MANAGEMENT GUIDELINES

FOR

COMMON MEDICAL CONDITIONS

2nd EDITION 1985

Internal Medicine Services

Canterbury Hospital Board

CONTENTS

INTRODUCTION

A formal continuing medical education (CME) programme for physicians commenced in Christchurch in 1979. Medical audits, carried out as part of this CME programme revealed a need for some treatment guidelines to improve standards of basic medical care. The success of the first edition of this handbook (June 1983) has warranted the production of this second edition. The format remains the same. Each sub-specialty of Medical Services has produced recommendations which have been edited to achieve a reasonably uniform format.

These guidelines should not be followed in a rigid manner. The treatment given to the patient must always be considered in the light of that patient's individual problems and needs. Although these recommendations may often need modification in practice, they should provide a useful guide to the provision of good basic medical care.

Remember that the delivery of medical care is a group activity. Always listen to advice from the patient and relatives, from other members of the staff and from the General Practitioner. Always try to get as much accurate information about the patient as possible. Get all available past medical notes, and if necessary telephone the General Practitioner. In some situations, for example a suspected fit, an interview with a witness may prove to be crucial. Above all remember that patients are people and that coming into hospital is probably the worst thing that has ever happened to them. Relatives may be fearful that they are about to lose a loved one. The correct treatment is not worth much if it is given in an uncaring or inconsiderate manner and the reasons for giving it are not explained to the patient.

As the current editors we are keen to receive comments, and criticisms so that future editions may continue to evolve and improve. The basic aim is to provide a guide to current medical practice in Christchurch Hospitals which will be updated frequently.

We would also like to acknowledge the enthusiastic help we have received from many consultants, registrars and other hospital staff not only in Medicine but from other disciplines. We are grateful to Mrs Mary Mann and the secretarial staff in Haematology for their skilled assistance.

Edited by:

MEJ Beard / DNJ Hart
Department of Haematology
CHRISTCHURCH HOSPITAL

for

JK Laing
Chairman of Medical Services

(Copies can be obtained from the Department of Haematology, Christchurch Hospital)

USE OF ANCILLARY SERVICES

Try to organise requests for such services early in the day. Try to minimise the number of tests done out of normal working hours or at weekends. Remember to be courteous when requesting emergency tests from ancillary staff.

- **Pathology**

Most departments provide a routine diagnostic service from 8 a.m. to 5 p.m. Monday to Friday. A skeleton staff works from 8.30 a.m. to noon on Saturday and Sunday mornings and on public holidays. In Haematology, Immunohaematology and Biochemistry a limited service is available after these hours until 12 midnight daily. Between 12 midnight and 8 a.m. a technologist will have to be called in for urgent work at a cost of about $70.00 per test. Please bear this in mind when ordering urgent tests. Similar arrangements pertain in Microbiology except that between 11 p.m. and 8 a.m. weekdays, and between 5 p.m. and 8 a.m. weekends and public holidays tests can only be done after discussion with the Microbiologist.

For full details of the pathology services available please see "The Users Guide to Laboratory Services", N.C.H.B., 1983.

- **Radiology**

X-Ray Consultations

Where possible patients requiring specialised examinations such as ultrasound, C.T. or arteriography, should be discussed with the Radiologist attached to the referring clinical team. After hours, such urgent examinations must be discussed with either the Radiology Registrar or the Radiology Consultant on call.

Normal Working Hours

Christchurch Hospital	0800-1600 with a late shift from 1600-2330 daily
Princess Margaret Hospital	0830-1600 Monday to Friday. At PMH at skeleton staff works from 0830-12 noon Saturday and Sunday mornings
Christchurch Women's Hospital	0800-1600 Monday to Friday
Burwood Hospital	0800-1700 Monday to Friday

Radiology After Hours

This may cost over $70.00 for a single examination when the Radiographer has to be called in from home. Try to delay x-rays at night until the department opens the following morning.

C.T. Examinations from Princess Margaret Hospital

These should be discussed with the appropriate Radiologist at the Princess Margaret Hospital before asking for an appointment.

