuss with diabetes registrar/senior medical staff.**

500 mls saline over 2nd hour
500 mls saline over 3rd hour
500 mls saline over 4th hour

- If hypotension (SBP <100 mmHg) or signs of poor organ perfusion are present, use colloid to restore circulating volume.
- Add in 10% dextrose once blood glucose ≤15mmol/l. Infuse at 125-250 mls/hr. **Do not alternate saline and dextrose**.
- Measure U&Es and serum osmolality at the end of hour 2 and hour 4.

Electrolyte Replacement

- Target potassium concentration is 4.0-5.0mmol/l.

Potassium Replacement

No potassium in the first litre unless known to be < 3.0 mmol/l.

Thereafter, replace potassium as below:

plasma potassium	potassium added
< 3.5 mmol/l	40* mmol/l
3.5 – 5.0 mmol/l	20 mmol/l
>5.0 mmol/l, or anuric	No supplements

* must be given in one litre of fluid; avoid infusion rates of KCL >10mmol/hr

Occasionally infusion rates of >10 mmol/l are required if so ECG monitoring is manditory.

Blood Glucose and Insulin

- Hourly *laboratory* glucose
- Aim to ensure a gradual reduction in blood glucose over the first 12-24 hours. There is no specific evidence to avoid rapid rates of fall (e.g. >5 mmol/hr), but there are some observational data to suggest that excessive rates of fall may be associated with cerebral oedema.
- The target blood glucose concentration for the end of the first day is 10-20 mmol/l.
- Make up an infusion of 50 units of soluble insulin (e.g. Humulin S or Actrapid) in 50 mls 0.9% saline (1 unit/ml) and infuse using a syringe driver.

- 3 units/hr initially

If plasma glucose does not fall in the first hour, the rate of infusion needs increased - **phone the metabolic registrar for advice.**

- If blood glucose falls below target (i.e.<10 mmol/l) on 3 units/hr, the insulin infusion can be reduced to a minimum of 1 unit/hr. **Do not reduce the insulin infusion rate below this**. If glucose continues to fall, increase the infusion rate of dextrose or the concentration. Discuss with the metabolic/diabetes registrar.
- Remember that intravenous insulin has a half-life of 2.5 minutes. It is important that the insulin infusion is not interrupted.

Consider Precipitating Factors:

- FBC
- CXR
- ECG/MI screen
- Urine dipstick for blood and nitrites and culture (urgent lab microscopy is not necessary)
- Blood cultures and other infection screen.

Other measures

- Urinary catheter: if cardiac failure, persistent hypotension, renal failure, no urine passed after 4 hours or impaired consciousness.
- CVP line: consider if elderly with concomitant illness, cardiac failure or renal failure.
- Thromboembolic complications are common, however full anticoagulation has been associated with a high risk of GI bleeding. Patients should receive DVT prophylaxis with LMWH, rather than unfractionated heparin (unless renal impairment) and should have TED stockings (unless contra-indicated).
- Nasogastric tube: if consciousness is impaired, to avoid aspiration of gastric contents.
- Antibiotics: low threshold for use.

SUBSEQUENT MANAGEMENT - 4 HOURS+

Fluids and Electrolytes

- Allow oral intake if swallowing safe and bowel sounds present.
- Measure U&Es twice daily, until within the normal reference range (or back to usual baseline for that patient).
- Continue with isotonic saline ≤250ml/hour until U&Es back to baseline and the patient is eating.
- Continue potassium infusion until target is maintained.

Insulin and Dextrose

- A blood glucose meter can be used to monitor blood glucose concentration if the previous laboratory blood glucose is <20 mmol/l.
- Maintain IV insulin (minimum rate 2 units/hr) and 10% dextrose infusion (250ml/hr) until biochemically stable and patient has eaten at least two meals. It is not necessarily the case that the patient will require subcutaneous insulin; the need for sc insulin or oral hypoglycaemic therapy should be discussed with the diabetes team.

Continuing Care

- Ensure patient is reviewed by the diabetes team prior to discharge, so that the cause of the HONK can be elucidated, appropriate education be given and follow up arranged.
- Patient should not be discharged until biochemically normal, eating normally and established on appropriate therapy.
- Ensure that a copy of the discharge summary is sent to the diabetes team.

HYPOGLYCAEMIA

PERI-OPERATIVE MANAGEMENT OF DIABETIC PATIENTS

General Principles

Plan Ahead

Admit 1 day before elective surgery for:

- full assessment of risk factors, baseline biochemistry, glucose profile, ECG.
- optimisation of metabolic control
- formulation of peri-operative management plan with Diabetic Registrar
- Schedule the patient for surgery (whenever possible) early in the morning and first on the list.
- Discuss all patients with the anaesthetist and remember that the Diabetes Team are ALWAYS available to give you help/advice (Page #6800 RIE, WGH via switchboard, SJH Diabetes consultants).
- If patients have poor metabolic control but require emergency surgery, discuss with the Diabetes Team.

WHICH PATIENTS NEED PERI-OPERATIVE INSULIN?

- All outpatients being treated with insulin
- All patients having major surgery (most abdominal and thoracic procedures)
- Any traumatic procedure especially in poorly controlled patients
- All patients undergoing emergency surgery
- All who are acutely ill

HOW SHOULD THE INSULIN BE ADMINISTERED?

GKI or Sliding Scale

The precise method should be discussed with the anaesthetist but is

likely to be either GKI or sliding scale.
Continuous infusion of glucose (G), potassium (K), and insulin (I) i.e. a GKI regimen - according to the guidelines set out below.

Proforma for GKI regimen

(**1**) On the morning of operation, omit breakfast and do not give subcutaneous insulin.

(**2**) Before 0800hr measure blood glucose on the ward and send an urgent blood sample to Clinical Chemistry for plasma urea, electrolytes and glucose determinations.

(**3**) If blood glucose < 10 mmol/l commence infusion with
16 units soluble insulin e.g. **Human ACTRAPID**
10 mmol/l KCl
in 500 ml 10% Dextrose at 100 ml/hr

(**4**) Less insulin (i.e. start with 12 units) is required in
thin elderly patients
those on less than 30 units/day at home
those who have had previous total pancreatectomy

(**5**) More insulin (i.e. begin with 20 units) is required in
patients requiring high insulin doses previously (> 1 unit/kg/day)
patients with intercurrent infection
some endocrine (e.g. acromegaly) and metabolic disorders

(**6**) If the blood glucose is > 12 mmol/l and rising, the insulin in the infusion should be increased by 4 units (**THIS REQUIRES A NEW BAG**)

(**7**) If the blood glucose is 6 mmol/l and falling the insulin in the infusion should be reduced by 4 units (**THIS REQUIRES A NEW BAG**).

If GKI is continued beyond 18 hours

- monitor Urea and Electrolyte levels daily
- adjust K supplement to maintain normokalaemia
- watch for water overload causing dilutional hyponatraemia
- less fluid can be given if 20% dextrose is used with double the insulin dose but local phlebitis may occur.
- Long term GKI is therefore best given through a central venous catheter.

Stopping the GKI

- The infusion should be continued until one hour after patient's first post-operative meal.
- Subcutaneous insulin is given with this meal - with at least as intensive a regimen as pre -operatively.

Remember, intravenous insulin has a half-life of only 2.5 minutes, so if intravenous insulin is disconnected for any appreciable length of time, hyperglycaemia will quickly ensue (unless subcutaneous insulin has been given).

The insulin infusion is prepared by adding 50 Units of Actrapid insulin to 0.9% saline in a syringe to a total volume of 50ml. Thus, 1ml of the solution contains 1 unit of insulin. The doses of insulin are adjusted according to a sliding scale, which is prescribed as below.

BG (mmol/l)	Insulin infusion (Units actrapid/hour = ml/hour)
>16	6 (test urine for ketones, call Dr as the sliding scale may need revision)
13-15.9	4
10-12.9	3
7.0-9.9	2
5.0-6.9	1
4.0-4.9	0.5
<4	off (call Dr, the sliding scale may need revision)

- Capillary blood glucose should be tested every hour. It is crucial that medical staff monitor the pattern of blood glucose every 2-4 hours as the sliding scale may require modifications to ensure that blood glucose concentrations remain between 5 and 10mmol/l.
- Commence glucose infusion with 20 mmol/l of KCl - infusion should run at 50ml/hr. Usually this will be 5% or 10% glucose, but in some special circumstances (e.g neurosurgery) an infusion of 5% glucose/0.45% saline is preferred. The anaesthetist will advise which glucose infusion should be used. If the patient is very hyperglycaemic, the glucose infusion should be deferred until the intravenous insulin has lowered the blood glucose to <14 mmol/l.
- The insulin and glucose infusions should both be given through the same IV cannula, rather than separate cannulae, to avoid the danger of a blocked cannula resulting in only one of the two being given.
- The insulin syringe should be attached to a 'PCA giving set', incorporating a Y-connector with a one-way valve for attaching the glucose infusion. The one-way valve prevents insulin being pumped backwards into the glucose giving set.
- Inform anaesthetist if blood glucose is less than 4 mmol/l or greater than 16 mmol/l.

- If capillary blood glucose is greater than 20 mmol/l, take blood for urgent laboratory glucose and U&E's (including venous bicarbonate).
- If blood glucose concentrations are stable and in the desired range, the frequency of monitoring may be reduced, e.g.to 2 hrly.
- U&E's and a laboratory glucose should be checked daily while the patient is on intravenous insulin/glucose.
- Be prepared to vary the KCl content of the intravenous fluids according to plasma K^+ levels. Be especially careful in patients with renal impairment.
- If patient is on intravenous insulin and glucose for greater than 24hrs, ensure that Hartman's solution is also given to avoid hyponatraemia. Remember 10% glucose is hypertonic. **This glucose infusion is not designed for volume replacement, but for glucose control**. Extra fluids such as Hartmann's will invariably be required and these can be "piggy-backed" in through a separate IV infusion line. However, if patients are volume overloaded, discuss management with the anaesthetist and/or diabetes registrar.

DIABETIC PATIENTS NOT REQUIRING INSULIN

Patients undergoing relatively minor procedures (e.g. hernia repair, laparoscopic cholecystectomy)

- Treatment is simpler if insulin is not required but frequent blood glucose monitoring is still essential.
- Check blood glucose pre-operatively to confirm that level < 10 mmol/L (lab analysis).
- Omit usual oral hypoglycaemic agent(s).
- Avoid IV glucose infusion
- On return from theatre repeat blood glucose. If > 15 mmol/l, insulin may be required.

CAUTION -

Diabetic patients on metformin are at risk of acute renal failure from radiological investigations where intravascular contrast material is given. (CT scan, IVP, angiogram, CTPA etc). Metformin should be omitted before the procedure and for 48 hours after. Careful watch needs to be kept on renal function and it should be ensured that patients remain well hydrated.

HYPOGLYCAEMIA

INTRODUCTION

- Complication of diabetes most feared by patients.
- Mild hypoglycaemia common in diabetic patients on insulin and is usually managed by themselves.
- Severe hypoglycaemia is that requiring help from another person to treat it.
- Unconsciousness caused by hypoglycaemia in hospital setting requires parenteral treatment.
- Hypoglycaemia is implicated in 4% of deaths in diabetics under the age of 50 years.

RECOGNITION AND DIAGNOSIS

- Defined arbitrarily as laboratory blood glucose < 3.5 mmol/l.
- Always confirm hypoglycaemia with a laboratory measurement, but treat on basis of BM while awaiting lab result.
- Symptoms of hypoglycaemia are age specific, with behavioural change being common in children and neurological symptoms prominent in the elderly - **always** check blood glucose in patients with suspected stroke or altered conscious level (including confusion).
- Most patients presenting with hypoglycaemia will be on insulin or sulphonylurea drugs, e.g. gliclazide.

AETIOLOGY

In patients with diabetes mellitus on insulin or sulphonylureas (not biguanides i.e. metformin or thiazolidindione) common causes include:

- Lack of food.
- Unaccustomed exercise.
- Alcohol
- Excess insulin.
- May be more than one of these factors. About 25% of Type 1 diabetic patients have reduced/lost awareness which increases the risk of severe hypoglycaemia.

COMMON SYMPTOMS OF HYPOGLYCAEMIA

Autonomic	Neuroglycopenic	Non-specific
Sweating	Weakness	Headache
Trembling	Visual disturbance	Nausea
Pounding heart	Difficulty speaking	
Anxiety	Tingling	
Hunger	Dizziness	
	Difficulty concentrating	
	Tiredness	
	Drowsiness	
	Confusion	

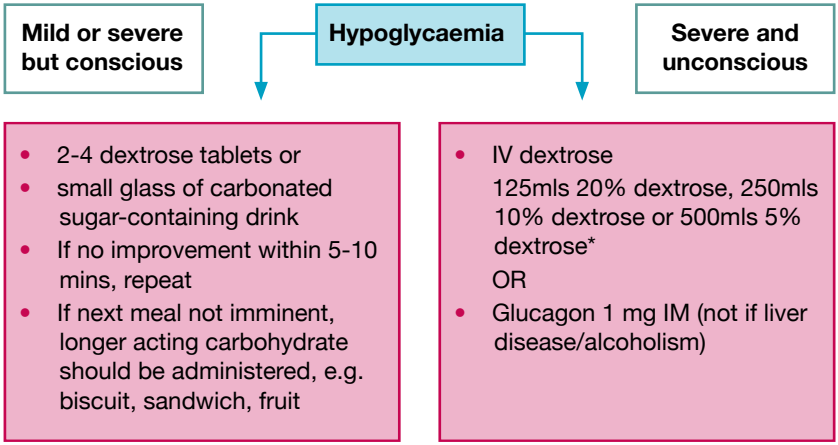
UNUSUAL ASSOCIATIONS AND PRESENTATION OF HYPOGLYCAEMIA

Cardiovascular	Neuropsychological	General
Prolongation of QT-interval	Focal/generalised convulsions	Fracture of long bones/vertebrae
Atrial fibrillation	Coma	Joint dislocation
Non-sustained ventricular tachycardia	Stroke; TIA's	Soft tissue injury
	ataxia, choreoathetosis	Head injury
	Focal neurological deficits	Burns
Silent myocardial ischaemia		Hypothermia
	Decortication	Road traffic accidents
Angina	Cognitive impairment	
Myocardial infarction	Behavioural/ personality change	
Sudden death	Automatism/aggressive behaviour	
	Psychosis	

MANAGEMENT

- Maintain ABCDE and oxygenation whilst correcting hypoglycaemia (especially airway).
- **ALWAYS** confirm hypoglycaemia with a laboratory measurement, but treat on basis of BM whilst awaiting lab result.

- If patient not known to have diabetes, or deliberate overdose of insulin/sulphonylurea suspected, take blood for assay of insulin and c-peptide concentrations.



- Glucagon is effective almost as quickly as dextrose but may not work in alcohol related hypoglycaemia, in liver disease or in prolonged hypoglycaemia. Occasionally causes vomiting, abdominal pain, diarrhoea. Dextrose infusion 10-20% IV may be needed especially when a long acting insulin or oral hypoglycaemic agent is responsible.

Give oral starchy carbohydrate within 10-30 mins of glucagon to replenish liver glycogen stores and prevent recurrent hypoglycaemia.

- In the situation of a massive insulin overdose with a long acting preparation the injection site can (occasionally) be surgically removed.

Recovery from hypoglycaemia may be delayed if:

- hypoglycaemia has been prolonged or severe.
- an alternative cause for impairment of consciousness co-exists, e.g. stroke or drug overdose.
- patient is post-ictal (convulsion caused by hypoglycaemia).

Follow up

- Think of the causes of hypoglycaemia.
- Why has it occurred?
- If patient recovers quickly then admission is rarely indicated (unless sulphonylurea induced hypoglycaemia) but ensure that adequate follow up is arranged through the diabetes team.

Always discuss with the metabolic registrar the management and follow up of patients admitted with hypoglycaemia. However, it is important to elucidate the *reason for* hypoglycaemia. The most common cause for hypoglycaemia is patient error, i.e. too much insulin or not enough carbohydrate. Others include:

- Excessive exercise (hypoglycaemia can be early or occur the following day).
- Excess alcohol (inhibits hepatic gluconeogenesis).
- Renal failure (insulin and sulphonylureas undergo renal clearance).
- Development of coincidental endocrine disease, e.g. Addison's disease (weight loss, anorexia, skin pigmentation, postural hypotension, hyponatraemia, hyperkalaemia etc), hypopituitarism, hypothyroidism.
- Malabsorption and gastroparesis, e.g. coeliac disease (weight loss, abdominal pain, bloating, loose stools, glossitis, apthous ulceration, anaemia, hypoalbuminaemia etc).

Risk factors for severe hypoglycaemia

Intensive insulin therapy
Low HbA1c
Previous history of severe hypoglycaemia
Long duration of diabetes
Impaired awareness of hypoglycaemia
Irregular life style
Alcoholism or binge drinking

Risk factors for sulphonylurea-induced hypoglycaemia

Age (not dose of drug)
Impaired renal function
Previous history of cardiovascular disease or stroke
Reduced food intake; diarrhoea
Alcohol
Adverse drug interactions
Use of long-acting sulphonylureas
Recent hospital admission

SULPHONYLUREA-INDUCED HYPOGLYCAEMIA (SIH)

- Mild SIH is treated in a similar way to insulin-induced hypoglycaemia (see above).
- Sulphonylurea-induced hypoglycaemic **coma** requires intravenous dextrose and treatment in hospital because relapse after initial treatment is well recognised. An intravenous bolus of glucose stimulates insulin secretion, especially in individuals who have retained pancreatic beta-cell function, and many people will require an ongoing intravenous infusion of 10% dextrose to sustain the blood glucose concentration above 5.0 mmol/l. **Inform diabetes team**.

All of these patients should be admitted.

HYPERCALCAEMIA

Severe hypercalcaemia (corrected calcium >3.0mmol/L) is uncommon, and usually due to hyperparathyroidism, or malignancy (e.g. myeloma). Symptoms may be masked by underlying malignancy. In any unwell patient with known malignancy check the serum calcium, and albumin.

Management of Hypercalcaemia in cancer is detailed on page 248.

CAUSES OF HYPERCALCAEMIA

- Primary hyperparathyroidism.
- Malignancy: solid tumours with metastases to bone; tumours secreting PTH or PTHRP (usually squamous carcinomas); haematological malignancy.
- These two causes account for >80% of cases.
- Familial hypocalciuric hypercalcaemia.
- Sarcoidosis, granulomatous disease.
- Endocrine: thyrotoxicosis; Addison's disease; phaeochromocytoma.
- Milk-alkali syndrome.
- Immobilisation (<16 yr old).
- Meds: Vit D analogues, anti-oestrogens, lithium, thiazides.

SYMPTOMS

- Thirst
- Polyuria
- Constipation
- Nausea and anorexia

- Abdominal pain
- Depression
- Confusion

COMPLICATIONS

- Peptic ulceration
- Acute pancreatitis
- Muscle weakness
- Psychosis, drowsiness, coma
- Corneal calcification
- Short QT interval on ECG

INVESTIGATIONS

All patients

- FBC, ESR
- U&Es
- Ca^{++}, PO_4^{-}, Mg^{++}, ionised Ca^{++}, albumin
- ALP, LFT's
- ECG
- CXR
- Parathyroid hormone

Specific depending on the history.

- Myeloma screen and skeletal survey.
- Bone scintigraphy.
- Thyroid function tests.
- Serum ACE.
- 24hr urine for calcium and creatinine.
- Short Synacthen test.

TREATMENT

Calculate corrected calcium or refer to ionised value. **Emergency treatment i**s required if corrected calcium >3.5 mmol/l (ionised>1.8 mmol/l). Between 3 and 3.5mmol/L may not require emergency treatment, but this depends on signs and symptoms.

For each 1g the albumin is below 40g/L add 0.02mmol/L to the uncorrected calcium e.g. calcium 2.62mmol/L with an albumin of 30g/L gives a corrected calcium of 2.62 + (10 x 0.02)= 2.82mmol/L.

Fluid

- Urgent fluid replacement with 0.9% saline (add potassium chloride as required) will lower calcium, and enhance renal clearance.
- Check U&E's and calcium twice daily.

Diuretics

- Loop diuretics (e.g. furosemide 40mg IV bd) will enhance calcium loss in the urine. DO NOT start until fluid deficits rectified.
- NEVER use thiazides as they cause calcium retention.

Bisphosphonates

- Ensure fluid deficit corrected first.
- A single infusion of pamidronate (see table) will lower calcium levels within 2 to 4 days (but not acutely).
- Maximal effect is at about 1 week.
- Recurrent hypercalcaemia may be treated with repeated IV infusions of pamidronate.
- In cancer-related refractory hypercalcaemia, zoledronate may be given once salt and water deficits have been replenished. Please discuss with haematology/ oncology.

Other

- If patient is on digoxin, discontinue.
- Steroids should not be used routinely. May be helpful in sarcoidosis, myeloma and hypervitaminosis-D (prednisolone 60-80mg oral daily).

PAMIDRONATE DOSE TABLE

Serum calcium (mmol/L)	Dose of pamidronate
<3.0	15mg
3.0-3.5	30mg
3.6-4.0	60mg
>4.0	90mg

If creatinine clearance >30ml/min infuse at rates up to 60mg/hr. If creatinine clearance <30ml/min administer maximum rate of 20mg/hour (4 hr 30mins for 90mg) but *do not reduce dose*.

HYPOCALCAEMIA - THE 5 COMMON CAUSES

- Spurious hypocalcaemia, that is failure to correct for low albumin (check ionised calcium). Add 0.02 mmol/l to the total calcium for each g/l albumin is below 40 g/l.

- Hypoparathyroidism, surgical.
- Renal failure.
- Vitamin D deficiency.
- Hypomagnesaemia.

CLINICAL FEATURES

Mild hypocalcaemia may be asymptomatic.

Early features

- Anxiety and nervousness.
- Paraesthesiae around the mouth, in toes and fingers.

Late features (esp. if total Ca^{++} <1.9 mmol/l)

- Convulsions
- Prolonged QT interval on ECG.
- Papilloedema
- Muscle cramps
- Muscle twitches
- Chvostek's sign
- Trousseau's sign (carpal spasm).

INVESTIGATIONS

- Total and ionised calcium, albumin, phosphate, magnesium.
- U&Es
- $25(OH)_2D_3$ and $1,25(OH)_2D_3$, PTH and alkaline phosphatase may help establish aetiology.

EMERGENCY TREATMENT

- Required for severe complications e.g. fits, dysrrhythmias, tetany.
- Monitor ECG.
- 5-10mls calcium chloride 10% or calcium gluconate 10% IV over 15 minutes will reverse tetany. Calcium chloride is immediately available in minijet form, but ampoules of calcium gluconate are available for injection and the preparation of infusions.
- Follow up: slow IV infusion at 0.5-2mg Ca/kg/hr (0.06 -0.22mls/kg/hr) as calcium gluconate 10%; dilute 60mls calcium gluconate in 1 litre 5% dextrose. (10% calcium gluconate contains 8.9 mg elemental Ca^{++}/ml).
- Oral calcium: introduce as below +/- vitamin D as soon as possible.

- Hypomagnesaemia may be the cause. Emergency treatment is with IV magnesium. Hypomagnesaemia is caused by chronic alcoholism, malabsorption, cyclosporin treatment, prolonged parenteral nutrition or diuretic therapy.
- Treat convulsions and arrhythmias with magnesium sulphate IV: 8 mmols magnesium sulphate diluted in 100 ml 0.9% NaCl and infused over 20 minutes. Monitor ECG. May cause hypotension.

TREATMENT OF MILD AND MODERATE CASES

- Mildly symptomatic or asymptomatic patients with chronic hypomagnesaemia, oral replacement can be tried but may be unsuccessful due to diarrhoea. Magnesium glycerophosphate is used most commonly, however this is an unlicensed medicine and should be discussed with the appropriate consultant first.
- Primary hypocalcaemia: oral or IV calcium +/- vitamin D will be required. Therapeutic target is low normal calcium. Oral calcium is administered as calcichew (2-3 tablets daily) or sandocal 400 (1-4 tablets daily) or sandocal 1000 (1-2 tablet daily). Vitamin D as Alfa calcidol usual dose is 0.25 - 1 microgram per day.
- Chronic asymptomatic hypocalcaemia: may need larger doses of oral calcium up to 7g per day in multiple divided doses. Vitamin D usually needed (0.25-1 microgram per day). Use shorter-acting vitamin D analogues as that will make reversal easier if any toxicity/hypercalcaemia.

HYPOKALAEMIA

Potassium <3.5mmol/l

GENERAL

- Common
- Rarely an emergency, except in diabetic ketoacidosis, or arrhythmias.
- Common causes are GI losses, vomiting and diuretics.
- Oral replacement is preferred.
- IV treatment required if patient vomiting, NBM, or with cardiac arrhythmia.

TREATMENT

Oral

- Sando K 2-3 tablets oral bd, or tds. Avoid Slow K, especially in the elderly as it can cause oesophageal erosions and ulcers.
- Add a potassium sparing diuretic if diuretic induced.
- Monitor potassium levels daily and review dose regularly.

Intravenous

NEVER administer stat or undiluted.

- Maximum concentration is 40 mmol/L usually over 4hrs.
- Higher concentrations (e.g. 80 mmol/L) may be given centrally, but the rate must not exceed 20 mmol/hr (with continuous ECG monitoring).
- **Caution**: monitor serum potassium levels to ensure hyperkalaemia does not occur, especially in patients with renal impairment.
- Use pre-prepared bags to minimise risk of error (wherever possible).
- Serum potassium concentration is a poor reflection of total body potassium (frequently much lower). Seemingly large quantities may be required e.g. in DKA.
- If difficulty replacing potassium is experienced, check serum magnesium. May be low, especially in alcoholics, and patients on diuretics.
- Hypomagnesaemia impairs potassium retention by the kidney.

ADDISON'S DISEASE

SYMPTOMS AND SIGNS

- Weight loss
- Pigmentation
- Abdominal pain
- Vomiting, diarrhoea
- Fatigue
- Postural hypotension
- Shock

LABORATORY INVESTIGATIONS

- Low Na^+
- High K^+
- Metabolic acidosis
- High urea
- Hypoglycaemia
- Hypercalcaemia
- These changes occur late in the disease.

TESTING FOR ADDISON'S DISEASE

A short Synacthen test is useful to confirm the diagnosis and only takes 30 mins. However do not do short Synacthen test in the very ill. Take blood to check cortisol and ACTH then start hydrocortisone treatment.

SHORT SYNACTHEN TEST

- Venous blood sample for baseline cortisol and ACTH.
- Give 250 micrograms Synacthen im (IV if peripherally shutdown).
- Recheck cortisol at 30 minutes.
- A normal response is a 30min cortisol >460nmol/L.

TREATMENT

- Correct hypoxaemia.
- Establish IV access.
- Take a sample for serum cortisol/ACTH.
- 0.9% saline IV with 10% dextrose IV if hypoglycaemic.
- 200mg hydrocortisone IV.
- Then 100mg hydrocortisone IV qds for 48hrs.
- Decrease hydrocortisone dose to 50mg qds the following day and continue to decrease at daily intervals as follows
- Then 50mg bd iv or oral if well enough
- Then 25mg bd oral
- Then 20mg am and 10mg pm (no later than 6pm) oral
- Then 10mg am and 5mg pm (usual maintenance dose)
- Fludrocortisone 50-100 micrograms oral per day may be required (when total daily hydrocortisone dose is <30mg), as determined by plasma electrolytes, and blood pressure.

- Measurement of plasma renin activity can also be helpful in assessing mineralocorticoid deficiency.
- Discuss with Endocrinology registrar.
- Patients should be advised to wear a medic-alert type bracelet or talisman and should be given a steroid card. Further details can be found in the BNF.
- Advise not to stop steroids unless told to by a doctor. If become unwell steroid dose should be doubled. If vomiting, or diarrhoea contact GP at once.

Management of intercurrent illness in patients requiring glucocorticoid replacement

- Patients with Addison's disease or ACTH deficiency secondary to pituitary failure are unable to mount an increased cortisol reponse to stress.
- In mild or moderate illness, patients should double or triple their glucocorticoid replacement for the duration of the illness.
- In severe illness or if vomiting/diarrhoea, iv hydrocortisone is required. 100mg iv qds. NB replace fluid deficit with iv saline as appropriate.
- Decrease back down to usual dose gradually as outlined above.

HYPONATRAEMIA

Seen in 1.5% of hospital admissions.

Mechanism

Dilutional (impaired renal water clearance) or depletional. Often a combination.

Dilutional commoner and seen in:

- Cirrhosis
- Cardiac failure
- Nephrotic syndrome
- Hypothyroidism
- ACTH deficiency
- SIADH: check plasma and urine osmolality, urinary sodium, TFT, synacthen test, CXR

Depletional causes:

- Vomiting/ diarrhoea
- Diuretics

- Addison's disease.
- Renal salt wasting.

HISTORY, EXAMINATION & INVESTIGATIONS

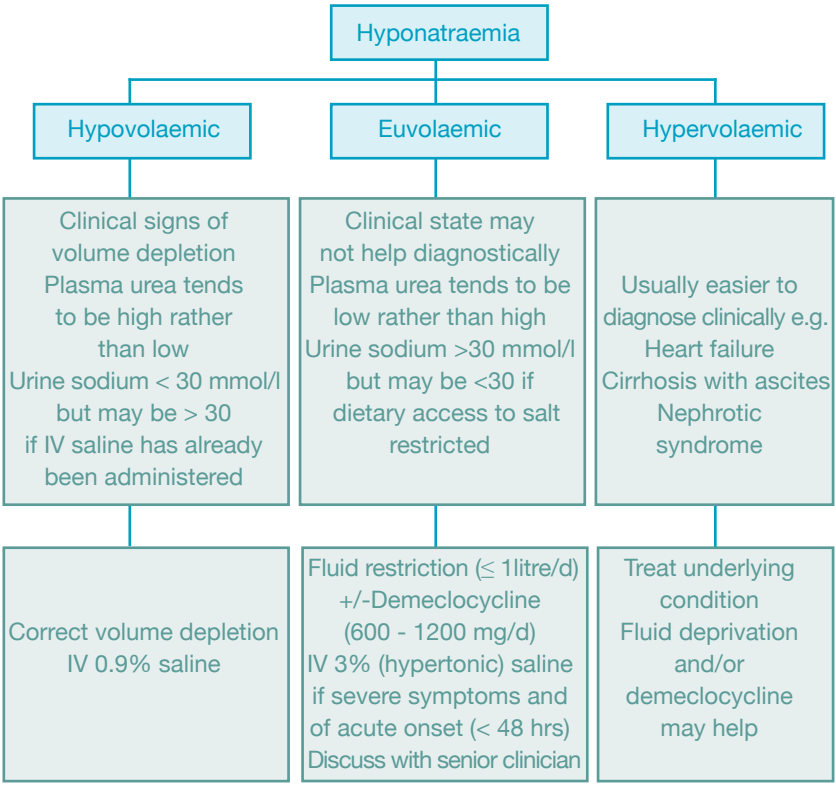
- Accurate history to establish rate of onset of symptoms, any obvious cause eg diuretics.
- Assess hydration status.
- Check urine sodium concentration before giving any IV therapy.

Patients with urinary sodium >30mmol/l are more likely to have dilutional hyponatraemia (exceptions are Addison's disease and renal salt-wasting and patients receiving diuretic therapy).

- Symptoms and signs relate to the rate of onset more than the degree of fall in sodium.
- Na^+ <130 mmol/l may give headache with nausea and vomiting and lead to fits, coma and respiratory arrest. This is more likely in women of child-bearing age (16-45 yrs).
- Na^+ <120 mmol/l is associated with 50% mortality. Chronic development has much lower morbidity and mortality. If chronic even severe hyponatraemia may be asymptomatic.

Chronic fall to 110mmol/l can be well tolerated, acute fall to 127mmol/ has been fatal.

Flow Chart for the assessment and management of a patient with hyponatraemia*



- *Most difficulty arises in differentiating mild hypovolaemia from euvolaemic, dilutional, hyponatraemia. In both hypovolaemic and euvolaemic hyponatraemia plasma osmolality will be low and the urine will be less than maximally dilute (inappropriately concentrated). Posm/Uosm will rarely help clinical management.
- Monitor the sodium concentrations carefully (every hour if necessary during iv therapy).
- In a sick individual consider Addison's disease and give parenteral hydrocortisone (100mg) after taking blood for plasma cortisol as glucocorticoids are anticipated to have little toxicity in this acute setting and may be life-saving.

MANAGEMENT

- Depends on degree and rate of fall: in patients with a severe abrupt fall in sodium associated with symptoms rapid correction is well tolerated and beneficial.
- In more chronic onset and without symptoms correction should be much slower.
- Depends on body salt and water status.

Seek expert advice.

EMERGENCY TREATMENT

Prompt treatment is required for patients with neurological signs, and sodium less than 120mmol/L. EMERGENCY treatment is required for seizures. Discuss all such cases with Endocrine Registrar. Consider high dependency or intensive care management early.

- Hyponatraemic encephalopathy: symptomatic and Na <120mmol/l use hypertonic saline aiming to raise the sodium by 3-5mmol in the first instance over 4-6 hours: get senior advice. Sodium should not rise more than 12mmol in 24 hours. In chronic cases, the Na^+ increment should be no greater than 8mmol in 24 hours. Hypertonic saline should only be given on advice of endocrine or ICU Reg/ Cons. Caution in renal and cardiac disease.
- Treat fits as standard with diazemuls and refer early to ICU.
- Remove cause.
- Fluid restriction ± demeclocycline where appropriate. Cardiac failure, cirrhosis and nephrotic syndrome: water restrict, diuretics, no improvement with hypertonic saline (can make worse).
- In volume depleted patient give 0.9% saline, and correct hypokalaemia (may benefit from hypertonic saline, but usually respond to isotonic).
- Treat hypothyroidism and Addison's disease with appropriate hormones.

CRITERIA FOR SIADH

- Plasma sodium <130 mmol/L, urine sodium >30 mmol/L.
- No oedema or hypovolaemia.
- Normal renal, thyroid, and adrenal function.
- No diuretic usage.

Chapter 7

NEUROLOGICAL EMERGENCIES

NON-TRAUMATIC COMA

This guideline relates to the unrousable, unresponsive patient. There are many causes of coma, (GCS<8) but the initial approach is similar for all of them

IMMEDIATE MANAGEMENT

Assess the airway and breathing

- Open airway and stabilise the cervical spine if there is a history of head or neck trauma.
- Give high concentration oxygen and if no breathing ventilate with a bag-valve-mask and 100% oxygen
- Intubation will often be necessary - seek expert help from an anaesthetist early.

Assess the circulation

- Check pulse, perfusion, oxygen saturation and blood pressure
- Correct hypovolaemia or arrhythmias
- Obtain large bore IV access
- Immediate investigation: take blood for BM, full blood count, glucose, electrolytes and toxicology screen

Look for evidence of hypoglycaemia

- Measure glucose rapidly
- If you believe hypoglycaemia is present give 200-500ml 5% dextrose
- Give Pabrinex IV HP 1+2 (20ml in 100ml 5% glucose or 0.9% sodium chloride over 30mins, as per LUHD guidelines) to alcoholics or malnourished patients at the same time as glucose

IMMEDIATE ASSESSMENT

- Obtain history from ambulance crew, relatives, partner, friends or GP.
- Record the level of consciousness using the Glasgow Coma Scale, and reasses it frequently.
- Examine pupils, look at eye movements, and look for unilateral weakness (suggesting an intracranial cause such as stroke) by giving a painful stimulus.
- Examine the rest of the patient carefully looking for pointers to a diagnosis.

FURTHER TREATMENT TO CONSIDER

If you suspect an OPIATE OVERDOSE (drug paraphernalia at scene, track marks, pinpoint pupils, reduced respiratory rate) give NALOXONE as per Toxicology chapter.

If you suspect a BENZODIAZEPINE OVERDOSE (previous prescriptions of benzodiazepines, empty drug boxes, reduced respiratory rate). manage as per Toxicology chapter.

If you suspect MENINGITIS (neck stiffness, rash or fever) give INTRAVENOUS ANTIBIOTICS: Ceftriaxone 2g IV. See meningitis section.

FURTHER INVESTIGATIONS TO CONSIDER

If the cause of the coma is not immediately evident, further investigation is usually required. Consider;

- CT brain: once circulation is stable and the airway is secure
- Drug levels: toxicology screen
- Lumbar puncture: cell count, protein, glucose, culture.

Early advice from a neurologist and/or neurosurgeon and/or intensive care physician may be crucial.

ONGOING CARE OF THE UNCONSCIOUS PATIENT

- Monitoring of conscious level, blood pressure, pulse, ECG and oxygen saturations
- DVT prophylaxis: heparin may be contraindicated
- Pressure sore prevention
- Nutrition

AETIOLOGY OF COMA

Primary neurological disease

- Trauma
- Intra-cranial haemorrhage: SAH, intra-cerebral, sub/extradural
- Arterial/venous infarction
- Infection: meningitis, encephalitis, cerebral abscess
- Other structural: tumours
- Epilepsy: postictal non-convulsive status epilepticus
- Psychogenic

Secondary to systemic disease

- Toxic (drugs/alcohol)
- Hypoxia/hypercarbia

Metabolic

- Hypoglycaemia
- Hyperglycaemia
- Hyponatraemia
- Hypocalcaemia
- Liver or renal failure
- Wernicke's encephalopathy
- Hypertensive encephalopathy

GLASGOW COMA SCALE

Eye Opening		**Best** verbal response		**Best** motor response	
1	None	1	None	1	None
2	To pain	2	Sounds only	2	Abnormal extension response to pain
3	To voice	3	Incoherent Words	3	Abnormal flexion response to pain
4	Spontaneous	4	Confused speech	4	Withdrawal from a painful stimulus
		5	Normal conversation	5	Localises a painful stimulus
			T = intubated patients	6	Normal

Add up the score for each component of the scale, and report them separately.

Localisation to pain is defined as reaching above the clavicle to a painful stimulus given above the neck.

General assessment

Raised intracranial pressure leads to bradycardia and hypertension (Cushing response). Once haemodynamically stable, look for:

- Neck stiffness in flexion of neck: may be absent in deep coma despite meningeal irritation.
- Skin rash: remember conjunctivae, hands and feet (soles).
- Pyrexia
- Medic-alert bracelets.
- Evidence of drug abuse (needle tracks).
- Cranial trauma (feel over whole head).

Neurological assessment

- Use sternal and nail bed pressure to elicit response, if no response to verbal stimuli.
- If asymmetrical, score best side, but note asymmetry (lesion localisation).

Pupil size/reactions:

- Pinpoint pupils = opioid OD or pontine structural lesion.
- Asymmetry pupil size: lesion localisation, especially emerging third nerve palsy.

Reflex asymmetry:

- Lesion localisation.
- Bilateral extensor plantar response common in coma.

Further management

If diagnosis obvious from initial assessment/blood tests (e.g. metabolic), treat appropriately and reassess (should improve after correction, if not, why not?).

If primary neurological cause suspected:

- Brain imaging (CT usually), but ensure patient stable first. Airway protection, correction of hypoxaemia and abnormal CO_2 may necessitate intubation. Get help early.
- Consult neurological advice (Neurology SpR via WGH switchboard).

Further investigation will depend on the above clinical assessment.

EPILEPTIC SEIZURES

Epilepsy is a syndrome characterised by two or more unprovoked epileptic seizures.

Epileptic seizures may be:

- Generalised (most commonly tonic-clonic).
- Focal.

CAUSES

First seizure:

- Patients presenting with suspected first ever seizure should be managed as per the 'First seizure in adults' protocol. See Chapter 2.
- Further investigations/treatment should only be undertaken after consultation with a neurologist.

Symptomatic seizures in a person known to have epilepsy:

- Subtherapeutic drug concentration (poor compliance, drug interaction).
- Primary CNS disease (infection, stroke, trauma etc.).
- Encephalopathy due to toxic/metabolic disturbances.
- Intercurrent illness, infection, fatigue, stress.

Isolated presentation:

Patients presenting with suspected first ever seizure must have:

- ECG, FBC, glucose, U&Es, (toxicology if indicated) LFTs, calcium, magnesium.
- If recovered may be discharged, and referred to "first seizure" clinic (Dr Davenport, Consultant Neurologist, RIE): see referral sheet in Chapter 2.
- Inform patient and document advice regarding DVLA (patients have legal obligation to inform DVLA regarding any suspected epileptic seizures or episode of disturbed consciousness not explained by vasovagal syncope). The patient should not drive until further assessment.
- Further investigations/treatment should only be undertaken after consultation with neurologist.

STATUS EPILEPTICUS

Defined as more than 30 minutes of:

- continuous seizure activity or;

- two or more sequential seizures without full recovery of consciousness between seizures.
- This summary is for tonic/clonic status.

In 50% of patients it is the first seizure. The longer status goes on the harder it is to control and the greater the cerebral damage and systemic effects.

COMPLICATIONS OF STATUS EPILEPTICUS

- Systemic and cerebral hypoxia
- Neurogenic pulmonary oedema
- Rhabdomyolysis, acute renal failure, hyperkalaemia
- Lactic acidosis
- Hepatic necrosis
- DIC
- Death

MANAGEMENT

- Airway: assess, open and maintain, high concentration oxygen. Naso-pharyngeal airway may be helpful.
- Breathing: assess and support.
- Circulation: assess, IV access (check blood glucose), IV fluids. Use 0.9% sodium chloride and avoid 5% dextrose.
- Drugs: abolish seizure activity (below).
- Monitoring: pulse oximeter, ECG, BP, GCS, pupils.

Urgent investigations

- Blood glucose.
- U&Es, Ca^{++}, Mg^{++}, CK.
- ABG
- LFTs
- FBC and coagulation screen.
- The specific cause may be crucial e.g. meningitis, subarachnoid haemorrhage and so on. See below for details of these.
- Discuss with Neurology Registrar: contact via switchboard WGH.

DRUGS

Initial treatment is with **DIAZEPAM** emulsion (Diazemuls).

- 2mg increments IV initially up to 10mg over 5 minutes.
- Alternative is IV lorazepam 4mg slow IV into a large vein.
- Benzodiazepines may cause respiratory depression and hypotension.
- Repeat Diazepam once 15 minutes later up to total 20mg if required.
- Repeat lorazepam once 15mins later up to a total of 8mg, if required.
- Usually effective but wears off allowing recurrent seizures in many.

Second line therapy for seizures persisting despite benzodiazepines is PHENYTOIN.

For patients NOT already on phenytoin:

- Give by IV infusion diluted in 100ml 0.9% sodium chloride.

Recommended maximum concentration is 10mg/ml. Sodium chloride is the ONLY suitable diluent.

- For otherwise fit adults a loading dose of 15mg/kg given no faster than 50mg/min is used.
- The solution is liable to precipitation and a 0.2µm filter should be used in the line.
- To avoid local venous irritation flush cannula with 0.9% sodium chloride before and after infusion.
- Monitor ECG continuously as heart block may occur.
- Measure BP frequently as phenytoin causes hypotension.
- Maintenance: IV 100mg phenytoin 8 hourly (or 300mg phenytoin od orally/NG) until the need for ongoing anti-epileptic treatment is reviewed by a neurologist.

In the elderly or in patients with cardiac disease a lower loading dose should be used e.g. 10mg/kg and can be divided into two separate doses.

- Refractory status, continuing for >30 mins despite the above therapy requires expert involvement from Intensive Care and Neurology.
- **Call the duty anaesthetist and inform the ICU Consultant on call.** The next line of therapy involves the use of IV general anaesthetic drugs, tracheal intubation and assisted ventilation.
- Remember specific causes especially meningitis, encephalitis and other intra-cranial pathology.

If cranial CT scan is required secure ABCD first. This will involve invasive monitoring and ventilation.

SUBARACHNOID HAEMORRHAGE

Acute bleed into the subarachnoid space, may also have intracerebral component.

- 80%: aneurysmal
- 10%: no known vascular cause (perimesencephalic)
- 5%: avms, tumours etc.

PRESENTATION

- Acute onset (severe) headache (usually maximal instantly or within few minutes).
- Transient or persisting loss of consciousness.
- Epileptic seizures.
- Vomiting
- Focal neurological signs.
- Meningism is uncommon in the early stages; irritability common.
- Fever is uncommon in the early stages.
- Limb and cranial nerve signs; subhyaloid retinal haemorrhages.
- Hypertension and tachycardia.
- Pulmonary oedema may occur early.
- 20% SAH present with headache alone.

Contact the Neurology Registrar on-call via switchboard WGH.

MANAGEMENT

- Airway: assess, maintain, give high concentration oxygen if hypoxic.
- Breathing: assess and support. Laryngoscopy and intubation cause severe hypertension and may precipitate rebleeding. Unless the patient has arrested or cannot be ventilated intubation should not be attempted except with an appropriate anaesthetic technique by an experienced clinician.
- Circulation: assess, support, gain IV access. Most patients will be hypertensive: no attempt should be made to reduce blood pressure as it is critical to maintenance of cerebral perfusion pressure.

INDICATIONS FOR INTUBATION AND VENTILATION IN SAH

- Airway or breathing compromised.
- Hypoxaemia not corrected by high concentration oxygen.
- GCS 8 or less.
- Hypoventilation and $PaCO_2$ >6kPa.
- Hyperventilation and $PaCO_2$ <3.5kPa.

- **Disability**

  Neurological assessment: grading of subarachnoid haemorrhage is by the World Federation of Neurological Surgeons Classification and is based on Glasgow Coma Scale.

WFNS GRADING SAH

Grade 1: GCS 15
Grade 2: GCS 13-14
Grade 3: GCS 13-14 with deficit
Grade 4: GCS 7-12
Grade 5: GCS 3-6

- Lower grades may be due to convulsions or hydrocephalus as well as the magnitude of the bleed.
- Management depends on grade: CT brain scanning should be performed early. If negative, lumbar puncture must be performed (unless contra-indicated). Timing is crucial (not before 6-12 hours since symptom onset) and xanthochromia is sought biochemically (bilirubin on spectrophotometry).
- Discuss Grade I-2 with Neurology Registrar WGH and discuss Grades 3-5 with Neurosurgery Registrar WGH.

PRIORITIES

- Resuscitation as previous.
- Analgesia: oral paracetamol 1g 6 hourly, oral/IM codeine phosphate 30mg 6 hourly, and lactulose 10ml bd. Subcutaneous/intravenous morphine 10mg 2 hourly can be used with care, preceded by an anti-emetic.
- Investigation: CT scan head. Transport only after appropriate stabilisation and with adequate monitoring and escort.

PREVENTION & TREATMENT OF COMPLICATIONS OF SAH

- **Standard preventive measures for delayed ischaemic neurological deficit/vasospasm:** usually occurs day 4-12. Good fluid intake and oral nimodipine 60mg 4hrly for 21 days. Nimodipine may cause hypotension necessitating halving of dose to 30mg, or omission of doses until BP recovers. Do not treat hypertension.
- **Rebleeding:** peak of up to 20% in first 24 hours, and 40% in 1st month if left untreated. Definitive treatment is to occlude the aneurysm by endovascular 'coiling', or sometimes neurosurgical 'clipping'.
- **Raised intracranial pressure:** haematoma and hydrocephalus may be treatable surgically.
- **Epileptic seizures.**
- **Neurogenic Pulmonary Oedema (NPO):** in the patient with SAH if BP is normal or low, they are poorly perfused and oxygenation is poor with crackles in the chest NPO is likely. Involve ICU early for specific treatment.

MENINGITIS

Suspect meningitis in every patient with a fever, headache, meningism, or neurological signs. Optimal management requires a rapid assessment, diagnosis, and treatment.

FEATURES OF MENINGITIS

- Meningism- photophobia, neck stiffness in 70%, headache, Kernig's sign.
- Fever
- Decreased level of consciousness.
- Seizures in about 20%.
- Focal neurological signs, especially cranial nerve palsies in about 20%.
- Petechial rashes in meningococcal septicaemia. However, a similar rash can occur in staphylococcal and pneumococcal septicaemia.

LIKELY ORGANISMS

- Depend on age, and a large number of other factors e.g. immunological state.

The commonest bacterial pathogens are:

- <60yrs *Streptococcus pneumoniae, Neisseria meningitidis*.
- >60yrs *Streptococcus pneumoniae, Neisseria meningitidis*, *Listeria monocytogenes*.

INITIAL MANAGEMENT

- Full ABCDE assessment and treatment: see Chapter 2.
- Take blood cultures and start antibiotics immediately. Do not delay while awaiting a CT scan or LP.
- Careful examination for neurological signs and rashes.
- Check vital signs: if shocked treat as for septic shock at once with high concentration oxygen and IV fluids.
- Document GCS.
- Signs of raised ICP: give mannitol 20% 200ml, furosemide 20mg and Alba 200ml IV stat and call ICU and Neurosurgery.
- CT scan with appropriate escort, resuscitation and monitoring.

ANTIBIOTICS

- If <55 yrs ceftriaxone 2g IV bd.
- If >55 yrs or immunocompromised or pregnant ceftriaxone 2g IV bd and amoxicillin 2g IV qds to cover *Listeria*.
- Seek urgent microbiological advice if penicillin allergy.
- Contact ID middle grader.
- Consider IV aciclovir (10mg/kg tds) if LP is delayed (see encephalitis).
- Discuss use of dexamethasone 10mg 6 hourly IV or oral for 4 days if pneumococcol meningitis likely (eg no purpuric rash) and it can be started before or at same time as antibiotics. There is no benefit in giving steroids after antibiotics.
- Notify to Lothian Public Health.

INVESTIGATIONS

- FBC
- U&E's and glucose.
- Blood cultures.

- EDTA blood sample for PCR (pink tube, as FBC).
- Coagulation screen.
- Throat swab in viral transport medium and stool for viral culture. State clearly on request form “meningitis”.
- If clinical features suggest recent mumps, parotid duct swab in viral transport medium.
- Lumbar puncture: see below re CT scanning. A CT scan may be required first if a mass lesion, or abscess is suspected, i.e. focal neurological signs, papilloedema, middle ear pathology, or a history suggestive of a neoplasm or if profoundly immunosuppressed eg HIV positive. Check opening pressure, if >35 cmH_2O, remove only the fluid in the manometer and refer to ICU urgently (see next page). Otherwise try and send at least 5ml to Microbiology (greatly increases diagnostic yield). One sample to microbiology for MC&S, one to biochemistry for glucose, protein, and xanthochromia if subarachnoid haemorrhage is a possibility, and one to Virology.
- Contemporaneous blood glucose.

Contraindications to lumbar puncture include signs of raised intracranial pressure, (including reduction in conscious level, focal neurological signs) or major coagulopathy.

- CXR

Normal CSF is gin-clear. Any haze/turbidity is an indication for immediate antibiotic if not already given.

Cerebro-spinal Fluid Findings

	BACTERIAL	VIRAL	TUBERCULOUS
Cell count	↑↑↑	↑↑	↑↑
Cell type (normal up to 5 lymphocytes)	Polymorphs	Lymphocytes	Lymphocytes
Protein (normal <0.4g/L)	↑↑ (0.5-2.0)	↑ (0.4-0.8)	↑↑↑ (1.0-3.0)
Glucose	<40% serum	>50% serum	<40% serum

TENTORIAL HERNIATION AND CONING

- Raised ICP can cause this.
- Rapidly fatal but it is potentially reversible if identified and treated early.
- May occur post lumbar puncture but this is rare in patients with no focal neurology or raised ICP

Diagnosis

- Intra-cranial pathology e.g. recent lumbar puncture in meningitis or SAH, haematoma.
- Pupil(s) dilate abruptly, and fix.
- Respiration periodic or stertorous.
- Bradycardia and hypertension.
- Coma

Action

- **Call 2222 then ICU and Neurosurgeon.**
- Bag, mask, valve hyper-ventilate with high concentration oxygen.
- IV access.
- Mannitol 20% 200ml IV, furosemide 20mg IV, ALBA 200ml all stat.
- Require intubation and ventilation **with anaesthetic**.
- Further management will be decided by ICU and Neurosurgical specialists.

FURTHER MANAGEMENT OF MENINGITIS

- Analgesia.
- IV fluids if volume deplete.
- Infection control for suspected meningococcal disease, isolate patient for first 48h.
- Notify the on-call consultant in Public Health of all meningococcal and *Haemophilus influenzae* infections. They will arrange prophylaxis for **all** contacts, including the patient's immediate household contacts and any significantly exposed staff contacts (mouth-to-mouth resuscitation or other close prolonged contact; prophylaxis rarely necessary for staff).

ICU referral if:

- Shock unresponsive to fluid resuscitation.
- Respiratory failure.
- GCS <11.

Prophylaxis Don't forget to give the patient prophylaxis before discharge (if they have not received ceftriaxone during admission).

ENCEPHALITIS

VIRAL ENCEPHALITIS

Viral encephalitis is inflammation of the brain due to viral infection. *Herpes simplex* is the most destructive but potentially treatable causative agent. Currently, *Herpes simplex* encephalitis is estimated to occur in approximately 1 in 250,000 to 500,000 individuals a year. It occurs throughout the year and in patients of all ages, $^{1}/_{3}$ in those aged less than 20 years and approximately one half in those aged over 50 years. In pre aciclovir (acyclovir) days, the mortality was over 70%.

Other viral causes of acute encephalitis include:

- Enterovirus, mumps, influenza, EBV, VZV, CMV.
- In patients with travel history: arboviruses, rabies.

Presentation

- Signs of meningeal inflammation: e.g. fever, headache, neck stiffness.
- Altered mentation/personality change.
- Decreasing conscious level.
- Focal neurology.
- Seizures

INITIAL MANAGEMENT

- Careful clinical examination including full neurological examination and Glasgow Coma Score.
- ABCDE as Chapter 2.
- Ask for travel history.
- If patient needs a CT head scan, do not delay antibiotics (see Meningitis chapter) and aciclovir (10mg/kg tds IV).
- Ensure the patient is stable enough for transfer to CT scan.

INVESTIGATIONS

- FBC, U+E's, glucose, LFT, Ca, clotting screen.
- Blood cultures X3.
- Blood for serology.
- Throat swabs in viral transport medium.
- Stool for Virology
- Parotid duct swab (for mumps) in viral transport medium.
- Swab any lesion suggestive of *Herpes simplex*.

- CT scan if focal neurology, raised intracranial pressure, mass lesion. Lumbar puncture if CT shows no features to contraindicate this. CSF to microbiology for microscopy, cell count and gram stain. CSF also to biochemistry for sugar and protein (a contemporaneous plasma sugar is also required). CSF should be sent to Virology for culture and PCR (min. volume 1ml).
- CXR
- EEG
- CT/MRI

FURTHER MANAGEMENT

- Analgesia
- Glasgow Coma Scale and other vital signs should be carefully monitored. Seizures should be treated with anticonvulsants.
- IV fluids to maintain euvolaemia.
- Notify Infectious Diseases and Neurology SpR on call via switchboard WGH.

SPECIFIC ANTIMICROBIAL THERAPY

- Antibiotics as per meningitis of unknown aetiology (see meningitis).
- IV aciclovir (acyclovir) 10mg/kg tds depending on renal function.

DIFFERENTIAL DIAGNOSIS

There is a wide spectrum of conditions that may mimic viral encephalitis, including brain abscess/empyema, partially treated bacterial meningitis, tuberculous meningitis, tumour, vasculitis, connective tissue disorders and toxic/metabolic causes. Consult Neurology or Infectious Diseases.

SUPPORTIVE CARE

If raised ICP, depressed conscious level, shock or respiratory failure early ICU referral is appropriate. See Chapter 2.

SPINAL CORD COMPRESSION

Definition

Malignant spinal cord compression occurs when the dural sac and its contents are compressed at the level of the cord or cauda equina.

- It affects about 5% of patients with cancer. Lung, breast, and prostate cancer are the commonest causes but it occurs in other cancers.
- Cord compression can be the initial presentation of cancer.
- Late diagnosis is common causing permanent loss of function and significant morbidity.

Chapter 8

ACUTE DETERIORATION IN THE ELDERLY

DELIRIUM

Delirium is a medical emergency and needs prompt assessment and treatment.

Delirium ('acute confusional state') is an acute deterioration in cognition, often with altered arousal (drowsiness, stupor, or hyperactivity) and psychotic features (eg. paranoia). The main cognitive deficit in delirium is 'inattention', eg. the patient is distractable, cannot consistently follow commands, and loses the thread during a conversation. Delirium is different from dementia, where there is a much slower decline in cognition and inattention is much less prominent, but the two conditions commonly co-exist.

Delirium affects 1 in 5 of older patients in hospital. It is important because it frequently indicates serious illness – NB 'confusion' in the CURB-65 score. The outcome is frequently poor.

CAUSES OF DELIRIUM

- Three main groups:
  1. physical and psychological stress: any acute illness, trauma, surgery, etc.
  2. drugs: drugs with anticholinergic activity (eg. amitriptyline, oxybutinin), opiates, benzodiazepines, steroids; also drug withdrawal (eg. benzodiazepines, alcohol)
  3. metabolic, eg. hyponatraemia, hypercalcaemia, hypoglycaemia
- Note that a higher number of predisposing factors (old age, baseline cognitive impairment, multiple comorbidities) mean that an apparently minor insult, eg. a UTI or a change of drugs, can precipitate delirium.

INITIAL ASSESSMENT

- Delirium should be suspected in any patient with (a) cognitive impairment and/or altered arousal and (b) evidence that the altered mental status is of recent onset (hours, days, weeks).
- Therefore, to screen for delirium you need to assess cognition and arousal, and seek a third party history regarding the patient's baseline state.

- Assessment of cognition can be done formally using the Abbreviated Mental Test, and through clinical observation (eg. inability to converse normally, distractibility, inability to follow commands, etc.)
- Note other features, such as irritability, paranoia, lability of mood, apathy, etc.
- *Agitation is not necessary to make the diagnosis*: more than 50% of patients will not show this.
- Once you have made the diagnosis you need to consider the predisposing and precipitating factors.
- In older patients delirium may be the presenting feature of acute illness, for example pneumonia, UTI, cholecystitis, etc. Often patients will lack other obvious features of the illness. Thus, initial examination is directed at looking for an acute cause.
- Do not neglect examination of the nervous system (stroke can cause delirium), joints, and skin.

ABBREVIATED MENTAL TEST SCORE (AMT)

	SCORE OUT OF 10	COMMENTS
1. What is your present age (± 1 year)?		
2. What is the time just now (± 1 hour)?		
3. What year is it?		
4. What is the name of this place? Please memorise this address - 42 West St		
5. When is your birthday (date and month)?		
6. When did the First World War begin?		
7. What is the Queen's name?		
8. Can you recognise 2 people?		
9. Count backwards from 20 to 1?		
10. Can you remember the address I just gave you?		

INVESTIGATIONS

- Exclude hypoglycaemia and hypoxia at the bedside.
- U&Es, Ca
- LFTs
- FBC
- ESR & CRP
- Troponin
- Glucose
- Blood cultures if any evidence of infection
- ABGs if tachypnoeic, low 0_2 sats (<96%), possibility of $C0_2$ retention or metabolic acidosis

- Urinalysis +/- MSU
- CXR
- ECG
- Abdo USS if LFTs deranged – eg. to investigate possible cholecystitis
- Consider CT brain +/- LP if delirium persists without known precipitant. Further investigations should be under the supervision of a specialist.

MANAGEMENT

- Because delirium is usually due to an interaction between multiple predisposing factors and precipitating factors, management should be aimed at not just finding and treating the assumed cause, but also optimising all aspects of care:
  1. optimise physiology: correct hypoxia and hypoglycemia, treat anaemia, dehydration, hyponatraemia, malnourishment, etc.
  2. treat any possible precipitants
  3. stop or reduce deliriumogenic drugs (amitriptyline, etc.) – consult pharmacist if unsure
  4. minimise mental stress – provide repeated re-orientation, involve family/carers, and provide care in as quiet and stable an environment as possible (eg. side room)
  5. avoid prolonged bedrest: mobilisation can help recovery
- Management is best carried out on specialist units: transfer to Acute Medicine of the Elderly ward early. Appropriate nursing care can often avoid sedation (quiet, well lit environment).
- If agitation causes severe distress or immediate danger of injury consider using drug treatment. The first line drug is haloperidol 0.5mg oral or im, at intervals of 20 min – 1 hr until agitation is reduced to acceptable levels. If in any doubt contact a senior colleague for advice or seek specialist help. See below for further details

ADDITIONAL POINTS

- Benzodiazepines prolong delirium and may worsen outcome. **Do not use** unless under specialist supervision, alcohol withdrawal is suspected, or the patient has Parkinson's disease or dementia with Lewy Bodies.
- Delirium is very common in dying patients – treat cause(s) if possible and consider antipsychotics
- Differentiation between depression, dementia and delirium can be difficult, and where the delirium persists seek specialist advice.

ACUTE AGITATED CONFUSION IN AN OLDER PATIENT

PRESCRIBING GUIDELINE

Look for possible precipitants

Metabolic problems - sodium, calcium, hypoxia, hypoglycaemia?

Is your patient in **pain**?

Is there **infection** in chest, urine, skin, joints, or meninges?

Is **alcohol withdrawal** a possibility?

Is **benzodiazepine withdrawal** a possibility?

Is urinary retention a possibility?

Drugs - be suspicious of **all** prescribed drugs **and** check that none have been suddenly stopped.

Can you modify the environment?

One to one nursing - discuss **extra staff** with the directorate manager.

Try to find a quiet, well lit, **side room**.

Can **family** stay with the patient for some of the time?

Provide an understanding **nurse**.

Is your patient too hot, too cold, or hungry?

Drug Treatment

N.B. Only use drugs if your patient is at risk of causing harm to themselves or others.

If alcohol or benzodiazepine withdrawal is a possibility refer to the alcohol withdrawal guideline.

In other cases use:

1. **Haloperidol** 0.5-1mg orally if possible **Wait 20 mins at least**
2. If no response repeat **Haloperidol** 0.5-2mg orally or IM **Wait 20 mins at least**
3. If no response discuss with a **senior member** of **your team**
4. If agitation remains an acute problem discuss with **on-call psychiatric staff.** (Out of hours contact via REH switchboard on Ext.7600)

An alternative to haloperidol in patients in whom this is unsuitable (eg. Parkinson's disease, dementia with Lewy Bodies) is lorazepam 0.5mg orally or im, using same regime as for haloperidol. Use as little as possible: benzodiazepines *prolong* delirium and may be associated with a worse outcome.

REMEMBER

This is a general guideline - your patients have *individual* problems

Seek and treat participants **Try to modify the environment**

Give drugs time to work

FALLS AND IMMOBILITY

Falls and unsteadiness are very common in older people. Although only 10-15% of falls result in serious injury, they are the cause of 92% of hip fractures in older women. There is now a good evidence base for falls and fracture *prevention*.

PROBLEMS THAT MAY PRESENT AS A "FALL" OR "OFF LEGS"

Bear in mind that many patients will be in more than one of these categories:

- Loss of consciousness: syncope or seizure.
- Acute illness e.g. infection, stroke, metabolic disturbance.
- Simple trip.
- Chronic neurological and locomotor disease (see below).

ASSESSMENT

Full history and examination are required:

- Ask about the circumstances of the fall, and frequency if they are recurrent
- Try to establish if the patient lost consciousness e.g. "do you remember hitting the ground?". A witnesses account is best.
- Check for symptoms or signs of acute illness, especially infection.
- Find out the past history - if necessary ask the relatives and GP.

  Conditions associated with falls:
  - Stroke and vascular dementia.
  - Parkinson's disease.
  - Alzheimer type dementia.
  - Disease of weight bearing joints e.g. OA, joint replacement or previous fracture.
  - Depression.
- Look for the known risk factors for falls (many patients will have several):
  - Impaired cognitive function: check the AMT.
  - Poor balance: ask and examine the patient's gait.
  - Reduced strength: grade 1-5 and look for wasting.
  - Poor vision: ask and check eyesight.
  - Postural hypotension: ask about dizziness on standing up and check erect and supine blood pressure and drug treatment.

- Drugs:
  - polypharmacy (>4 drugs).
  - sedatives and anti-psychotics.
  - antidepressants including SSRIs.
  - hypnotics
- Exclude serious injury e.g. hip or vertebral fracture, head injury.
- Assess osteoporosis risk e.g. previous low trauma fracture, low BMI, steroid use, smoker and consider DEXA scan.

Admission is required in those who:

- cannot walk without help
- are acutely unwell
- are falling so frequently that they can't manage at home.

INVESTIGATION

- FBC
- U&E, glucose, LFTs, CRP, Ca & PO_4.
- Digoxin level if on this.
- Urinalysis and MSU if features of sepsis, pyrexial or raised WBC and CRP.
- ECG *(24 hour ambulatory ECG is not helpful unless the patient is having recurrent syncopal episodes*).
- Chest X-ray.
- If the patient has impaired cognitive function unexplained by known pathology:
  - CT brain, B_{12} and folate, TFTs.
- If the patient has impaired balance or strength unexplained by known pathology, consider CT brain if focal neurological signs, X ray if abnormal joints. Occasionally other investigations are required such as nerve conduction studies to confirm a peripheral neuropathy, or Vitamin D levels in proximal myopathy. (Osteomalacia).

MANAGEMENT

This has to be tailored to the individual patient's problems and requires input from a multidisciplinary team.

- Treat any acute illness.
- Optimise the management of any chronic pathology e.g.:
  - Pain control and physiotherapy for degenerative joint disease.
  - Adjust anti-Parkinsonian medication to achieve best control.

- Ensure 2^0 stroke prevention and treatment measures are in place.

- Multifactorial intervention for falls prevention in all:
  - Exercise and balance training by physiotherapy.
  - Reduce medication as far as possible and reduce or stop any contributing drugs e.g. diuretics, antithypertensives, SSRIs or anti-anginals.
  - Reduce postural hypotension:
    - ensure not anaemic
    - reduce or stop any contributing drugs
    - teach the patient to rise carefully from bed or chair
    - consider TED stockings
    - in extreme cases, seek expert advice regarding drug treatment to maintain or raise BP
  - Safety education and home hazard assessment by OT
  - Correct visual impairment
- Refer to Lothian Joint Formulary guidelines on osteoporosis.
- Commence treatment with a weekly bisphosphonate and Adcal D3 in those with proven osteoporosis and those with 2 or more previous fragility fractures.

Chapter 9

EMEGENCIES IN HAEMATOLOGY , ONCOLOGY & PALLIATIVE CARE

1. NEUTROPENIC SEPSIS

Definitions

Neutropenia: neutrophil count of less than 1.0 x 10^9/l.

Fever: isolated temperature greater than 38.5°C or 2 recordings greater than 38.0°C two hours apart. (NOTE: patients may be neutropenic and septic with a normal/low temperature. If recent chemotherapy and unwell then assume neutropenic sepsis until proven otherwise).

Presenting features

- Generalised constitutional symptoms are common (lethargy, rigors, confusion). Patients can go from being well to being in life threatening septic shock in just a few hours. Neutropenia markedly alters the host's immune response and makes infection more difficult to detect.
- Ask about respiratory, urinary, oropharyngeal and lower GI symptoms. Enquire about recent instrumentation/dental work.
- Does the patient have a Hickman Line? Ask about recent line use and whether there is pain around the line.

i Patients with febrile neutropenia MUST receive antibiotics even if there are no localising signs of infection.

Assessment

Look for:

- Signs of shock e.g. tachypnoea, tachycardia, hypotension, altered mental state.
- Fever
- Detailed examination for any localising signs of infection.

Management

AIM FOR FIRST DOSE OF IV ANTIBIOTICS AS SOON AS POSSIBLE BUT AT THE LATEST WITHIN 1 HOUR OF ADMISSION – if septic following chemotherapy then confirmation of neutropenia is not needed before first antibiotics

- Assess ABCDE. Treat as in Chapter 2.
- Give high concentration oxygen by mask.

- Gain IV access and resuscitate with colloid if hypotensive.
- Check full blood count, electrolytes, renal function, LFT's, calcium, lactate, ABG & CRP.
- Take blood cultures, peripheral and from all line lumens.
- Urine for culture (even if dipstick - negative).
- Stool for culture and *C difficile* toxin if patient has diarrhoea.
- Sputum if available.
- Other microbiology samples depending on symptoms and signs eg throat swab, mouth swab, ear swab.
- Viral throat swab and serology.
- Perform chest x-ray but do not delay antibiotics for this.
- Monitor respiratory rate, SpO_2, pulse/BP every 15 mins until stable.
- Monitor urine output.
- Ensure oncology/ haematology staff know of admission.
  Consider escalation of care to HDU/ITU if haemodynamically compromised, as per Chapter 2.

Anti-microbial therapy

Information available: WGH Haematology site on LUHD intranet - microsites - haematology-WGH
healthcare – A-Z - haematology – policy documents – antimicrobial treatment

- Piperacillin - tazobactam 4.5g IV QDS
- IV gentamicin 7mg/kg OD (ideal bodyweight) (see guideline for administration and monitoring).
- Add clarithromycin if chest infection.
- Add metronidazole if lower GI symptoms.
  Replace gentamicin with vancomycin if a) patient MRSA colonised; b) long term central line. In latter consider removing the line.

2. SUPERIOR VENA CAVA OBSTRUCTION

90% of cases have a malignant cause. The commonest is lung cancer (65%) followed by lymphoma, metastatic lymphadenopathy, germ cell tumours & thymoma.

Presenting features

Usually insidious onset with progressive dyspnoea, facial swelling, head fullness, arm swelling & cough. Symptoms may be present only

on waking, and may be aggravated by lying down.

Assessment

- Distended neck veins, distended chest wall veins & facial oedema are the commonest signs. Cyanosis, facial plethora and arm oedema can also be seen.
- Examine for neck nodes.

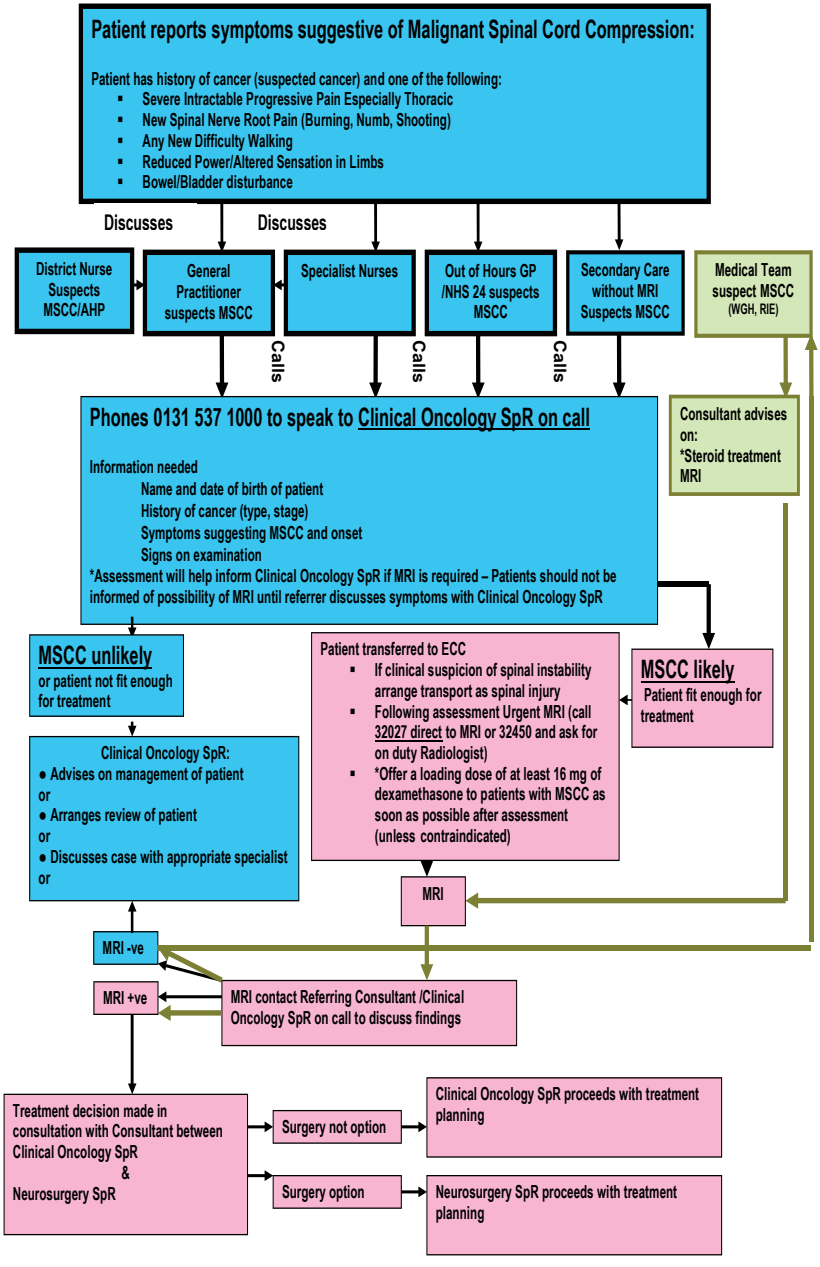
Management

- Sit upright
- High concentration oxygen by mask
- If very symptomatic give 16mgs dexamethasone IV and oral morphine 2.5mgs 4 hourly
- Arrange urgent CT scan thorax and upper abdo
- **Where possible histological diagnosis should be made prior to treatment. Consider biopsy neck nodes, bronchoscopy, endobronchial ultrasound guided biopsy, CT guided biopsy and sputum cytology. Discuss with respiratory physicians.**

Treatment

- Depends on histology and stage of tumour
- Discuss with Thoracic Oncology Team or on call oncology registrar. (SVCO can be caused by disease which may be amenable to radical treatment)
- SVC stent +/- thrombectomy is most appropriate for immediate palliation of symptoms and may allow time for proper staging and histological diagnosis. (Liase with interventional radiology at RIE)
- Chemotherapy is appropriate for small cell lung cancer, lymphoma and germ cell tumours.
- Palliative radiotherapy may be used for patients with non small cell lung cancer who have mild symptoms and no radical treatment option.

LOTHIAN MALIGNANT SPINAL CORD COMPRESSION PATHWAY



Unique ID: NHSL.
Category/Level/Type: 2
Status: Active
Date of Authorisation: December 2008

Author (s): Malignant Spinal Cord Compression Steering Group
Version: 12
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Introduction

- Patients receiving palliative care may deteriorate suddenly due to their illness or another acute medical or surgical problem.
- Management options depend on life expectancy, level of intervention needed, and an assessment of risks, benefits, side effects and likely outcome.
- Symptom control and supportive care may be the most appropriate management if the patient is dying. (see: Last days of life)
- Discuss treatment options with the patient and family. If possible discuss and document the patient's wishes in advance including those about resuscitation, hospital admission and transfer to an intensive care unit.
- Emergency treatment can be given but ongoing treatment in a patient lacking capacity to consent requires a Section 47 Certificate. (see: Adults with Incapacity Act on website)
- This guideline covers the following palliative care emergencies:
  - Bleeding events
  - Hypercalcaemia
  - Seizures
  - Spinal cord compression

Bleeding

- Acute haemorrhage can be very distressing for the patient and family.
- It is usually best to discuss the possibility with the patient and their family.
- An anticipatory care plan is helpful. This includes having sedative medication prescribed for use if needed.
- If the patient is at home, discuss options for sedation if family carers feel able to use these.
- Discuss resuscitation; document and communicate resuscitation status.
- Make sure all professionals / services involved are aware of the care plan, including out of hours services.

Management of severe, acute bleeding

Non-drug

- Call for help. Ensure carers at home have an emergency contact number.
- Put the patient in the recovery position.
- Apply direct pressure to any bleeding area; dark coloured towels are best.
- If resuscitation is appropriate, admit to hospital and manage according to local protocols for haemorrhage.
- If the patient has a massive haemorrhage and is clearly dying, support and non-drug interventions are more important until help arrives than trying to give sedative medication as the patient will usually lose consciousness rapidly.

Sedative medication

- If the patient is distressed, titrated doses of a rapidly acting benzodiazepine are indicated. The route of administration guides the choice of drug.
  - IV access available: midazolam 5-20mg IV or diazepam (emulsion for IV injection) 5-20mg IV in small boluses until settled.
  - IM injection: midazolam IM 5-10mg can be given into the deltoid muscle.
  - Rectal route or via a stoma: diazepam rectal solution 5-10mg.
  - Sublingual: midazolam 10mg can be given using the parenteral preparation or the buccal liquid (special order product).

http://intranet.lothian.scot.nhs.uk/NHSLothian/Healthcare/A-Z/PalliativeCare/PalliativeCareGuidelines

HYPERCALCAEMIA IN PALLIATIVE CARE

Introduction

- Hypercalcaemia is the commonest life-threatening metabolic disorder in cancer patients.
- Occurs most frequently in myeloma, and in breast, renal, lung and thyroid cancer.
- 20% of patients with hypercalcaemia do not have bone metastases.
- Common symptoms: malaise, thirst, nausea, constipation, polyuria, delirium.
- Treatment may not be appropriate in a dying patient at the end of life – seek advice.
- To reduce risk of renal toxicity from bisphosphonate treatment, consider withholding medication that affects renal function (eg. NSAIDs, diuretics, ACE inhibitors).

Patient presents with symptoms suggestive of hypercalcaemia.

Check calcium + urea & electrolytes, eGFR, albumin

Corrected calcium ∗ > 4.0mmol/L	Corrected calcium ∗ 2.6 - 4.0mmol/L	Corrected calcium normal ∗
Severe hypercalcaemia can cause seizures or arrhythmias - seek consultant advice	Rehydrate with 1-3litres 0.9% NaCl IV -check calcium, U & E next morning	Monitor calcium if patient at risk of hypercalcaemia.

Calcium is still raised – treat with pamidronate IV (reduce dose in renal impairment)♦

Corrected calcium (mmol/L)	Pamidronate dose	Diluent & maximum infusion rate
2.6 – 3.0	30mg	500mls NaCl 0.9% over > 60 minutes
3.0 – 3.5	60mg	500mls NaCl 0.9% over > 60 minutes
3.5 – 4.0	90mg	500mls NaCl 0.9% over > 90 minutes
> 4.0	90mg	500mls NaCl 0.9% over > 90 minutes
If calcium >3.0mmol/l, some units routinely give pamidronate 90mg as a higher dose may increase response and delay relapse.		

Review treatment of underlying cancer.

Continue IV fluids until patient able to maintain oral hydration.

Monitor renal function.

Recheck calcium after 5 days.

Calcium has increased from pre-treatment level after rehydration and pamidronate.

Seek advice; review diagnosis and treatment plan.

Calcium has decreased from pre-treatment level but is still elevated.

Maintain good hydration; recheck calcium after 2-3 days. Do not repeat pamidronate until 7 days after first dose to avoid causing hypocalcaemia.

Calcium normal

♦ **Pamidronate in renal impairment: seek advice**

- GFR >20ml/min: give pamidronate over at least 90 minutes.
- GFR <20ml/min: consider risks & benefits of pamidronate. Maximum infusion rate 20mg/hr; consider dose reduction.

∗ Corrected calcium = measured calcium + (40 - serum albumin) X 0.02

SEIZURES IN PALLIATIVE CARE

Introduction

- Seizures (generalised or partial) occur in 10-15% of palliative care patients most often due to primary or secondary brain tumours, cerebrovascular disease, epilepsy, or biochemical abnormalities (eg. low sodium, hypercalcaemia, uraemia).
- An advance care plan is needed if the patient wishes to avoid hospital admission.

Assessment

- Exclude other causes of loss of consciousness or abnormal limb/ facial movement. (eg vasovagal episode (faint), postural hypotension, arrhythmia, hypoglycaemia, extrapyramidal side effects from dopamine antagonists, alcohol).
- Find out if the patient has had previous seizures or is at risk - history of epilepsy, previous secondary seizure, known cerebral disease.
- Is there a problem with usual antiepileptic drug therapy – unable to take oral medication, drug interactions – check BNF (eg.corticosteroids reduce the effect of carbamazepine, phenytoin).

Management

Acute seizure management

- Put the patient in the recovery position; move any objects that might cause injury.
- If seizure does not resolve quickly, anticonvulsant medication is needed.

Treatment options

- In hospital, diazepam (emulsion) IV in 2mg bolus doses up to 10mg or lorazepam 4mg by slow IV injection are used.
- Diazepam rectal solution 10-30mg given PR or via a stoma.
- Midazolam SC 5mg, repeated after 5 minutes.
- Buccal midazolam 10mg can be given using the parenteral preparation or the buccal liquid (special order product).

Persistent seizures

- IV phenytoin is used in hospital settings.
- Phenobarbital can be given as 100mg IM bolus dose followed, if needed, by a subcutaneous infusion of phenobarbital 200-400mg diluted in water for injection over 24 hrs. Seek advice from a palliative care specialist.

Chronic seizure control

- Most patients with a structural cause for seizures benefit from treatment.
- Follow SIGN guideline recommendations. Check BNF for drug interactions.
  - Partial or secondary generalised seizures
    - sodium valproate, carbamazepine or lamotrigine.
  - Primary generalised seizures – sodium valproate or lamotrigine.
- Dying patient unable to take oral medication - antiepileptics have a long half life so additional anticonvulsant treatment may not be needed.
  - Midazolam SC 5mg or diazepam rectal solution PR 10mg, if required.
  - Midazolam SC 20-30mg infusion over 24 hrs can be used as maintenance therapy.

Practice points

- Phenytoin is no longer a first line drug for chronic seizure control. It interacts with many drugs, and is prone to cause side effects including sedation in palliative care patients.

Professional resource

SIGN Guideline 70 (Epilepsy in Adults): http://www.sign.ac.uk/

SPINAL CORD COMPRESSION

Early recognition is vital

Assessment

- Consider cord compression in any patient with cancer.
- Thoracic cord compression is commonest but any part of the spine and multiple sites can be affected.
- Sites of pain and level of compression do not always correlate; X-rays and bone scans can be misleading.
- **Key signs and symptoms**
  - New, progressively severe back pain (particularly thoracic).
  - New spinal nerve root pain (burning, shooting, numbness) – may radiate down anterior or posterior thigh (like sciatica), or like a band around the chest or abdomen.
  - Coughing, straining or lying flat may aggravate pain.
  - New difficulty walking or climbing stairs; reduced power (motor weakness), sensory impairment or altered sensation in limbs.
  - Bowel or bladder disturbance - loss of sphincter control is a late sign with a poor prognosis.
- A full neurological examination should be done but may be normal initially.
- MRI is the definitive investigation - images the whole spine.
- Spinal cord compression (above L2) - increased tone (reduced if acute syndrome), weakness, hyper-reflexia & extensor plantors. Sensory level to pinprick (spinothalamic tracts) & proprioceptive loss (posterior columns). The bladder may be palpable. Local spinal tenderness.

Cauda equina syndrome

Compression of lumbosacral nerve roots below the level of the cord itself results in a different clinical picture.

- New, severe root pain affecting low back, buttocks, perineum, thighs, legs.
- Loss of sensation often with tingling or numbness in the saddle area.
- Leg weakness, often asymmetrical.
- Bladder, bowel and sexual dysfunction – occur earlier than in cord compression. Loss of anal reflex.

Contact on call Clinical Oncology registrar via WGH switchboard. Neurosurgical referral may be appropriate.

Management

- **Emergency referral is essential –** see local protocol for your NHS Board.
- High dose **dexamethasone**, unless contraindicated, should be started as soon as a diagnosis of cord compression is suspected: 16mg orally and then daily in the morning. Withdraw gradually after radiotherapy treatment.
- If clinical suspicion of spinal instability, transport as a spinal injury.
- Consider Anti-thrombotic measures - Heparin TEDS.
- Pain control – see Pain Management. Give adequate pain relief.
- If there is complete paraplegia and loss of sphincter control, radiotherapy may improve pain control but is unlikely to restore function.
- Patients with residual disability need a full multidisciplinary assessment and continuing supportive care including physiotherapy, occupational therapy, pressure area care, bladder and bowel care; social care, psychological and family support.

Further reading: http://www.palliativecareguidelines.scot.nhs.uk

NALOXONE IN PALLIATIVE CARE

Description

Antagonist for use in severe opioid induced respiratory depression.

Preparation

- 400 micrograms/ml injection (1ml ampoule).

Indications

- Reversal of life-threatening respiratory depression due to opioid analgesics, indicated by:
  - A low respiratory rate < 8 respirations/minute.
  - Oxygen saturation <85%, patient cyanosed.

If less severe opioid toxicity

  - Omit next regular dose of opioid; review analgesia.
  - Monitor the patient closely; maintain hydration, oxygenation.

Cautions

- Naloxone is not indicated for opioid induced drowsiness and/or delirium that are not life threatening.
- Naloxone is not indicated for patients on opioids who are dying.
- Patients on regular opioids for pain and symptom control are physically dependent; naloxone given in too large a dose or too quickly can cause an acute withdrawal reaction and an abrupt return of pain that is difficult to control.
- Patients with pre-existing cardiovascular disease are at more risk of side effects.

Side effects

Opioid withdrawal syndrome: anxiety, irritability, muscle aches; nausea and vomiting; can include life-threatening tachycardia and hypertension.

Dose & Administration

Small doses of naloxone by slow IV injection improve respiratory status without completely blocking the opioid analgesia.

- Stop the opioid.
- High flow oxygen, if hypoxic.
- Dilute 400 micrograms naloxone (1 ampoule) to 10ml with sodium chloride 0.9% injection in a 10 ml syringe.
- Administer a small dose of 80 micrograms (2ml of diluted naloxone) as a slow IV bolus. Flush the cannula with sodium chloride 0.9%.
- Give 80 microgram (2ml) doses at 2 minute intervals until the respiratory rate is above 8. Flush the cannula between the naloxone doses.
- Patients usually respond after 2-4ml of diluted naloxone with deeper breathing and an improved conscious level.
- A few patients need 1-2mg of naloxone. If there is little or no response, consider other causes (e.g. other sedatives, an intracranial event, acute sepsis, acute renal failure causing opioid accumulation).
- Closely monitor respiratory rate and oxygen saturation. Further doses may be needed. The duration of action of many opioids exceeds that of naloxone (15-90 minutes) and impaired liver or renal function will slow clearance of the opioid.

Dose & Administration

Prolonged or recurrent, opioid induced respiratory depression:

- If repeated naloxone doses are required, start a continuous intravenous infusion of naloxone via an adjustable infusion pump.
  - Add 1mg of naloxone (= 2.5ml of 400 micrograms/ml naloxone injection) to 100ml of sodium chloride 0.9% to give a concentration of 10 micrograms/ml.
  - Calculate the dose requirement per hour by totalling the naloxone bolus doses and dividing by the time period over which all the doses have been given.
  - Start the IV infusion of naloxone at **half** this calculated hourly rate.
  - Adjust the naloxone infusion rate to keep the respiratory rate above 8 (do not titrate to the level of consciousness).
  - Continue to monitor the patient closely.
  - Continue the infusion until the patient's condition has stabilised.
- Additional IV boluses may need to be given using naloxone diluted in sodium chloride 0.9% as above.

If in doubt, seek advice

- Seek and treat the precipitating cause(s) of the opioid toxicity.
- Review the regular analgesic prescriptions.

Good Practice Point

- Naloxone should be available in all clinical areas where opioids are used. (National Patient Safety Agency)
- Naloxone is also available in disposable, pre-filled syringes. These doses may be too high for patients on regular opioid analgesics.

Resources

Professional

Palliative Care Drug Information online http://www.palliativedrugs.com/

Community use

- Naloxone may be administered IM when IV access is not immediately available
- 100 micrograms (0.25ml) naloxone IM should be given and repeated after five minutes if there is no improvement with the first dose.
- An IV line should be sited as soon as possible.

Key references

1. Twycross R, Wilcock A. *Palliative Care Formulary* (3rd Edition) 2007, Palliativedrugs.com Ltd., Nottingham
2. National Patient Safety Agency. Safer practice notice 2006/12
3. Adult Emergencies Handbook. NHS Lothian: University Hospitals Division.
4. Electronic Medicines Compendium. www.medicines.org.uk/naloxone http://emc.medicines.org.uk/emc/industry/default.asp?page=displaydoc.asp&documentid=647 18/6/07
5. Lothian Joint Formulary. Section 15.1.7. www.ljf.scot.nhs.uk

CARE OF THE DYING PATIENT

If you think a patient is dying, consider the following points:

1. Discuss the issue with senior colleagues and document any decisions. If you agree that a patient is dying, document clearly in the notes:
- "This lady/gentleman is probably dying" or similar: be explicit
- Date and time
- Who has made the diagnosis
- What further action has been taken

2. Review:
- Symptom control:
  - Pain relief
  - Relief of distress from breathing
  - Psychological distress
  - Relief of nausea and vomiting
- Resuscitation status
- Rationalisation of drugs
- Hydration
- Discussion with next of kin
- Discussion with the patient if appropriate

3. Review the patient at least daily to check:
- They are comfortable
- Prescribed symptom relief is effective
- Any issues they wish to discuss
- Hydration

4. Speak to relatives regularly to update them about the patient's progress.

STANDARDS OF CARE FOR DYING PATIENTS LUHT DEPARTMENT OF MEDICINE FOR THE ELDERLY

Doctors of all grades should feel able to diagnose dying in their patients. The diagnosis should be made by the most senior doctor available and clearly documented in the case notes at the time.

Once the diagnosis has been made, ALL of the following should be addressed in ALL patients and documented in the casenotes:

- Symptom control
  - Pain relief
  - Relief from respiratory distress
  - Nausea and vomiting
  - Relief of psychological distress
- Measures for appropriate hydration
- Rationalisation of drugs
- Avoidance of unnecessary observations and investigations
- Resuscitation Status
- Discussion with relatives
- Discussion with the patient (when appropriate)

Patients who are dying should be reviewed regularly at least daily to check that they are comfortable and symptom free.

Standards in the bold boxes will be subject to regular audit.

This guideline has been derived from the Liverpool Integrated Care Pathway for the Last Days of Life.

Revised August 2003

THE ROLE OF JUNIOR MEDICAL STAFF IN THE DIAGNOSIS OF DYING

1. The diagnosis of dying should be made by the most senior doctor available.

2. If you suspect somebody is dying despite all current interventions, suggest it to seniors.

3. When a senior does diagnose dying in a patient, document clearly in the notes:
- "This lady/gentleman is probably dying" or similar: be explicit
- Date and time
- Who has made the diagnosis
- What further action has been taken

4. Consider, or ask seniors to consider, **all** of the following in **every** patient:
- Symptom control:
  - Pain relief
  - Relief of distress from breathing
  - Psychological distress
  - Relief of nausea and vomiting
- Resuscitation status
- Rationalisation of drugs
- Hydration
- Discussion with next of kin
- Discussion with the patient if appropriate

And write down the outcome!

5. Review the patient regularly (at least daily) to check:
- they are comfortable
- prescribed symptom relief is effective
- if they have any issues they want to discuss

6. Speak to relatives regularly to update them about the patient's condition
   A doctor should break the initial bad news to relatives, but any member of the team that knows the relatives can give day to day updates.

Chapter 10

TOXICOLOGY

National Poisons Information Service (NPIS)

NPIS (Edinburgh) is one of the UK Units commissioned by the Health Protection Agency that contribute to the TOXBASE® website. This provides guidance on the management of poisoning by any one of a large number of different drugs, chemicals and plants. TOXBASE® is a standard reference for advice on the features and treatment of poisoning cases, and is updated on a daily basis. It can be accessed from the Combined Assessment Area (Base 6) and A&E departments at the Royal Infirmary, ARAU at the WGH, the A&E department of St. John's Hospital, and the critical care areas on all three sites. Additional information related to unusual or severe poisoning can also be obtained by telephone. Website: **http://toxbase.u5e.com**

NPIS : 0844 8920111
24-hour information service for more severe and complex poisoning cases

ADMISSION POLICY

- Patients who present after drug overdose or deliberate self-harm (e.g. self-cutting) normally require admission to hospital. In some cases this may be for psychiatric assessment alone, rather than ongoing medical care. The preferred site for admission in Edinburgh is CAA Base 6, Royal Infirmary (0131-242-1443).
- Patients who are unconscious or at high risk of airway or haemodynamic compromise should normally be admitted to a critical care area (e.g. HDU, ICU).
- Patients expressing suicidal thoughts but who have not actually harmed themselves or taken a drug overdose do not usually need admission to a medical unit, and should be discussed with the on-call duty Psychiatrist.
- At SJH patients are managed in A&E.

IMMEDIATE MANAGEMENT

- Maintain airway using nasopharyngeal or oropharyngeal airway if conscious level is reduced
- Endotracheal intubation is required if unresponsive and loss of protective airway reflexes. Make ICU referral early
- Give oxygen if drowsy aiming to maintain SpO_2 > 92%

- Ensure adequate ventilation. Treat underlying cause if applicable or consider need for intubation and ventilation. **NB. Opiate overdose may lead to respiratory depression with hypoventilation**
- Consult TOXBASE®; contact NPIS if further advice needed 0844 892011 (24hr)
- Consider need for activated charcoal or gastric lavage
- Record respiratory rate pulse, blood pressure, oxygen saturation and temperature
- Monitor cardiac rhythm if drug likely to have haemodynamic effects or cause arrhythmia

GENERAL MANAGEMENT

- Manage in an appropriate care area eg HDU/ICU
- Correct underlying hypoxia to reduce risk of seizures or arrhythmias
- If hypotensive administer IV fluids to ensure adequate hydration and elevate the legs. If blood pressure remains low then inotropes may be required.
- Metabolic acidosis increases the risk of seizures and arrhythmia after overdose with certain drugs. If acidosis persists despite correction of hypoxia and hydration status then IV sodium bicarbonate may be administered. 1.26% sodium bicarbonate 250 ml can be administered and repeated as necessary. Seek expert advice.
- Control agitation with oral or IV diazepam (0.1-0.3mg/kg body weight). Repeated administration may be needed. Large doses may be needed in patients using recreational drug such as cocaine or amphetamines.
- Treat seizures with IV lorazepam 2-4 mg or diazepam 10-20 mg in adults; repeated doses might be needed. Management of persistent seizures should be discussed with the NPIS; some anticonvulsants can increase toxicity of certain drugs.
- If cardiac arrhythmias occur ensure that hypoxia and metabolic acidosis are corrected. Arrhythmias due to tricyclic antidepressant overdose should be treated with IV sodium bicarbonate, which should be given as 50 ml 8.4% sodium bicarbonate via a central or large peripheral vein, and repeated if needed.
- Torsade de pointes arrhythmia (polymorphic ventricular tachycardia) can be caused by some drugs that prolong the QTc interval. This should be treated with IV magnesium sulphate 8-10 mmol, given over 1-2 minutes. This may be repeated after 5-10 minutes if necessary.
- Use antidotes where indicated in TOXBASE®.

GUT DECONTAMINATION/DRUG ELIMINATION

- Induced vomiting is of no benefit, is potentially hazardous, and should be avoided.
- Absorption of many drugs may be reduced by oral activated charcoal (50 g) within the first hour post ingestion. Activated charcoal must not be given without adequate airway protection or if there is a paralytic ileus (absent bowel sounds).
- Some substances including iron, lithium, methanol and ethylene glycol are not bound to charcoal.
- Repeated doses of activated charcoal enhance elimination of certain drugs, and can be beneficial beyond 1 hour post-ingestion: carbamazepine, phenobarbitone, quinine and theophylline.
- Gastric lavage is rarely necessary, and should be considered only if a life-threatening dose of chemical or drug have been ingested within 1 hour.
- Gastric lavage should NOT be undertaken in patients with reduced conscious level or inadequate airway protection, or after ingestion of petroleum distillates or corrosives due to the risk of aspiration. If in doubt discuss with the NPIS.
- Whole bowel irrigation with osmotic laxatives may reduce absorption of some drugs that are not adsorbed by charcoal. It is occasionally necessary for patients who have ingested packages of illicit drugs (e.g. 'body-stuffers').
- Urinary alkalinisation may increase elimination of some drugs (e.g. salicylate), and can protect against renal impairment in patients with rhabdomyolysis.
- Haemodialysis can improve outcome in some cases of severe toxicity, e.g. digoxin, ethylene glycol, lithium, methanol and salicylates. Further information is available from TOXBASE® and NPIS.

EMERGENCY INVESTIGATIONS

- See table for suggested investigations
- Perform arterial blood gas if airway is compromised, hypoventilation or metabolic acidosis is suspected. Carboxyhaemoglobin should also be measured in cases of suspected carbon monoxide poisoning.
- Chest X-ray should be performed if the patient is persistently hypoxic or after inhalational exposure.

- Paracetamol and salicylate concentrations should be measured if there is suspected ingestion of either, or the ingested drugs are unknown. The timing of sample collection is important.
- Plasma concentrations of certain other drugs can be helpful, e.g. carbamazepine, digoxin, iron, lithium, phenytoin, theophylline and thyroxine.
- In cases of severe unexplained metabolic acidosis after suspected overdose, consider measurement of aspirin, ethanol, methanol and ethylene glycol concentrations, and check CK (discuss with local laboratory).

A GUIDE TO OBSERVATIONS AND INVESTIGATIONS FOR THE PATIENT WITH ACUTE POISONING

Drug	At risk of	U&Es	LFTs	INR	CK	ABG	Drug level	12-lead ECG	Cardiac monitor	Detected in TOX screen?	Comment
Amphetamine /ecstasy	Hyperpyrexia	✔	✔		✔			✔	✔	✔	
Antihistamine	ECG changes	✔						✔	✔		
Antipsychotic	↓BP, ECG changes	✔	✔		✔			✔	✔		Check CK if ↑temp
Aspirin	Acid-base disturbance	✔				✔ if severe	✔				Level at 2 and/or 4 hours
Benzodiazepine	↓GCS, ↓BP, ↓respiration	✔								✔	
Beta-blocker Calcium channel blocker	↓HR, ↓BP ↓HR, ↓BP, arrhythmia	✔ ✔						✔ ✔	✔ ✔		
Carbamazepine	Ataxia, ↓GCS, ECG changes	✔	✔				✔	✔			Level not normally urgent
Cocaine	↑BP, MI	✔			✔			✔	✔	✔	
Iron	GI bleeding, acidosis	✔	✔	✔			✔				Level at 4 hours
Lithium	↓BP, arrhythmia	✔					✔	✔	✔		Level immediately & at 6 hrs (not in Lithium sample tube)
NSAIDs	Renal failure	✔									
Opiates	↓GCS, ↓BP, ↓respiration	✔						✔	✔	✔	
Paracetamol 0-8 h	Hepatic and renal failure	✔					✔				Level at 4 hours
Paracetamol 8-24 h	Hepatic and renal failure	✔	✔	✔			✔				Level ASAP
Paracetamol >24 h	Hepatic and renal failure	✔	✔	✔			✔				
Phenytoin	Ataxia, ↓GCS, ECG changes	✔					✔	✔			Level not normally urgent
Sodium valproate	↓BP, renal failure	✔		✔			✔ if severe				Level not normally urgent
SSRI antidepressants	↑temp, ↑HR	✔		✔				✔	✔		ok if symptomatic
TCA antidepressants	↑HR, arrhythmia, seizures	✔						✔	✔		ok if symptomatic

Paracetamol

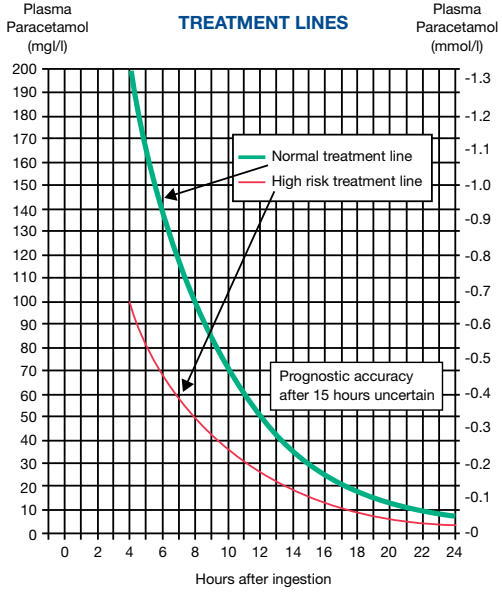
Early features: usually none

Late features: nausea, vomiting

Toxicity: Ingestion of >150 mg/kg (or >12g) or >75 mg/kg in a high-risk patient may be fatal or cause severe toxicity

PRESENTATION WITHIN 8 HOURS OF INGESTION

- Give activated charcoal if >150 mg/kg ingested within 1 hour
- Measure paracetamol concentration at 4 hours. There is no point in measuring the concentration before this.
- Use paracetamol nomogram (shown below) to determine need for treatment. Remember to check if patients have any risk factors.
- If paracetamol level is above treatment line, give N-acetylcysteine (NAC). Normally, N-acetylcysteine should not be given until paracetamol levels known.



HIGH RISK FACTORS

A number of factors increase the risk of toxicity after paracetamol ingestion, either because they are associated with hepatic enzyme induction (more rapid formation of toxic metabolite), or glutathione depletion (inability to detoxify toxic metabolite):

- Carbamazepine
- Phenobarbitone
- Phenytoin
- Primidone
- Rifampicin
- St John's Wort
- Regular alcohol excess
- Malnutrition (e.g. recent fasting, eating disorders, cystic fibrosis, AIDS)

N-ACETYLCYSTEINE (NAC)

- Treatment is most effective if started within 8 hours of ingestion.

Adult dosing schedule for N-acetylcysteine:

- 150mg/kg IV in 200mls 5% dextrose over 15 minutes, then:
- 50mk/kg IV in 500mls 5% dextrose over 4 hours, then:
- 100 mg/kg in 1000mls 5% dextrose over 16 hours

Note : dose based on maximum weight of 110kg

ANAPHYLACTOID REACTIONS TO N-ACETYLCYSTEINE

- A histamine-mediated reaction occurs in 10% of patients, usually within 30 min: features include flushing, vomiting, rash, and rarely bronchospasm and hypotension. True anaphylaxis does not occur. Anaphylactic reactions are more likely to occur in patients with a history of asthma.
- Infusion should be stopped, and symptoms often subside within 20-30 minutes. In some cases, antihistamines may be needed (e.g. IV chlorphenamine 10-20 mg). Occasionally, bronchodilators are required (e.g. nebulised salbutamol 5 mg) and, rarely, IM adrenaline and IV hydrocortisone are required for severe hypotension. See chapter 2.
- When symptoms have resolved the NAC infusion should be recommenced at 50% of the normal administration rate.
- Reactions to NAC do not necessarily recur. Therefore, the normal

treatment schedule should be used even if patients have a history of a reaction to a previous N-acetylcysteine infusion.

PRESENTATION 8-15 HOURS POST INGESTION

- If >150 mg/kg (or >12g) or >75 mg/kg in a high risk patient has been ingested start N-acetylcysteine immediately (see Adult Dosing Schedule above)
- Check FBC, U&Es, LFTs and prothrombin time (INR) and paracetamol concentration
- If paracetamol concentration is below treatment line, blood tests are all normal and the patient is asymptomatic discontinue NAC. Otherwise continue with the normal infusion protocol.

PRESENTATION 15 –24 HOURS

Patients presenting late are at greatest risk of developing liver damage.

- If >150 mg/kg (or >12g) or >75 mg/kg in a high risk patient has been ingested start N-acetylcysteine immediately
- Check FBC, U&Es, LFTs and prothrombin time (INR) and paracetamol concentration
- The paracetamol concentration is less reliable at this time, and the presence of an elevated prothrombin time and ALT are better markers of possible liver damage
- If paracetamol is below treatment line, blood tests are all normal and the patient is asymptomatic, N-acetylcysteine can be discontinued. Otherwise continue with the normal infusion protocol.

PRESENTATION >24 HOURS

Patients presenting late are at greatest risk of developing liver damage.

- Check FBC, U&Es, LFTs and prothrombin time (INR)
- If investigations are normal, and the patient is asymptomatic no further medical treatment is required
- If abnormal give N-acetylcysteine
- Patients require frequent monitoring of U&Es (including bicarbonate), LFTs, INR, lactate and glucose
- Progressively rising INR and ALT, metabolic acidosis, renal

impairment, hypoglycaemia and hepatic encephalopathy are poor prognostic indicators and the patient should be discussed with the NPIS and on-call gastroenterology/ liver team (via switchboard RIE).

STAGGERED OVERDOSE

- The nomogram is unreliable in patients that have taken a staggered overdose. Plasma concentrations will confirm ingestion but cannot be used to determine the need for treatment.
- If >150 mg/kg (or >12g) or >75 mg/kg in a high risk patient has been ingested within a 24-hour period, then N-acetylcysteine infusion should be given
- Check FBC, U&Es, LFTs and prothrombin time (INR)
- If repeat blood tests are normal 24-hours after ingestion of the last tablets, and the patient is asymptomatic, then N-acetylcysteine can be discontinued

COMPLETION OF N-ACETYLCYSTEINE

- Check U&Es, ALT and prothrombin time (INR) at the end of the infusion.
- If ALT and creatinine are normal, and INR $\leq$1.3, then the patient can be discharged after appropriate psychiatric review **(N.B. N-acetylcysteine directly causes a small rise in INR that is not related to liver function)**.
- If ALT or creatinine are abnormally high, or INR >1.3, or there is metabolic acidosis, then N-acetylcysteine should be continued at 150 mg/kg over 24 hours. Coagulation and LFTs should be checked every 8-12 hours. When there is a sustained improvement the N-acetylcysteine can be discontinued.
- In a small number of cases, INR and ALT continue to rise despite N-acetylcysteine therapy. Patients may develop liver failure, renal failure, hypoglycaemia and metabolic acidosis. These patients may need consideration for liver transplant, and should be discussed with senior staff urgently.

BENZODIAZEPINES

Features

Drowsiness, hypotension, coma and respiratory depression. Toxicity is worse when co-ingested with alcohol or other CNS depressants, e.g. opioids.

Toxicity

Serious toxicity from pure benzodiazepines is uncommon

Management

- Consider need for gut decontamination if present within 1 hour of ingestion
- If significantly reduced conscious level or respiratory depression, then call 2222 for urgent endotracheal intubation and ventilatory support in a critical care area
- Flumazenil (Anexate®), a benzodiazepine antagonist, may be used if immediate access to critical care is not available. It has a short half-life (around 1 hour) and can provoke seizures, especially in patients with:
  1. Pre-existing epilepsy
  2. Benzodiazepine-dependence
  3. Mixed overdose, particularly common after tricyclic antidepressants

i FLUMAZENIL should not be used as a 'diagnostic test'.

SALICYLATES

Features

Vomiting, tinnitus, deafness. In severe cases confusion, seizures, metabolic acidosis, pulmonary oedema and coma may occur.

Toxicity

Likely if >250 mg/kg ingested; >500 mg/kg can cause severe toxicity/death.

Management

- Give activated charcoal if >120 mg/kg ingested less than 1 hour ago.
- It can take several hours to reach peak plasma concentrations. Salicylate concentrations should be checked in patients who have ingested >120 mg/kg.
- In symptomatic patients: check at 2 hours post-ingestion, then repeat after further 2 hours in case of on-going drug absorption.
- In asymptomatic patients: check at 4 hours post-ingestion.
- In patients with features of toxicity, a repeat level should be checked in case of prolonged drug absorption, and repeated until levels are falling.
- Poisoning severity is indicated by plasma salicylate concentrations taken together with clinical and biochemical

features. Concentrations >350 mg/l (2.5 mmol/l) are associated with toxicity, and concentrations >700 mg/l (5.1 mmol/l) are associated with severe toxicity and may be fatal. Confusion, impaired consciousness, metabolic acidosis and high salicylate concentrations all indicate severe poisoning.

- Check U&Es, prothrombin time (INR) and blood glucose. If serum potassium is low this must be corrected first. After correction of serum potassium, metabolic acidosis should be corrected with IV sodium bicarbonate.
- If salicylate >500 mg/l, then IV 8.4% sodium bicarbonate 225ml should be administered over 1 hour to enhance salicylate clearance. This should be repeated as necessary to obtain optimal urine pH 7.5-8.5. It is important to monitor electrolytes and acid-base status closely (particularly to avoid hypokalaemia).
- Patients with plasma salicylate level >700 mg/l, those with renal failure, severe metabolic acidosis, pulmonary oedema or CNS toxicity should be considered for haemodialysis (discuss with NPIS for further information).

ANTIDEPRESSANTS

Features

- **Tricyclic antidepressants (TCAs)** e.g amitriptyline, dosulepin Tachycardia, dilated pupils, urinary retention, hyperreflexia, divergent squint, hypotension, seizures, coma, arrhythmias, prolonged QRS duration, metabolic acidosis.
- **Selective serotonin reuptake inhibitors (SSRIs)** e.g. paroxetine, sertraline. Nausea, vomiting, tremor, prolonged QTc, serotonergic syndromes.
- **Selective norepinephrine reuptake inhibitors (SNRIs)** e.g. venlafaxine. Tachycardia, tremor, agitation, prolonged QRS and QTc duration, arrhythmia, seizures, coma.
- **Mirtazapine**. Drowsiness, nausea, vomiting.

Toxicity

- In general the most toxic in overdose are venlafaxine and tricyclics (particularly dosulepin) due to the risk of seizures and arrhythmia.
- Toxicity greatest when two or more antidepressants taken together.

Management

- Consider activated charcoal if within 1 hour of ingestion.
- Organise early intubation and intensive care admission if reduced

conscious level.

- Correct electrolyte or acid-base disturbance, ensure adequate hydration.
- Perform ECG and monitor cardiac rhythm.
- If QRS >120 ms after TCA overdose, administer IV 8.4% sodium bicarbonate 50 ml (=50 mmol) via central or large peripheral vein, even in the absence of acidosis, to reduce risk of arrhythmia and seizure. Repeat as necessary.
- Arrhythmias are best treated by correction of hypoxia and acidosis (metabolic and respiratory). Torsade de pointes should be treated with IV magnesium sulphate 8-10 mmol over 1-2 minutes. Consult TOXBASE® or contact NPIS for further advice.
- Treat seizures with IV lorazepam (2-4 mg) or diazepam 10-20mg; repeated doses may be required.
- Serotonin syndrome may occur after ingestion of 2 or more drugs with serotonergic effects e.g. TCAs, SSRIs, monoamine oxidase inhibitors, tramadol. Features include alteration of mental status, neuromuscular hyperactivity and autonomic instability. If suspected, monitor temperature and check serum creatinine kinase (CK). Discuss management with NPIS.

OPIOIDS

For example codeine, diamorphine, dihydrocodeine, fentanyl, methadone, morphine, pethidine, tramadol.

Features

Reduced conscious level, respiratory depression, pinpoint pupils and hypotension. **(N.B. opioids and their active metabolites accumulate in patients with renal impairment: opioid toxicity should be suspected in any patient with unexplained type-2 respiratory failure)**

Management

- ABCDE as Chapter 2.
- Monitor respiratory rate and ensure adequate airway and support ventilation.
- If reduced conscious level or respiratory depression, then administer IV naloxone 0.4-2.0 mg: repeat the dose if inadequate response after 2 minutes.
- Naloxone (Narcan®) is a competitive antagonist and large doses (>4 mg = 10 ampoules) may be required in severe cases.
- Naloxone can be administered by the IM route if IV access is not possible, or if the patient is threatening to self-discharge when its effects might be more prolonged.

The plasma half-life of naloxone is shorter than that of most opioids, so repeated doses are often required. This is especially true of long-acting opiates (e.g. MST or methadone), where a naloxone infusion might be needed.

- Naloxone infusion is usually started at around 60% of the initial dose per hour. A solution containing 5 mg (12.5 ampoules) reconstituted in 25 mls dextrose gives a 200 micrograms/ml solution for IV infusion via a syringe driver.
- Measure U&Es and CK. **N.B. patients who have reduced conscious level are at high risk of rhabdomyolysis, pressure injuries and compartment syndromes.**

RECREATIONAL DRUGS

Features

- Stimulants such as MDMA (ecstasy), amphetamines, cocaine, lysergic acid diethylamide (LSD) may cause severe agitation, tachycardia, sweating, pyrexia, dilated pupils, hypertension, arrhythmia and seizures. Severe cases result in coma, rhabdomyolysis, renal failure, subarchnoid haemorrhage, myocardial infarction, refractory seizures and death.

Specific features

- Cocaine also causes coronary artery spasm, myocardial ischaemia and infarction and aortic dissection.
- Ecstasy may cause severe hyponatraemia.
- Gamma hydroxybutyrate (GHB) may cause bradycardia, hypotension, reduced conscious level and coma and may be associated with severe withdrawal symptoms.

Management

- Measure U&Es, LFTs and CK.
- Perform ECG and monitor cardiac rhythm.
- Control agitation and seizures with diazepam. Large doses and repeated administration may be required.
- Hypertension usually settles after administration of diazepam. If hypertension persists despite diazepam, then consider intravenous nitrates (e.g. glyceryl trinitrate 1-2 mg/hour) and gradually increase the dose until blood pressure is controlled.
- Treat cocaine induced chest pain and ECG changes with aspirin, diazapem and nitrates.
- Tachycardia usually responds well to adequate sedation and control of agitation, and specific therapy is not normally needed.

- Correct metabolic acidosis with sodium bicarbonate.
- Hyperthermia should be treated with passive cooling and sedation with intravenous diazepam (large doses may be required). However, when body temperatures exceed 40ºC, then more active cooling is preferable, and the patient should be transferred to a critical care area.

Chapter 11

ACUTE RHEUMATOLOGY

ACUTE MONO OR OLIGOARTHRITIS

Commonest causes are summarised by the abbreviation GRASP. Acute arthritis in ≥ 1 joint should be considered to be sepsis until proven otherwise.

- Every effort should be made to aspirate involved joints, involving on-site orthopaedic teams/radiology for ultrasound guided aspiration if necessary.
- It is imperative to send blood cultures on admission.
- Once aspirates and blood cultures are sent, empirical IV antibiotics (see below) should be commenced. Err on side of diagnosis of sepsis until proven otherwise.

GOUT

- 1st MTPJ > ankle > knee > upper limb: tophi.
- Middle age to elderly.
- Men > women.
- Polyarticular in 10%.
- Can mimic sepsis: see above.
- Atypical subacute onset in hands in elderly women with renal impairment on diuretics.
- History of previous attacks, alcohol or diuretic intake, obesity, renal disease.
- Family history.

REACTIVE ARTHRITIS

- Young male > female.
- Large joint, lower limb: usually more than one.
- Can mimic sepsis: see above.
- History must include GI, Genito-urinary and sexual information.
- Balanitis, keratoderma blenorrhagicum, nail changes.
- Conjunctivitis, iritis.

SEPSIS

- Any age, any joint, may be more than one joint.
- General symptoms: malaise, fever.
- Skin infection may be seen e.g. pustules, boils.
- *Staphylococcus aureus* is most common organism in adults.
- Is there reduced immunity? e.g. Rheumatoid arthritis, steroids, NSAID, liver or renal disease.
- Gonococcal athritis should be considered in young adults. Patients are usually female with polyarticular disease. There may be no clinical evidence of concurrent STD.

PSEUDOGOUT

- Middle aged or elderly.
- Knee or wrist.
- Can mimic gout/sepsis.
- Previous attacks likely.
- May have chondrocalcinosis on x-ray.

OTHER CAUSES

Other causes include: haemarthrosis, monoarticular presentation of polyarticular disease, mechanical.

INVESTIGATIONS

For All

Every effort should be taken to aspirate involved joints: Involve on-site orthopaedic teams/radiology for ultrasound guided aspiration if necessary.

- Record colour, viscosity and turbidity.
- Microscopy for cell count, differential and Gram stain (Microbiology); polarising microscopy for crystals (Histopathology lab).
- Culture.
- Blood cultures x3.
- FBC and diff, ESR and CRP.
- X-ray joint on admission.

Selective Investigations

- Gout: serum urate (but a poor discriminator).

- Reactive: stool for Salmonella, Campylobacter, Shigella,Yersinia.
- STDs: endocervical swab or first pass urine for chlamydia. Endocervical, urethral, rectal and throat swabs (as applicable on history) for culture for gonococcus.
- Yersinia serology (if stool culture negative).
- Serology in polyarthralgia: parvovirus, ASOT, mycoplasma. Consider also, if possible exposure history, Lyme.

MANAGEMENT

Seek rheumatological advice early in suspected septic or reactive arthritis via WGH switchboard.

If gonorrhoea confirmed, contact tracing should be arranged via Genito Urinary Medicine.

GUM do not contact trace for chlamydia: arrange yourself or via patient's GP.

Analgesia

- Paracetamol
- NSAIDs
- Others

In cases with infected joint prosthesis obtain specialist Orthopaedic or Rheumatological advice.

Gout

- Bed rest plus high dose indometacin (indomethacin) 50mg qds oral or alternative NSAID e.g. diclofenac 50mg oral bd to maximum dose. Colchicine (0.5 mg oral od-tds depending on tolerance) is useful in patients in whom NSAIDs are contraindicated (e.g. renal failure, allergy, GI complications). Should be used under expert supervision. Leave 3 clear days between courses, halve dose if creatinine clearance <10ml/min.
- Intra-articular steroid may be used in difficult cases: consult Rheumatologist.
- Do not use allopurinol until attack has settled for at least 2 weeks and only introduce with NSAID or colchicine (0.5mg bd) cover.

Adjust dose of allopurinol if renal function impaired: normal renal function 300mg od oral, creatinine clearance 30-60ml/min 200mg od oral, creatinine clearance <30ml/min 100mg od oral.

Reactive Arthritis

- Bed rest plus NSAID in adequate dose +/- intra-articular steroid. Treat associated/triggering infection. If active arthritis persists consult Rheumatologist.

Septic Arthritis

- Rest joint in appropriate position.
- Antibiotic therapy

  a) First line therapy: flucloxacillin 2 g iv 6 hourly

  b) In circumstances where there is increased likelihood of Gram negative infection (chronic or acute urinary tract infection, chronic prostate symptoms, recent intra-abdominal surgery)
  use flucloxacillin 2 g iv 6 hourly plus ciprofloxacin 500mg oral bd
  (ciprofloxacin 400mg iv bd if unable to take oral).

  c) Seek Microbiological advice if suspected (risk factors present) MRSA or confirmed MRSA positive.
- Treatment will vary locally e.g. Orthopaedic patients may be different to others. Discuss with rheumatologist/orthopaedic surgeon and specialist microbiologist.
- Once cultures available treat according to sensitivities and on microbiology advice.
- Duration of antibiotic therapy: minimum of 2 weeks IV, then prolonged oral or IV therapy depending on whether prosthetic joint, whether patient immunosuppressed and pathogen. Seek specialist advice (from Rheumatology/ID/Microbiology).

Pseudo-gout

- Bed rest, joint aspiration, single injection of intra-articular steroid usually sufficient. NSAID may be used.

Chapter 12

PSYCHOLOGICAL MEDICINE

ALCOHOL

PRESENTATION

- Acute intoxication.
- Withdrawal "DT's" see below.
- Seizures: withdrawal or intoxication, or hypoglycaemia.
- Associated problem e.g. pneumonia, rhabdomyolysis.
- Incidental e.g. admission for unrelated problem.

MANAGEMENT

- Check plasma alcohol level, FBC, U&E's, glucose, LFT's, clotting, and other tests indicated e.g. amylase if abdominal pain.
- Start thiamine 300mg od oral.
- **Pabrinex** may be required if NBM, actual or incipient Wernicke's encephalopathy or Korsakoff's psychosis (see below).
- Indications for Pabrinex or those at risk of Wernicke-Korsakov syndrome ie those with alcohol dependence and diarrhoea, vomiting, other physical illness, weight loss, poor diet.
  Signs of possible Wernicke-Korsakov syndrome:
  - Acute confusion
  - Reduced conscious level
  - Memory problems
  - Ataxia
  - Ophthalmoplegia
  - Hypoglycaemia
- **Pabrinex** IVHP (No1 and No2 mixed) by IV infusion in 100ml 5% dextrose over 30mins then 8 hourly for 48 hours.
  N.B. Risk of anaphylaxis - facilities for treating this must be readily available.
- **Alcohol withdrawal management** guidelines are detailed below and updates are available on the Intranet.
- Never prescribe hypnotics as discharge drugs.

High dependency or intensive care and nursing observation is required with IV sedatives.

- Treat any associated problems. Screen for infection including CXR.

N.B. Remember spontaneous bacterial peritonitis and tap any ascites and send for culture (in blood culture bottles), and urgent Gram stain and cell count, WCC (>250 per microlitre suggestive of SBP). Check cytology on ascitic tap.

- Consider a referral to the liaison psychiatrist/alcohol dependence team/social worker.

NOTE

- Myelo-suppression, with a reduced platelet count is not uncommon, as is folate deficiency.
- In chronic pancreatitis the amylase may be normal. A raised CRP is the best guide.
- TB is more common in alcoholics. Request AFB's on sputum sample x3 (preferably early morning).
- Don't assume alcohol is responsible for a fit. Could the patient have meningitis, or intra-cerebral pathology following a fall?
- Check for hypoglycaemia.
- Encephalopathic patients may have flap, ↓ LOC, signs of chronic liver disease. Distinguish from DT's (tremor, restlessness).
- Common precipitating causes of encephalopathy are infection, GI bleed, electrolyte disturbance, constipation.
- Withdrawal may occur two to three days after hospitalization.

MANAGEMENT OF ALCOHOL WITHDRAWAL

Alcohol dependence and withdrawal are associated with significant morbidity and mortality. People who admit to drinking more than 10 units a day are likely to have withdrawal symptoms. Delirium tremens is rare at a consumption of less than 15 units per day. Hypoglycaemia, hypokalemia, hypocalcaemia and fever may predispose patients to seizures or delirium tremens.

INITIAL ASSESSMENT

History

Ask the patient 'Do you take a drink sometimes?' or 'What have you had to drink in the last week?' Make a note of alcohol consumption in units wherever possible. If you suspect alcohol dependence ask 'have you experienced tremor or shakiness in the morning - and taken a drink to relieve this?' Ask when they last had a drink. Try to take a history from an informant if the patient is unable to co-operate.

Examination

Look for excessive capillarisation of the conjunctivae or facial skin, palmar erythema, and alcohol on the breath.

Key investigations: alcohol level or breathalyser, Gamma GT and liver function tests, MCV.

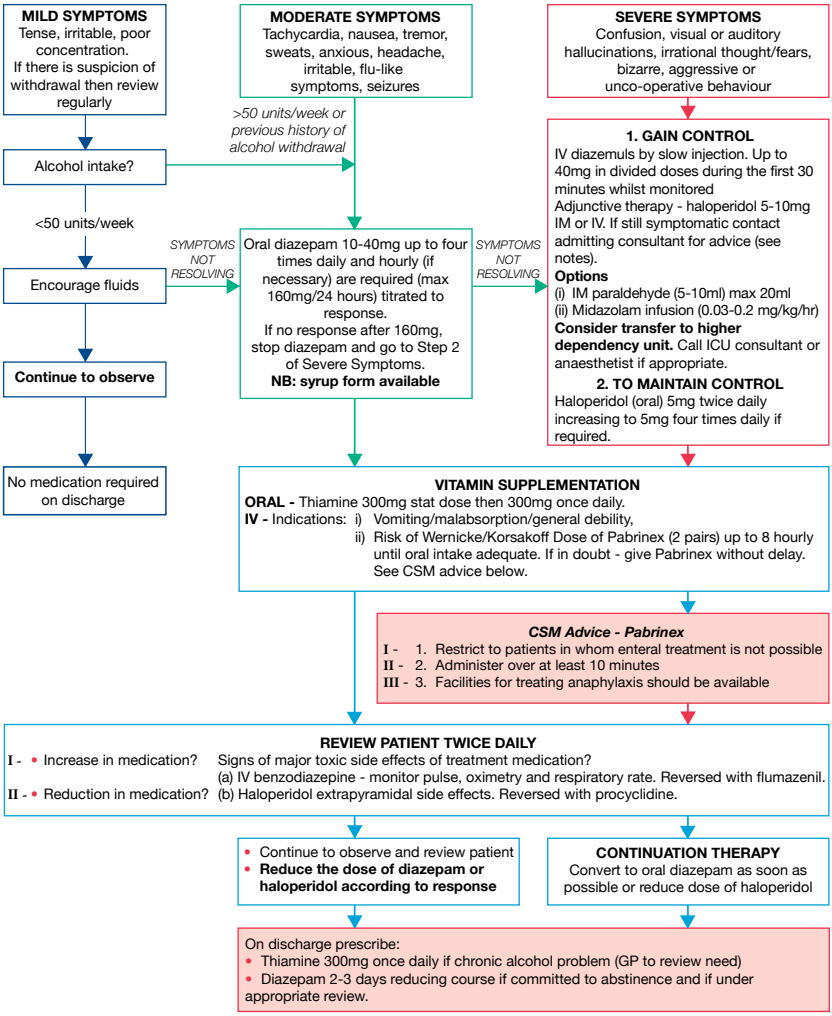
Guidelines for Continuing Care

- Nurse in good lighting, a cool ambient temperature with good ventilation and supportive staff. Augment psychosocial and alcohol history.
- Perform a detailed physical examination looking for the stigmata of alcohol abuse.
- Feed back diagnosis to the patient, with the results of tests, in an open, but helpful manner.
- Abstinence should be advised if there is alcohol dependence with physical damage.
- Follow up should be arranged to aid this. Possibilities include: their GP, the Department of Psychological Medicine at the Western General, Social Work department, the Alcohol Problems Clinic at the Royal Edinburgh Hospital, Alcoholics Anonymous, Lothian Council on Alcoholism. In any event, always inform the GP by letter.

ALCOHOL WITHDRAWAL MANAGEMENT

Ensure patients are cared for in a well-ventilated, adequately lit, quiet area

PRESCRIBING GUIDELINE



SPECIAL NOTES

1. **Dose with caution in the elderly.**
2. **Thiamine/Pabrinex should always be given before the administration of dextrose fluids to avoid precipitating Wernicke Syndrome.**
3. Reality orientation and reassurance is encouraged.
4. Transfer patients to oral medication as soon as possible.
5. For complicated cases or cases that are difficult to control seek specialist advice:
   At RIE - consult Psychiatric Team, Medical Registrar/Consult on call at RIE or the duty psychiatrist (REH).
   At WGH - consult consultant on-call or in charge.
   At SJH - contact Psychiatry SHO on-call, radio page via switchboard.
6. For follow up contact the Alcohol Liaison Service, RIE ext 21396, WGH contact ext 31834.
7. These guidelines may not be appropriate in the peri-operative period.

Strengths/Preparations available:
Diazepam tablets 2mg, 5mg, 10mg
Diazepam syrup 2mg/5ml, 5mg/5ml
Diazepam injection 5mg/ml
Haloperidol ampoule(s) 20mg/2ml
Haloperidol capsule(s) 500mcg
Haloperidol liquid 2mg/ml

Consider referral to Intensive Care if requiring more sedation.

ALCOHOL LIAISON SERVICE

The service operates at the **Royal Infirmary Monday to Friday 09:00-17:00**.

Direct referral should be made by telephone to extension 21396/21398 or by bleeping **Sr Leslie (#6426)**.

If patients are admitted and discharged over a weekend, referrals can be made via the service answerphone (as above) or complete a weekend referral form kept in doctors' rooms in CAA.

The following details are required when making a referral:

Referrer
Patient name
Address
DOB
Reason for admission

PATIENT'S PERMISSION MUST BE SOUGHT PRIOR TO REFERRAL

N.B. For patients to be seen promptly, referrals must be made as early in the day as possible. Where possible, a same day service is offered.

There is currently no alcohol liaison service at the WGH. Referrals from the WGH should go either to psychiatry or the Alcohol Problem Service at the Royal Edinburgh Hospital.

St John's: radiopage via switchboard

Alcohol Withdrawal Seizures

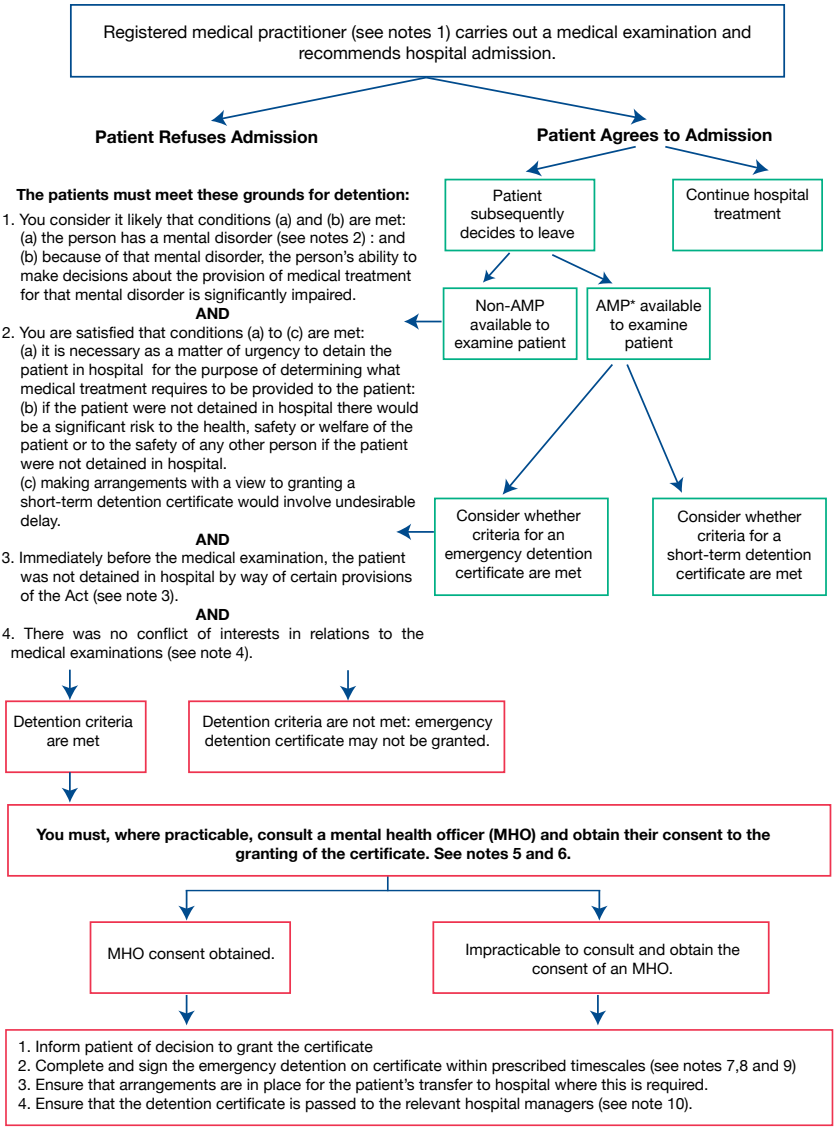
Initial treatment with 10mgs diazepam (as Diazemuls) by intravenous injection over two minutes may be given. Status epilepticus should be treated according to the guidelines.

Fluid and Electrolyte Balance

Examine for features of fluid depletion and check U&Es. Oral fluid intake of 2-2.5 litres per day should be given. Intravenous replacement of fluid and electrolytes may be required; potassium and magnesium supplementation should be tailored according to blood chemistry. Hypoglycaemia should be excluded by blood sugar measurements and treated accordingly.

Vitamin Supplementation: see above.

Guide for medical practitioners on the granting of an emergency detention certificate under section 36 of the Mental Health (Care and Treatment) (Scotland) Act 2003.



Throughout the process of granting an emergency detention certificates, you are bound to have regard to the principles of the legislation as laid out in sections 1 to 3 of the Act.

*AMP: approved medical practitioner

If considering detaining a patient seek advice from Dept Psychological Medicine WGH/RIE/SJH in office hours and psychiatrist will see patient if practical. OOH advice from REH ext 7600.

Note 1: Any registered medical practitioner may grant an emergency detention certificate. You do not have to be an approved medical practitioner.

Note 2: Section 328(1) of the Act defines "mental disorder" as "mental illness, personality disorder or learning disability, however caused or manifested". Section 328(1) further states that a person is not mentally disordered by reason only of sexual orientation, sexual deviancy: trans-sexualism: transvestism: dependence on, or use of alcohol or drugs: behaviour that causes, or likely to cause harassment, alarm or distress to an other person: or acting as no prudent person would act.

Note 3: The relevant provisions are set out at section 36(2) of the Act and they are: an emergency detention certificate: a short-term detention certificate: an extension certificate issued under section 47 of the Act pending an application for a CTO: section 68 of the Act (i.e. the extension to the detention period authorised once a CTO application has been submitted to the Tribunal): a certificate granted under sections 114(2) or 115(2) of the Act (i.e. a certificate issued subsequent to a patients non-compliance with the terms of a community-based interim CTO or a CTO).

Note 4: conflict of interest is not specifically defined. Good practice would recommend not being involved in the detention of a relative or colleague if avoidable.

Note 5: The medical practitioner must consult and seek the consent of an MHO to the granting of the certificate. All reasonable efforts should be made to contact a MHO. However, where the urgency of the situation is so great that it would not be practible for this consultation to take place then it is permissible for the practitioner to grant the EDC without consent.

Note 6: if one MHO refuses consent seek psychiatric advice. May be possible to consult second MHO.

Note 7: A valid emergency detention certificate can be issued on any document if form is not available. However, it is strongly recommended that form be used in all circumstances available via NHS Lothian intranet or at **http://www.scotland.gov.uk/Topics/Health/health/mental-health/mhlaw/mha-Forms**. If form is not used, the emergency

detention certificate must state the practitioner's reasons for believing the conditions mentioned at points 1 and 2 on the blue box overleaf to be met and must be signed by the medical practitioner.

Note 8: The emergency detention certificate must be completed either by the end of the day on which the medical examination takes place (if the examination takes place before 8pm) or within 4 hours of the medical examination being completed (if it takes place after 8pm).

Note 9: The emergency detention certificate authorises first the patient's transfer to hospital within 72 hours of the certificate being granted:and secondly, the patient's detention in hospital for 72 hours.

Note 10: Section 36(7) of the Act states that the patient's detention in hospital is only authorised if the emergency detention certificate is given to the managers of the hospital before the patient is admitted to hospital under the authority of the certificate. If the patient is already in hospital when the certificate is granted, then the certificate must be given to the hospital managers as soon as practicable after it was granted.

Practical arrangements for 3 sites - in WGH duty nurse manager must be informed and the detention forms must be taken to Jackie Graham's office in Med Records. Arrangements in RIE, SJH duty nurse manager to be informed and detention forms to be taken to Ms Mags Smith, ext 23052.

The purpose of the above information is to act as a guide only. It does not provide full and comprehensive coverage of everything you ought to know about emergency detentions. For fuller information please consult the Act and its Code of Practice.

OBTAINING INFORMED CONSENT POLICY/PROCEDURE

Care for patients in general as well as psychiatric hospital settings.

This is the commonest problem area that is covered by the Adults with Incapacity Act. However, other areas such as the inability to manage money or to agree to discharge arrangements may be important, please see page 21 of the handbook.

Frequently asked questions and answers

Q1 Why use the Mental Health Act in general hospital?
A1 If someone with a mental disorder is at risk of self-harm, self-neglect or of harming others they may be prevented from leaving hospital by

use of the Act. Sometimes the Act is used to authorise restraint of a violent person. Authorisation of compulsory treatment for mental illness may occasionally be required.

Q2 Who could be detained?

A2 Someone who has a mental disorder and impaired judgement about the treatment of that disorder could be detained on a short-term detention certificate (STDC). If using a STDC would involve 'undesirable delay' an emergency detention certificate (EDC) may be used. Detention may be necessary to allow for full assessment of suicidal intent. Violent behaviour is not a mental disorder but may be a sign of underlying mental disorder such as mania or schizophrenia. Similarly, violence associated with drug or alcohol intoxification or dependence is not a mental disorder but delirium or a confusional state may result from drug or alcohol withdrawal and may justify detention. Psychotic illnesses may result from drug or alcohol use. Intoxication may increase the risk of harm to self or others and this should be taken into account when considering the detention of someone with an underlying mental disorder.

Q3 How can someone be detained under the Mental Health Act?

A3 Only a senior psychiatrist, who is an Approved Medical Practitioner, can grant a STDC, which is effective for up to 28 days. The consent of a specialised social worker (Mental Health Officer/MHO) is required. An AMP may not be available out of hours in smaller hospitals. A fully registered medical practitioner can grant an EDC, normally with the consent of an MHO. If it is impossible to consult the MHO consent can be dispensed with. Under the previous Mental Health Act 1984 a relative could give consent, but this is no longer permitted. An EDC may be justified when detention in hospital is needed urgently in order to assess the need for treatment and where this is a risk to the person's health, safety or welfare or the safety of others. A form called DET1 will need to be completed. Forms can be downloaded from the Scottish Executive website **http://www.scotland.gov.uk/Topics/Health/health/mental-health/mhlaw/mha-Forms**. The form must be passed to the Medical Records Department after completion for it to take effect. It should not be filed in case notes.

Q4 What measures are authorised by an EDC?

A4 If the person is not an inpatient, admission to hospital is authorised (within 72 hours) and detention in hospital is then authorised for up to 72 hours. A person in an Accident and Emergency department is not usually an inpatient and an EDC will not usually authorise detention of

a person there. Under an EDC, treatment for mental disorder may be given if the person is able to consent and does so. Without consent, only urgent treatment may be given. There are some restrictions on the type of treatment that may be given e.g. treatment that entails significant physical hazard may not be given. The Mental Welfare Commission must be informed within 7 days, using form T4.

Q5 When does an EDC end?

A5 A person who is subject to an EDC should be assessed by an Approved Medical Practitioner as soon as possible. Normally the EDC will be rescinded and the person will either become informal or made subject to a STDC. An EDC should not usually remain in force for the full 72 hours. Occasionally a person may need to leave hospital temporarily during the period of detention. The EDC can be suspended by the doctor in charge of the patient's care, the Responsible Medical Officer.

Q6 What measures are authorised by a STDC?

A6 Compulsory treatment for a mental disorder is authorised in addition to detention. Treatment can be given without the patient's consent but with reference to the principles.

Q7 What is a Compulsory Treatment Order?

A7 This is a long-term order, with provisions similar to a STDC. Compulsory treatment under these orders can be given in hospital or in the community. A Compulsion Order is similar but is granted by a court. Occasionally patients subject to these orders are admitted to general hospital for treatment of a physical condition. A psychiatrist (AMP) must be responsible for mental health care. Liaison between the relevant psychiatric and general medical records departments is essential to ensure that the necessary legal arrangements are made to allow the patient to be admitted to the general hospital. If the psychiatric unit is in the same hospital, no special arrangements are necessary. *There is no requirement under the Act that such patients should be cared for by mental health nurses but local arrangements may be made if this is appropriate.*

Q8 Who is responsible for the patient's treatment under a compulsory order?

A8 Hospital managers must appoint an AMP to be the patient's Responsible Medical Officer. He or she is responsible for the patient's mental health care on the general ward but responsibility for the treatment of the patient's physical disorder remains with the appropriate physician or surgeon. If the patient's detention has been suspended, the psychiatric hospital is still responsible for appointing

an AMP. However, if the patient's order has been transferred to the general hospital, its managers are responsible for appointing the AMP. There should be clear arrangements for liaison between the AMP and the medical/surgical team.

Q9 Can treatment for a physical condition be given without consent?

A9 The Mental Health (Care & Treatment) Scotland Act authorises treatment for mental disorder or for conditions that are a consequence of mental disorder of patients detained on Short Term or Continuing Treatments only. Treatment of conditions that are a direct cause of mental disorder, such as infection causing delirium, is authorised, as is treatment of conditions directly resulting from mental disorder, such as self-poisoning resulting from a depressive illness. Artificial feeding of a person with anorexia nervosa or severe depression may be authorised by the Act although a second opinion is required.

Where a person is unable to consent to treatment because of mental disorder, treatment can be authorised under the Adults with Incapacity Act by completing a Section 47 certificate, providing that person does not object or resist. In an emergency, if a person objects or resists, treatment can be given under common law, but the AWIA procedure should be used if time allows.

Another person may by authorised to give consent under AWIA. This may be through Power of Attorney, an intervention Order or Welfare Guardianship. The consent of the person delegated to make a decision should always be sought whenever practicable. Occasionally consent may be withheld. The AWIA includes arrangements to resolve such disputes, including a second opinion procedure.

Where treatment is not urgent and the patient objects or resists, there is no simple procedure to authorise treatment. Guardianship or an intervention order may be approved by a court, and an enforcement order applied for subsequently, but the Commission does not know of any examples of this leading to successful treatment.

Further information about the Mental Health and Incapacity Law in Scotland is available from the Commission's website

www.mwcscot.org.uk

The website provides links to the Acts and their Codes of Practice. Mental Health Act forms can be downloaded from the Scottish Executive website. A link to forms is also provided from the Commission site.

Other useful information sources:

www.gmc-uk.org **www.bma.org.uk** **www.nmc-uk.org**

Appendix 1

SHARING DIFFICULT INFORMATION WITH PATIENTS/RELATIVES

Be truthful but sensitive to the amount of information wanted.
The communication process should be two way.

PREPARE FOR THE INTERVIEW

- Plan the meeting - a relative/close friend should be present, if possible:
  - allow enough time; not too early or late in the day.
  - ensure the patient is awake and comfortable.
  - in hospital, avoid giving bad news at the bedside if possible.
  - ensure you have all the relevant information.
- Place - quiet, private, equipped with tissues, notes/results, written information, booklets etc.
- Protect against interruption.
- Clinical staff who know the patients should give the results of tests; preferably in person not by phone.
- A nurse who knows the family should be involved.

GIVING INFORMATION

- Manage the whole interview by summarising, clarifying what has been understood and checking for outstanding issues/concerns. Use clear, simple, unambiguous language.
- Check how much the patient/relative knows already,
  e.g. ***"Can you tell me what you understand about the illness?"***
- Check how much they want to know,
  e.g. ***"Are you the sort of person that likes to know exactly what is happening?"***
- Clarify the current situation and give any new information, tailored to the person's needs.
  BUT, if the person is unaware of the situation - give a warning shot, e.g. ***"I'm afraid things are not so good"***
  - break the news slowly in small steps - pause after each.

Coping with patient's/relative's reactions & distress:

- A slow pace, with pauses, allows the person to take the information in.
- Avoid premature advice/reassurance - it may be misinterpreted or not heard.

- Acknowledge/empathise with distress and encourage the person to talk about their feelings, e.g. ***"It sounds as if you feel ....."***
- Help the person identify specific concerns resulting from the information given, e.g. ***"Can I ask you what exactly worries you about…?"***
- Summarise and prioritise the person's concerns.
- Take the person's concerns in order of priority and give appropriate information/advice.
- Give reassurance of ongoing support and agree a joint plan of action.

At the end of the interview

- Summarise the conversation and offer to write down key information.
- Offer relevant written information/booklets.
- Arrange a later opportunity to ask further questions or go over the information again.
- Check if there is anything else they need now.
- Offer the patient/relative time alone if they wish.

After the interview

- Record details of: the information given
  any resulting concerns/issues
  follow-up arrangements
- Ensure that other key staff including the patient's GP/consultant are aware of what has been said.

GIVING DIFFICULT INFORMATION BY TELEPHONE

This should be avoided, if possible, but may be necessary e.g. to inform relatives of a death.

In advance:

- Find out if the family want to be informed of changes in the patient's condition by phone.
- Do the family want to be contacted overnight or not?
- Is one family member to be contacted first?
  → Record these details clearly in the patient's record with contact numbers.
- If the death is "sudden and unexpected" it is always better if the GP, emergency social work service or the police go and break the news to relatives.

1. Write down or review what you are going to say before you phone.
2. **Speak slowly**
3. Check if you are speaking to the right person.
4. State who you are and where you are phoning from.
5. Warn them you have some bad news and check if they are alone. PAUSE.
6. Give the person the opportunity to phone you back later if they wish.
7. Give the information slowly, simply and clearly.
   If the patient has died, it is better to tell the truth.
   (Avoid euphemisms e.g. passed away).
8. Express your regret. PAUSE.
9. IF ALONE - offer to phone a relative/friend to be with them.
   IF NOT ALONE - offer to speak to the relative/friend who is there.
10. Check when and how relatives will be coming into the unit. They do not need to rush.
11. Assure them medical and nursing staff will be available to talk to them.
12. Phone and inform the GP of a patient's death.

Appendix 2

END OF LIFE CARE

WHEN DEATH OCCURS - CARE GOALS

If you have a bleep, ask someone to hold it while you speak with the family. Turn off mobile phone.

GOAL Family feel supported in the decision to be alone with the patient	• Reassure them that they will be given all the time they need. • Continue to make regular contact to provide support, but do not imply haste. • Provide a separate private area to enable the family to be together. • After a period of time ascertain if family still comfortable staying, sometimes they are at a loss as to what to do or what happens next.
GOAL Religious/cultural issues are identified	• Ask family if they would welcome support of minister/priest/other. Religious/Cultural issues? • Have they been identified? *(see "What to do after a death in Scotland Booklet" - Chapter 10)*
GOAL Family supported and advice given if they are waiting for the Death Certificate to be issued	• Medical staff will pronounce life extinct (PLE). • Provide tea/coffee in separate room, to allow medical staff to confirm death and issue death certificate to the family in private. • Medical staff will assess whether the Procurator Fiscal should be informed. The death certificate cannot be issued by hospital staff in the event of the fiscal taking over the case. • Using professional judgement as to the appropriateness, sensitively ascertain if any arrangements have been made/discussed re burial or cremation. If cremation is chosen, or if intentions are not clear, a Cremation Form part B should be completed and sent to the mortuary. It should not be handed to relatives. The mortuary will arrange for Form C to be completed if a post mortem is not undertaken and will give the cremation form to the undertaker. • Ward staff return belongings as per policy* and give bereavement booklet and invitation for bereavement support.
GOAL Arrangements for organ donation or post mortem if appropriate	• If there is a possibility of organ donation or a post mortem examination is thought desirable, discuss with the family. • A cremation Form C is not required if a post mortem examination has been undertaken but consultation with pathologist is necessary for completion of Q8a in Form B.
GOAL Declaration of serious infection hazard to undertaker.	Complete a care of the deceased form (infection certificate) and send to mortuary.
GOAL Family advised what to do next (if they do not wish to wait for the death certificate)	• Advise to return at a mutually convenient time the next day. • Inform them that any member of the family / friend can do this as it is often too difficult for the immediate family.
GOAL Advice given to the family about what to do next	Explain steps in booklet pertaining to registering the death and about the role of the funeral directors.
GOAL Enquire whether the person has support at home	Discuss whether contact with family /friends or GP is required for support. If appropriate accompany to the end of the ward or to the car.

***If all the above have been addressed perform Last Offices *identifying cultural beliefs and spiritual needs* (refer to manual if required)**

Ensure remaining patients concerns are addressed

	Initials	Yes	No	If "No" record a variance (Code …)
Above Goals met				

CHECKLIST OF REQUIREMENTS

This checklist is used at ward level to ensure that all important steps are taken and to document timing and responsible individuals.

	Initials	Yes	No
Patient's death confirmed by doctor?			
Senior nurse in charge informed of patient's death?			
Next of kin notified of death? (See breaking bad news guidelines)			
Procurator Fiscal Notification - ***inform as appropriate***			
Death certificate prepared? (See instructions in Deaths Book)			
Death certificate given to family?			
Family returning later for death certificate? (if yes please record at the bottom of the page)			
Bereavement booklet given to family?			
Valuables/belongings returned to family?			
Valuables held in cashier office?			

	Initials	Yes	No
Post Mortem ***If required*** - Patient's family must sign			
Copy of signed post mortem consent given to family?			
Cremation Form B (***if appropriate***) completed?			
Cremation Form B (***if appropriate***) sent to Mortuary?			
Infection Certificate for undertaker sent to Mortuary?			

	Initials	Yes	No
Consultant informed - within 24hrs			
GP contacted - within 24hrs			
Medical records informed - within 24hrs			
Cancel any follow up appointments if already booked prior to death			

Arrangements to collect death certificate: Date: / / Time:

Other comments:

Determine families wishes regarding jewellery? →

To remain on the patient? Yes / No

Comments:

Initials:

BREAKING BAD NEWS TO BEREAVED RELATIVES FOLLOWING ATTEMPTED RESUSCITATION

Bereaved relatives

- Despite good quality intervention, it is inevitable that resuscitation will not always be successful. Appropriate handling of the situation can help relatives and friends to cope, to start the grieving process and to initiate the practical process relating to funeral arrangements.
- Insensitivity or poor communication at this time may cause long-lasting psychological distress.

Contacting the relatives

- Personal communication is best. Use the Police rather than giving the news by telephone, but if it has to be done by phone an experienced person should do it, and arrange for immediate support e.g. neighbour. Face-to-face communication is the best.

Who should tell them?

- The appropriate person may be a member of the medical team, the named nurse or another. There are no hard and fast rules. It is often appropriate for a doctor and nurse to see the family together.

Practical points

- If you have a bleep or mobile phone, ask someone to hold it while you are speaking with the family.
- Prepare yourself: make sure any blood or other fluid which has been around during resuscitation is cleaned up. Wash your hands, take a big breath in to steady yourself. Plan what you will say.
- Involve a nurse who may know the family.
- **CONFIRM** they are the correct relatives, who's who, introduce yourself, find out what they know.
- Physical proximity is important. Sit down, don't look rushed (even if you are), give them time.
- Make eye contact. Holding hands may be appropriate. Talk clearly in a simple straightforward way getting to the point quickly. Use the word died or death.
- Do not use euphemisms e.g. passed away.
- Emphasise and repeat. Give time for reactions and questions (i.e. be quiet).
- Be truthful, direct, compassionate and empathise. The only thing you may be able to offer is a hug, if this is accepted. If it feels right it usually is right.

- Reactions vary: distress, anger, denial, guilt, numbness. Allow and encourage crying. Ask if there are questions: be sympathetic, honest but non-judgmental. Reassure them that pain and other distressing symptoms were dealt with.
- Physical comfort e.g. tea.
- Do not be afraid to show emotion.

Where to tell them?

- A quiet room.

Facilities which should be available

- Paper tissues. Comfortable chairs, a telephone to call out on (not an internal one which may ring at any time). A sink, drinks.

Seeing the patient or body

- Try to get the relatives in before death.
- Warn about equipment and any deformity.
- Encourage them to get close.
- Some relatives will want to help with cleaning the body.
- Remember Religious and Ethnic requirements. Involvement of the Chaplain, Minister, Priest or other religious officals may be welcomed.

Communication

- Contact the GP.
- Notify the Procurator Fiscal if required.
- Religious officers.
- Information on what to do next. Write the death certificate neatly and explain what it says.
- Leaving the hospital: ensure family or friends are available for support.
- Follow up: give the relatives contacts. They may wish to come back to discuss events at a later stage.
- Staff support and debriefing is to be encouraged.

Gaining experience of breaking bad news

Try to accompany experienced members of staff when they are speaking to relatives.

Thanks to the authors of the Lothian Palliative Care Guidelines for the sections on 'sharing difficult information with patients & relatives' and 'giving difficult information by phone'.

Appendix 3

GENERAL PRINCIPLES OF GOOD PRACTICE:INFUSION DEVICES

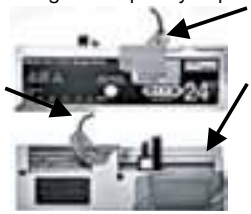
"Health Professionals are personally accountable for their use of medical devices and must therefore ensure that they have appropriate knowledge and training"

Medical Devices Agency 2001

What causes infusion device adverse incidents?

- Free-flow and siphonage.
- Incorrect setting of or failure to set infusion rate.
- Use of inappropriate accessories.
- Calculation errors.
- Lack of knowledge of infusion therapy.
- Patient/Visitor tampering.
- Using damaged devices.

Example of poor practice
Bandaged 'temporary' repair



Report mechanical or fluid spillage damage.
NEVER use damaged medical devices.

Free-flow and Siphonage

What is it?

- Uncontrolled fluid flow from container (syringe or fluid bag).

What causes it?

- Gravity: Fluid containers empty if raised above the infusion site and there is nothing to prevent flow (e.g. outflow tube is open).
- Volumetric set: A fluid bag empties if the roller clamp is not closed or the line is not clamped before removal from the pump.
- Syringe pump: Siphonage can occur if: (1) syringe is not properly inserted in pump, (2) the pump is located too high above patient or (3) the syringe is damaged.

Siphonage
A syringe can empty itself, pulling the plunger along, if the line is primed and the plunger is not restrained.

Note: If the syringe is cracked siphonage and emptying of the syringe can occure without movement of the plunger.

Anti-siphon valves are used to help prevent free-flow due to siphonage. They can be thought of as a valve held closed by a spring that requires about 100 to 150mmHg pressure to open and allow flow.

- Damaged syringes and siphonage: Air leaks can occur if the seal between barrel and plunger is broken or if the syringe is cracked. Siphonage then occurs without movement of syringe plunger.

What are the consequences?

- Free-flow and syphonage can cause over-infusion – in severe cases this can lead to death.

What steps should be taken to prevent free-flow?

Syringe pumps:

- Use anti-siphon valve where possible. Use Luer-lock syringes.
- Check that the syringe is not damaged.
- Clamp the syringe securely in the pump (plunger and barrel secured and syringe lip in pump groove) before attaching the line to the patient.
- Pump Height. Ideally, mount syringe pumps and drivers at or below the height of the infusion site.

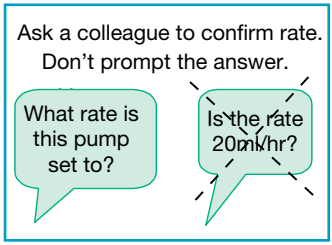
  Never mount higher than 2 feet above the infusion site.
- Clamp the infusion line before removing the syringe from a syringe pump or driver.

Volumetric pumps

- Ensure that the correct infusion line is selected for use with volumetric pumps.
- Clamp the line before opening the door and removing the line from the pump.

What checks to make before starting an infusion?

- Check infusion rate. Does it match the prescription? **Ask a colleague to tell you the rate.**
- After an end-of-infusion alarm, don't restart the pump before checking if the prescribed volume has been infused.
- Syringe pumps: Check that the pump correctly registers the syringe size being used (Graseby 3000 series and Alaris Asena series pumps).



Why should you carry out regular checks and what are you looking for?

Infusion devices are very reliable and rarely give problems. However, occasionally they do fail. It is also important to regularly check the infusion site for signs of extravasation or infiltration.

Regular checks

When:

- First check after 15-20 minutes
- Hourly thereafter

What: Patient

- Infusion site. Swelling, pain
- Patient comfort

Infusion devices do not measure the flow rate - they record the pumping action.

If the peristaltic fingers don't press correctly on the giving set (incorrect set or door not fully closed) the flow rate will be incorrect.

A syringe pump can record flow with an empty syringe.

Infusion System - pump, giving set and fluid container

- Infusion rate
- Volume left in bag or syringe - also check totaliser.
- The line. Has the line been left clamped.

When things go wrong:

Safety Action/Hazard Notices and Incident reporting

Safety Action Bulletins and Hazard notices

What are they? Issued by Scottish Healthcare Supplies to inform users of potential dangers involving medical devices, often following problems experienced in other hospitals.

Where do you find these safety warnings? These should be kept in a file in the clinical area. They are issued by e-mail and through the Messenger. If in doubt, contact the Clinical Skills Co-ordinators or Medical Physics.

Incident reporting

If an adverse event or a near miss occurs, fill in the incident report according to Trust protocol. You should also directly inform Medical Physics (x 22352 - RHSC and RIE; x 32167 - WGH; x 52148 - SJH). The giving set should not be removed from the pump (unless clinical care requires otherwise). The pump, together with the giving set and a copy of the infusion chart should be sent to Medical Physics.

Start-up time (Syringe pumps)

What is it? The time delay between starting an infusion and the patient receiving infusion at the prescribed rate. (Analogous to the time for a car to reach say 60mph from standstill.)

What causes it? Mechanical slack between the syringe and the pump and within the mechanism of the pump.

?? Question ??

Have you ever commenced an infusion and found that, after an hour, the pump's totaliser display indicates that the hourly rate has been delivered but the syringe volume has not altered?

Cause: Start-up time delay.
Prevention: Purge to remove slack.

How can it be prevented or at least minimised?

- Prime line before installing syringe in the pump.
- Install the syringe correctly and firmly in the pump.
- Before connecting line to patient, use the pump's PURGE facility. This takes up the pump's mechanical slack, minimising start-up time delay.

Occlusion Alarm Pressure

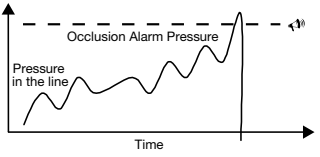
What is it? Infusion pumps generate sufficient pressure to deliver the infusion at the set rate. If the line becomes fully or partially blocked, the pressure in the line will rise. For example, phlebitis in the vein can increase the resistance to flow causing the pump to increase the delivered pressure to overcome the increased resistance. When the pressure rises above the occlusion alarm pressure the pump alarms OCCLUSION.

What is the limit? Recommended at less than 500mmHg for adult and 300mmHg for paediatric infusions. Some pumps enable the user to adjust the limit - with in-line pressure-monitoring users can adjust the alarm pressure to about 30mmHg above the pressure needed to deliver the infusion.

What should you do if the alarm sounds?

1. Determine the cause of the occlusion, checking the venflon site.
2. Check that the line is not clamped or kinked.
3. Release the syringe plunger clamp in order to avoid a post-occlusion bolus.

Pressure increase in line rising to an occlusion alarm



Does the occlusion alarm prevent infiltration/extravasation?

No, it is not sufficiently sensitive. Always check clinical signs (redness, swelling, and pain).

Appendix 4

RESUSCITATION: SPECIALISED INFORMATION

PREGNANCY

Introduction

Resuscitation in pregnancy is complicated by a number of important factors.

- There are at least two patients.
- The physiological changes of pregnancy alter the response to acute illness, and to treatment.
- There are a number of diseases unique to pregnancy which may result in collapse.
- In view of these factors although the standard approach to resuscitation is applied, there are specific modifications.

Most of the causes of cardiac arrest in pregnancy are identifiable at a time when cardiac arrest should be preventable: e.g. hypoxaemia, hypovolaemia, and the aim is to avoid cardiac arrest.

Physiology

Changes in anatomy and physiology affect the approach to management of the pregnant patient.

Airways

- Oedema.
- Anatomical changes.
- Nasal congestion.

Breathing

- At 10 weeks 40% increase in tidal volume and normal respiratory rate with minute ventilation rising from 7.5 to 10.5 litres.
- $PaCO_2$ falls to 4kPa, and at term PaO_2 rises from 11.3 to 12.3kPa.
- FRC falls by about 30%.

Circulation

- Total body water rises by about 7 litres.
- Blood volume increases from 65 ml/kg to 80-85 ml/kg.
- Hb falls from 140g/l - 120g/l.
- Cardiac output increases by 1.5 l/min at 12 weeks, and by 44% in the third trimester.

- HR increases by 17% and stroke volume by 27%.
- Blood pressure and peripheral resistance fall.
- The combination of ventilatory and circulatory changes means that the ability to mount a compensatory response to acute illness (sepsis, hypovolaemia, haemorrhage) is diminished as the system is already working way beyond normal capacity.

GI

- Lower oesophageal sphincter tone falls.
- Intra-abdominal pressure rises.
- Gastric emptying may be delayed.
- Risk of regurgitation of stomach contents greater than normal, and increases the risks of pulmonary aspiration in situations where conscious level is depressed (including general anaesthesia).

Resuscitation peri-arrest and during arrest

- Call for help early: anaesthetist, obstetrician and paediatrician as appropriate.
- ABCDE
- High concentration oxygen: is the airway secure? Get anaesthetic help early.
- Large bore IV access and fluids: 20ml/kg colloid. Activate Major Haemorrhage protocol as appropriate.
- Left lateral tilt: as required.
- Refinements to BLS and ALS: see ALS manual in A&E/ARAU.

Specific problems: Haemorrhage; embolism; anaesthetics, eclampsia.

Appendix 5

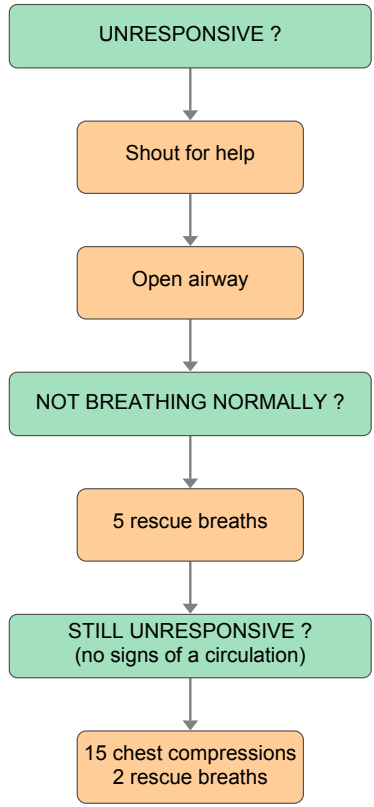
PAEDIATRIC BASIC LIFE SUPPORT

PAEDIATRIC BASIC LIFE SUPPORT

Resuscitation Council (UK)

Paediatric Basic Life Support

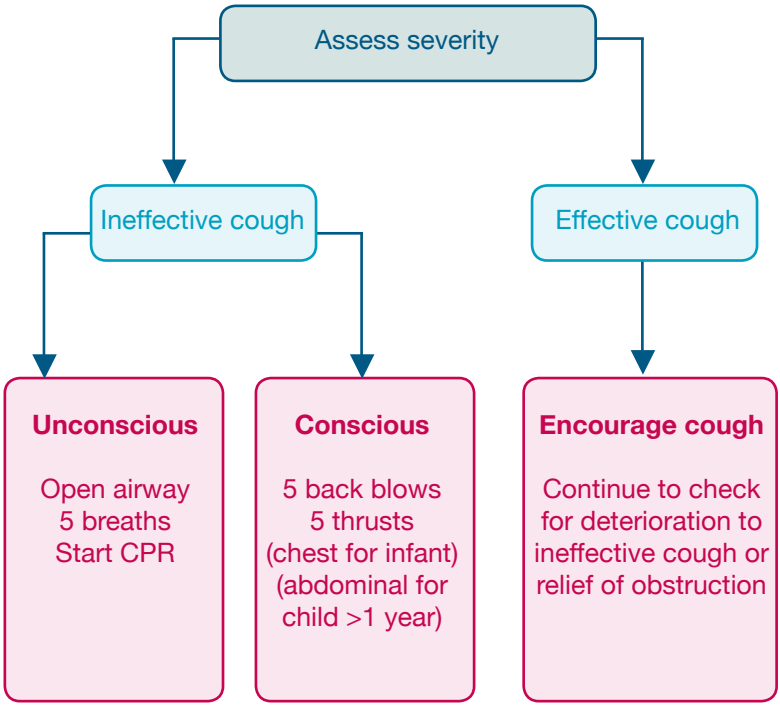
(Healthcare professionals with a duty to respond)



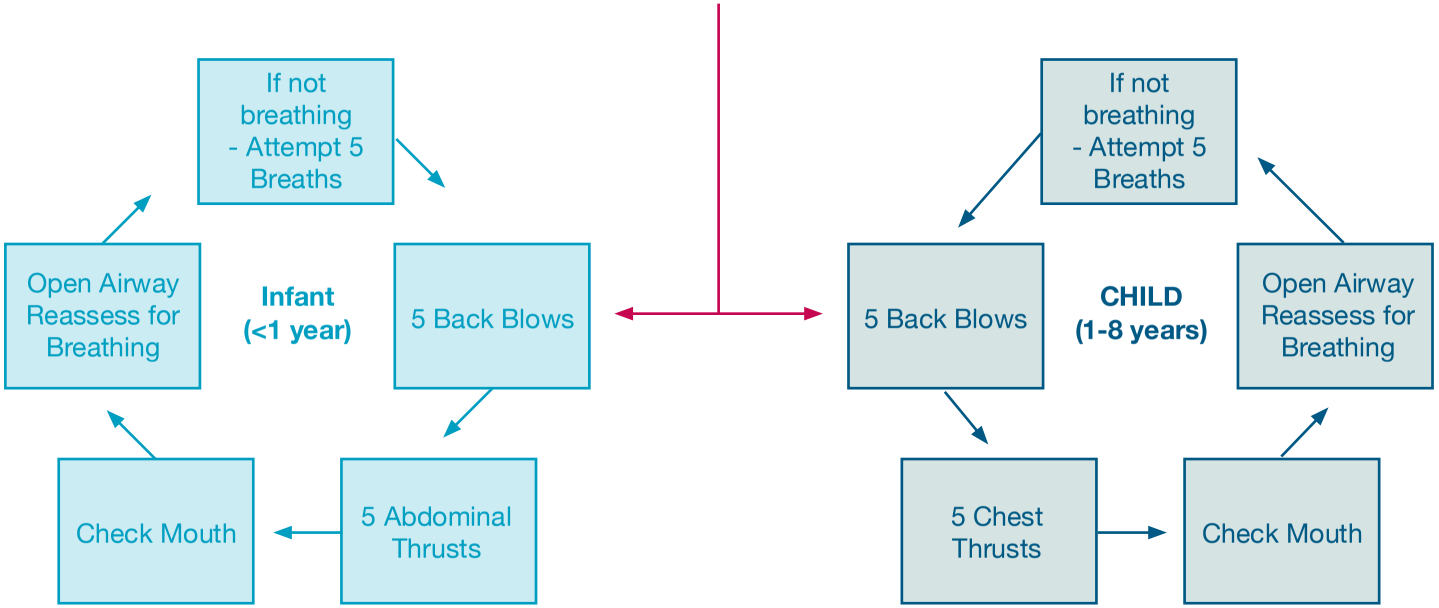
If alone after 1 minute call resuscitation team then continue CPR. If rescuers activate 2222 call immediately stating paediatric cardiac arrest.

Note: Compress the chest by approx. one-third of its depth. Use 2 fingers for an infant under 1 year; use 1 or 2 hands for a child over 1 year as needed to achieve an adequate depth of compression.

PAEDIATRIC FBAO TREATMENT



FOREIGN BODY OBSTRUCTION SEQUENCE



Resuscitation Guidelines 2000-Resuscitation Council (UK), Marie Elen January 2001

CONSENT TO MEDICAL TREATMENT FOR CHILDREN IN SCOTLAND

This information is concerned with young people under the age of 16.

Once a child reaches 16, he or she has full adult legal rights to decide whether to consent to treatment or not.

Child Health in Scotland operates within the framework of Scots law, which differs from the law in England and Wales.

MEDICAL CONSENT IN GENERAL

Medical treatment is lawful, either:

- With consent
- Or in cases of urgent necessity (when consent cannot be immediately obtained).

It is important to remember that consent to medical treatment, whatever the age and capacity of the patient, is a matter that qualified medical practitioners must always make a decision about.

In some cases where emergency treatment is required, the practitioner may decide that the situation is so urgent that the treatment cannot wait for consent. It is the practitioner who is making a judgement.

CONSENT FOR YOUNG PEOPLE OF 16 AND OVER

Scots Law treats the 16 year old as a full adult. He or she has the right to consent or refuse to consent to all medical, dental or surgical treatments or procedures.

CONSENT FOR YOUNG PEOPLE UNDER 16

> *(4) A person under the age of 16 years shall have legal capacity to consent on his own to any surgical, medical or dental procedure or treatment where, in the opinion of a qualified medical practitioner attending him, he is capable of understanding the nature and possible consequences of the procedure or treatment.*

This means that for any child under 16 there is a right to consent to any form of treatment if the medical or dental practitioner considers that the child has capacity to understand:

- what the treatment or procedure is
- and its possible consequences.

For example it may be considered appropriate for a child to consent to a straight forward procedure such as setting a broken limb but not when considering treatments for more complex illnesses.

If a doctor, dentist or other medical practitioner takes the view that the child has the capacity to consent, then only the child can consent or refuse consent. Although it would always be considered good practice for parents and if appropriate other family members to be included in the decision process.

It is important that all professionals who work with children are aware of the rights of the child rather than thinking that adults are the only people who have rights and whose views matter.

Who consents if not the child or young person?

If the medical practitioner does not think that the child is legally capable of consenting, the adults who could give consent would be as follows:

- Birth parents who have not lost their rights and responsibilities through adoption. A court could overrule the parents rights to consent or not to medical care, but this is very rare.
- Unmarried fathers do not automatically have parental responsibilities but carers rights.
- People who normally "care" for the child may also consent to medical treatment in certain circumstances. This is if the carer is over 16 years of age and the child is not capable of consenting **and** the carer has no knowledge that a parent of the child would refuse consent.
- School teachers and those under the age of 16 cannot give consent. It is also usual that in the event of the child being in care the local authority will have asked parents to sign a consent form, consenting to any required treatment.
- If the child is awaiting adoption then the local authority has all parental responsibilities for the child and the birth parents have no rights.

CONFIDENTIALITY

This is always a difficult area. The general opinion is that if a child is considered able to consent or refuse treatment, the child must also be entitled to patient confidentiality. It would always be considered good practice that the child and parents were included in any discussion. This would have to be done only if the child gave consent to it.

It would be a breach of confidentiality if a doctor told a parent that their child had sought advice on contraception without the prior consent of the child.

The only exception is where the child is at risk and information may be disclosed in order to protect the child. When the girl is under 16, it could be argued that in seeking contraception she is "at risk" of being a victim of a sexual offence, but it is not always appropriate to inform the police or social services.

Similarly with abortion, consent to abortion or refusal of such consent is a matter for the young person, unless the girl has severe learning difficulties. Considerable support and counselling would be considered good practice and reasonable attempts to involve the family **only if** the child agrees. It is ultimately up to the girl to decide for herself and not up to her parents.

Bibliography

British Agencies for Adoption and Fostering (1998) Practice Note 38. Consent to Medical Treatment for Children in Scotland.

Lothian Health (1998) Children and Young People's Health Strategy.

Appendix 6

MALIGNANT HYPERTHERMIA ACTION SHEETS - LUHD RIE/WGH 2005-2007

TO BE KEPT IN THEATRE PROTOCOL FOLDER & MH BOX

DIAGNOSIS

Clinical

Tachycardia + Tachypnoea / Raised $EtCO_2$
Masseter Muscle Spasm after Suxamethonium.
Rigidity / Fasciculations
Arrhythmias
Cyanosis / Low SpO_2
Skin Mottling
Temperature rise (Approx 1^0 / 5mins)
Soda Lime hot & Rapidly Consumed
Sweating +++
Blood pressure unstable

Monitoring/laboratory

SpO_2 decrease/Central Venous Hypoxia
Hypercarbia
Metabolic Acidosis
Hyperkalaemia
Myoglobinaemia
Creatine Phosphokinase increase
Clotting Screen Abnormality

ACTION

1. **DISCONTINUE ANAESTHETIC IMMEDIATELY WHEN POSSIBLE.**
   Withdraw trigger agents immediately ie. All volatile agents. Use new breathing system

2. **INTUBATE PATIENT & HYPERVENTILATE WITH 100% O_2 AT 3 x Vmin**
   (Aim for Et_{CO2} of 3.5-4KP_a)

3. **DISTRIBUTE "ACTION SHEETS":**

a) Treatment/Monitoring - Yourself + ODP - Page 1-3
b) Malignant Hyperthermia Box - Anaesthetic Room Nurse - Page 4

c) Drugs and catheterisation pack - Circulating Nurse - Page 5
d) Cooling (cooled iv fluids) - Assistant Surgeon + ODO/ Resident -Page 6
e) Help - Nurse/Resident -Page 7

4. ASK THE SURGEON TO :

A. Abandon the operation rapidly.
B. Insert urinary catheter.

5. INJECT DANTROLENE.

6. COMMENCE BODY SURFACE COOLING WITH COOL WATER.

7. INFORM CONSULTANT IN CHARGE.

TREATMENT - OVERVIEW

THE ORDER WILL DEPEND ON AVAILABILITY OF DRUGS AND EQUIPMENT SPEED IS MORE IMPORTANT THAN ORDER.

HYPERVENTILATION : 100% Oxygen (Use new breathing system, NO VOLATILE AGENTS)
Intubate
3 x V_{min} approx.
Aim for ET_{CO2} of 3.5 - 4 kPa.

IV CANNULA : Large bore

DANTROLENE : 1-2mg kg^{-1} IV rapidly.
(i.e. 4 - 6 x 20mg vials for average adult)
Vial Preparation :
Add *60 mls sterile water for injection* to each vial
Further titrated Dantrolene up to 10 mg kg^{-1} may be required.

COOLING : 1. Stop warming devices – fluid warmers, warming blankets/mattresses.
2. Surface cooling with cool water sponging
(***Ice cooling is no longer recommended as it can cause intense vasoconstriction which retains body heat and can raise the core body temperature even more***.)
3. IV cooled fluids : (4 x 1000ml N/saline

minimum stored in fridge)
RIE : Cardiothoracic theatre (Th 4-8), Or Orthopaedic Theatre Clean Utility Area fridge.
WGH : Blood fridges in main theatre (outside Theatre 3), DCN theatre & Theatre 14.

Consider using a cardiac bypass pump heat exchanger in cooling mode.

SUPPORTIVE TREATMENT TO COMBAT INCREASED METABOLIC RATE DUE TO SUSTAINED MUSCLE CONTRACTION:

Na BICARBONATE : 1-2 mmols/Kg (100-200ml 8.4%)
Reduces acidosis & serum K^+
Repeat cautiously according to blood gas results.

DIURESIS : MANNITOL 20% (at room temp) 2ml/Kg/hr up to 500mls.
FRUSEMIDE 40 mg
Volume replacement as necessary (cold fluids)

K^+REDUCTION : Dextrose & Insulin infusion - 50ml 50% dextrose + 10 units Actrapid
(Monitor Blood Glucose levels)

ARRHYTHMIAS : Usually secondary to acidosis & hyperkalaemia. Treat as appropriate. ß-Blockers frequently required. (Avoid the use of calcium channel blockers with dantrolene as hyperkalaemia can occur)

BLOOD TESTS : Blood gases. K^+. Glucose. Clotting screen (DIC is common),
Creatinine Kinase (repeat at 24 hrs)

INSTRUCTIONS FOR ANAESTHETIST + ODP

1. STOP ADMINISTRATION OF VOLATILE AGENTS.

2. USE NEW BREATHING SYSTEM

If a circle system must be used the CO_2 absorbent must be replaced with new fresh granules to avoid absorbed volatile agents being released back into the system.

3. ARRANGE FOR MALIGNANT HYPERTHERMIA BOX TO BE COLLECTED FROM :

RIE : GENERAL / ORTHOPAEDIC THEATRE RECOVERY
Clean Utility Area – lower shelf.
or ICU (Wd 118)

WGH : ICU – Drug cupboard No 5
WGH ICU also keeps another 12 vials of Dantrolene and 8x100ml vials of sterile water for reconstitution as a back up. Take them with you to save a second journey.

SJH: In the Theatre Suite – Recovery Room on dedicated trolley.

4. ARRANGE FOR ON-CALL PHARMACST TO SEND A FURTHER 12 VIALS OF DANTROLENE & 8X 100ML VIALS STERILE WATER URGENTLY.

Dosage: 1-2mg kg^{-1} IV rapidly.
(i.e. 4 - 6 x 20mg vials for average adult)
Vial Preparation :
Add *60 mls sterile water for injection* to each vial
Further titrated Dantrolene up to 10 mg kg^{-1} may be required.

5. INTUBATE patient & hyperventilate with 100% O_2 at 3 x Vmin
(Aim for $ETco_2$ of 3.5 - 4kPa)

6. SET UP:-

- ECG
- SpO_2
- Et CO_2
- Large bore IV cannula
- Thermometer (Naso-pharyngeal/oesophageal/rectal)
- Arterial line
- Urine output - Surgeon will insert catheter (with urimeter)
- Central Venous Pressure line

7. BLOOD SAMPLES:-

- Blood gases
- Potassium
- Clotting screen
- 10ml lithium heparin - for later analysis of creatine phosphokinase and myoglobin (At start / height / end of crisis)
- 20ml urine - for myoglobin (At start / height / end of crisis)

ANAESTHETIC ROOM NURSE
(OR OTHER FAST RUNNER)

GET MALIGNANT HYPERTHERMIA BOX
LOCATIONS –

RIE : GENERAL/Orthopaedic Theatre Recovery - Clean Utility Area – lower shelf or ICU (Ward 118) Clean Utility Area – Work surface corner

WGH : ICU - Drug cupboard No 5.
WGH ICU also keeps another 12 vials of Dantrolene and 8x100ml vials of sterile water for reconstitution as a back up. Take them with you to save a second journey.

PAEP : Central Drug Store opposite Theatre 1 Anaesthetic room.

RHSC : Main Theatre – The middle of the recovery room by the emergency trolley.

ROODLANDS HOSPITAL : Main Theatre – in the safe in the 'back corridor'

St. JOHN'S HOSPITAL LIVINGSTON : In the Theatre Suite – Recovery Room on dedicated trolley.

Contents

Dantrolene Sodium : 12 Vials x 20mg
Water for injection : 8 bottles x 100ml
1 bottle opener : For rapid filling of syringes using a quill
4 drawing up quills
12 luer lock 60 ml syringes
12 white needles
2 sponges for surface cooling
1 set Malignant Hyperthermia Protocol sheets

DRUGS - CIRCULATING NURSE

1. **MAKE SURE THAT THE FOLLOWING ARE HANDY :-**

- Emergency drug box
- Syringes needles and giving sets
- 0.9% Normal Saline (NOT RINGER LACTATE), 5% Dextrose, 8.4% Bicarbonate
- Foley catheter and equipment for urinary catheterisation
- Basin / bucket to hold cool water for use with the sponges in the MH kit

2. Remind the anaesthetist to ask the surgeon to insert a urinary catheter when he has finished sewing up.
3. Take charge of the MALIGNANT HYPERTHERMIA BOX when it arrives:
   Make up Dantrolene 1-2 mg kg-1 (SPEED IS IMPORTANT) :-
   Add 60ml sterile water for injection to each vial.
   The box contains quills and a bottle opener to speed up filling the syringes
   Shake vials well to dissolve the dantrolene.
   (Average initial adult dose is 4 - 6 ampoules rapidly IV.)
4. Check that you have in theatre:

- Mannitol 20%
- Dextrose 20% or 50%
- Insulin
- Furosemide

5. Frequently ensure that stocks of IV fluids are not running out.
6. Arrange for more DANTROLENE to be brought to theatre from pharmacy .
   Note : You will need another 800ml (8 x100ml bottles) of sterile water for injection per box of 12 Dantrolene vials.

Dispensary open hours:

RIE	Monday to Friday	0830-1830	Ext 22911
	Saturday	0830-1500	Ext 22911
	Sunday	1000-1400	Ext 22911
WGH	Monday to Friday	0845-1700	Ext 31461 (or page #6421 or bleep 5535)
	Saturday	0900-1230	Ext 31210

Outwith these times contact the on-call pharmacist via the switchboard

If necessary more Dantrolene can be mobilised from other hospitals. (See page 8.) - Ask Pharmacist to co-ordinate

COOLING - ASSISTANT SURGEON / RESIDENT / ODP

SPEED IS VITAL

Cool patient by sponging with cool water over as much of the body as possible.
This cools the patient by an evaporative heat loss process.
Two sponges are in the MH box.

(The anaesthetist may arrange cardiac bypass pump cooling if required.)

Important Further Information :

The following are no longer recommended for the treatment malignant Hyperthermia :

1. Ice cooling is no longer recommended as it can cause intense vasoconstriction which retains body heat and can raise the core body temperature even more. Frostbite with loss of extremities could also occur.

2. Gastric or peritoneal lavage.

HELP - NURSE / RESIDENT

The following people should be contacted :

RIE :

1. Supervising Consultant / On Call Consultant
2. Contact ward 118 ICU team in RIE (ext 2118) to arrange emergency transfer and admission.
3. The Assistant Operations Manager to report that the Malignant Hyperthermia policy plan has been actioned (RIE Bleep 2118)

WGH :

1. WGH Consultant on call. Emergency Anaesthetist (Bleep 8155)
2. ICU Consultant on call. ICU team to arrange emergency transfer and admission (ext 31664/31665)
3. SHO on call (Bleep No 8112)
4. Theatre Assistant Operations Manager to report that the Malignant Hyperthermia policy plan has been actioned (Bleep # 6122)

PAEP :

1. Contact ward 118 ICU team in RIE (ext 2118) to arrange emergency transfer and admission.
2. Inform Clinical Lead.
3. Theatre Assistant Operations Manager to report that the Malignant Hyperthermia policy plan has been actioned (Bleep # 1600)

ROODLANDS HOSPITAL :

1. Contact ward 118 ICU team in RIE (ext 2118) to arrange emergency transfer and admission.
2. Inform Clinical Lead.
3. Theatre Assistant Operations Manager to report that the Malignant Hyperthermia policy plan has been actioned.

LOCATIONS OF SUPPLIES OF DANTROLENE IN THE LOTHIAN AREA

Large back-up supplies are available from the pharmacies in RIE, WGH & St Johns
- Pharmacy will mobilise these sources if necessary

ROYAL HOSPITAL FOR SICK CHILDREN

12 vials of 20mg	In Main Theatre - Middle of recovery room by emergency trolley.

WESTERN GENERAL HOSPITAL

12 vials of 20mg	In ICU - in MH Box in'Drug Cupboard No 5'.
12 vials of 20mg	In ICU - in'Drug Cupboard No 5' as back-up.
12 vials of 20mg	WGH Pharmacy

ROODLANDS HOSPITAL

12 vials of 20mg	In Main Theatre - in safe in 'back corridor'.

ROYAL INFIRMARY OF EDINBURGH

96 vials of 20mg	In Pharmacy Dept - Drug store, injection store.
12 vials of 20mg	ICU Ward - At Nurses Station, top shelf.
12 vials of 20mg	General/Orthopaedic Theatre Recovery Room - Clean Utility Area - lower shelf.

St. JOHN'S HOSPITAL LIVINGSTON

12 vials of 20mg	In Theatre Suite - Recovery Room on dedicated trolley.

RECOVERY & FURTHER TREATMENT

With rapid diagnosis and treatment most cases of Malignant Hyperthermia will recover. After the initial crisis has been stabilised the patient should be admitted to an intensive care unit noting the following :

RETRIGGERING - May occur.
Oral Dantrolene (if possible) should be given for 48hours :
4mg/kg/day in divided doses.
Unnecessary stress should be avoided as this can trigger Malignant Hyperthermia.

HYPOTHERMIA - Can be induced by overvigorous cooling during recovery.

DIURESIS - Should be maintained to reduce the possibility of myoglobin induced renal failure.

BLEEDING DISORDERS - A DIC type coagulopathy is common.

PULMONARY OEDEMA - Is common.

MUSCLE OEDEMA - Compartment Syndrome may require fasciotomy.
(Spinal anaesthesia is often the method of choice for this)

Consider other diagnoses - Myopathy / Ecstasy ingestion / Neuroleptic Malignant Syndrome

Patients suspected of having Malignant Hyperthermia and their blood relatives should be referred later for formal investigation to :-

Malignant Hyperthermia Services
University Dept. of Anaesthesia
St. James's University Hospital
Leeds LS9 7TF

LEEDS MALIGNANT HYPERTHERMIA HOTLINE : 07947 609 601

- **WGH/RIE:** Attending clinicians should telephone switchboard on the emergency number (2222), informing them that there is major haemorrhage, the name and location of the patient and a contact telephone number (and individual where possible).

  SJH: Telephone/bleep blood bank (as below) and porters (ext 2120) not 2222.

- **Switchboard will inform:**
  - Blood Bank /Haematology Laboratory (by bleep).
  - Haematology/BTS duty doctor (by bleep).
  - Porter to go to the clinical area (porter will remain until stood down by clinical team).

- **Blood Issue (WGH Ext. 31912, SJH Ext. 53354/bleep 729, NRIE Ext. 27501/27502) should be rung directly to clarify the following:**
  - How urgent the need for blood is.
  - Patient's minimum data set (full name, date of birth, hospital number if available, A&E number or Major Incident number if necessary).
  - The number and nature of blood components requested (a standard pack for an adult will consist of 10 units of red cell concentrate, 1 pool of platelets and 3 units of FFP. For children the normal dose is 10-15 ml/kg for these components).
  - The exact location of the patient.

- If required, emergency O negative stock is held in the RIE and WGH blood banks, and also in the fridges in the Acute Receiving Unit at WGH, A & E at RIE, Simpsons Centre for Reproductive Health Labour Ward, RHSC, and Roodlands. If required please use the nearest available stock.

- In order to speed up the coagulation screen, the fibrinogen will be done first and phoned to the clinical team and Haematology/BTS duty doctor. If this is less than 0.8g/l the PTR and APTT will be prolonged and fresh frozen plasma and cryoprecipitate are likely to be required.

- When the full blood count and coagulation screen are available they will be phoned to both the clinical team and to the Haematology/BTS duty doctor. The Haematology/BTS duty doctor will liaise with the attending clinicians with regard to the haematological results and further blood component requirements.

For further FBC/coagulation or blood components, the clinical team should liaise direct with the appropriate laboratories on the emergency numbers. There is no requirement to go through the Haematology/BTS duty doctor, though he/she will be available as required.

MAJOR HAEMORRHAGE PROTOCOL

MAJOR HAEMORRHAGE
- **Make two phone calls**

TELL SWITCHBOARD: [Ext 222]
- There is a Major Haemorrhage
- Name and location of patient
- Contact name and telephone number

Switchboard to inform:
- Blood Issue
  (RIE 65353, WGH 31912, NRIE 27501 / 27502)
- Haematology Laboratory
- Haematology/BTS Duty Doctor:
- Porter\courier to clinical area

TELL THE BLOOD BANK:
(RIE Extension : 65353)
(WGH Extension: 31912)
(NRIE Extension: 27501/27502)

1. How urgent is the need for blood?
2. Patient's Minimum Data Set:
   Name,
   Hospital no./CHI no./A&E no./Major Incident No.
   Sex and Date of Birth,
   ABO & Rh Group (if known).
3. The number and nature of the blood components requested.
4. Where the blood is to be sent.
5. Name and contact telephone number for Clinician.

Send FBC and Coagulation Screen to Haematology and Pretransfusion testing sample to Hospital Blood Bank
Remember to bleep Haematology technician (RIE#6550 WGH 5477) for follow up FBC and coagulation screens

Red cells needed immediately

Use Emergency O negative Red cells in designated fridge. Send patient sample and request form urgently to Blood Bank.
Blood available immediately.

Use Emergency O negative Red cells from Blood Bank. Send patient sample and request urgently to Blood Bank.
Blood available immediately.

NOTE: O negative stock is often in critical supply. A sample should be sent to the Blood Bank ASAP to allow conversion to Group-specific blood.

Red cells needed in 15 minutes

Send patient sample and request form **urgently** to Blood Bank.

ABO and Rhesus group specific red cells available for collection at Blood Bank.
Blood available ***15 minutes*** after sample received.

NOTE: An antibody screen and crossmatch will be carried out on the released units within 30 minutes.

Red cells needed in 45 minutes

Send patient sample and request form **urgently** to Blood Bank.

ABO and Rhesus group, antibody screen and crossmatch will be carried out.
Blood available ***45 minutes*** after sample received.

NOTE: If the patient has a historic record and a Group and Screen on a current clinical sample, blood can be made available immediately by electronic release.

Are platelets, or FFP needed?

Allow time for preparation:
Platelets - Immediate Release if blood group available
FFP - 20 minutes

NOTE: Clinicians need to allow for the time it takes to deliver blood components from the blood bank to the clinical area.

Haematology\BTS Duty Doctor will liaise with attending clinicians re:
haematology and coagulation results, further blood components and blood stock management

NOTE: Cryoprecipitate can be ordered direct from blood bank if fibrinogen is less than 0.8 g/l.

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Useful links

The Anaphylaxis campaign:
www.allergyinfo@anaphylaxis.org.uk

Meningitis Research Foundation:
www.meningitis.org

British Thoracic Society :
www.brit.thoracic.org.uk

Resuscitation Council (UK):
www.resus.org.uk

The British Toxicology Society:
www.thebts.org

National Poison Information Service:
www.npis.org/NPIS/uk%20npis.htm

British Society Gastroenterology
www.bsg.org.uk

Scottish Intensive Care Society (SICS):
www.scottishintensivecare.org.uk

www.knowledge.scot.nhs.uk/scottishclinicaldecisionmaking

www.csmen.ac.uk/projects/Clinicaldecisionmaking.htm

In the education section of SICS website you will find this handbook as a pdf and also sections on critical decision making, EDM in Intensive Care and teaching materials for Identifying Sepsis Early.