- **Nuclear Medicine**

For all routine scans the appropriate request form should be sent to the Department of Nuclear Medicine. If the scan is considered urgent, the Department (Scanning Room) should be contacted by telephone, and every effort will be made to carry out the study that same day. It should be noted that some procedures such as bone scans require several hours between radiopharmaceutical injection and scanning, and so the Department should be contacted at the earliest available opportunity. For urgent scans out of normal working hours, ring Dr J. Turner or Dr B. Brownlie.

SOME PRESCRIBING ADVICE

(See Standing Orders and Information for Junior Medical Staff, Canterbury Hospital Board)

Remember that the writing of prescriptions is governed by law; the Poisons Regulations 1964 (amended 1981) and the Misuse of Drugs Regulations 1977 (amended 1980).

Some additional points which the Pharmacy feel need to be emphasized are:

- All prescriptions for inpatients should be written either on the treatment sheet (MR4) or on the separate form for I.V. infusions, the fluid prescription chart (MR4b).

- When an unusual dose of a drug is prescribed it should be underlined and initialled by the prescriber.

- If a prescription is to be altered, the change should be dated and initialled. It is however preferable to cancel the original prescription and write a new one.

- Exemption codes for new $1 charge on each prescription item.

    - National superannuitants (Code P)
    - Children, including those people who attract the child benefit (Code J).
    - Social Security beneficiaries which includes those people on invalids, widows, sickness, emergency and unemployment benefits (Code P).
    - The chronically ill (Code Z).

There is also provision for the charge to be waived for individual patients in exceptional situations, e.g. where frequent prescriptions are required. In these instances the medical practitioner should apply to the Director, Division of Clinical Services, P.O. Box 5013, Wellington, setting out the patient's name, the name of the medicine, the frequency of dispensing required, the reason for frequent dispensing, and a statement that it would be unreasonable for the patient to pay. If the application is successful and approval is given for the charge to be waived, Code E, followed by the approval number, should be quoted on prescriptions.

Note:
It is important that exempt prescriptions are written on a separate form from any other prescriptions. If both types of prescription are on the same form, the flat charge will apply to all of the prescriptions on that form.

- If a prescription is to be taken to an outside Pharmacy use the appropriate form. (F375). For a controlled drug (e.g. morphine) form H572 must be used. Temgesic prescriptions must also be written on controlled drug form H572 and this drug is dispensed from Christchurch Hospital Pharmacy only.

DRUGS

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DRUGS OBTAINED FROM THE HOSPITAL PHARMACY

The following drugs can only be dispensed from a Hospital Pharmacy. Amended lists are issued every 4 months. We suggest that you keep this list up-to-date by modifying it as necessary. The list below is for the period 1/12/84 to 31/3/85.

DRUGS REQUIRING THE RECOMMENDATION OF SPECIALIST*

Nefropam
Flucytosine
Aminocaproic Acid
Calcitonin
Colistin Base
Pyrimethamine with Sulphadoxine
Fusidic Acid
Amphotericin B
Sodium Hyaluronate
Verapamil
Kanamycin
Thioguanine
Calcium folinate
Cefamandole
Cefoxitin
Methotrexate
Metyrapone
Mitomycin
Sodium Cromoglycate (Caps)
Thiothixene
Sodium Nitroprusside
Norfloxacin
Pentagastrin
Potassium p-amino Benzoate
Isotretinoin (Dermatologist)
Ceftriaxone
Buprenorphine (Tabs)
Etretinate (Dermatologist)
Aprotinin
Trifluopepridol
Distigmine
Cefuroxime

DRUGS AVAILABLE ON THE PRESCRIPTION OF ANY MEDICAL PRACTITIONER

Corticotrophin
Corticotrophin in 16% Gelatin
**Amphetamine
Hydroxyzine
Cefaclor
Gentamicin
Desferrioxamine
**Dexamphetamine
Lactulose
Pentazocine & its salts
Kaolin,Neomycin Sulphate & Pectin
Cephalothin
Cephazolin
Neomycin
Tobramycin
Sodium Cromoglycate (eye drops)
Methylphenidate
Framycetin
Tetracosactrin
Tetracosactrin Zinc Phosphate Complex
Buprenorphine (inj)
Vancomycin
Cephradine

*If a prescription for one of these drugs is written by A Junior Doctor, he/she must write on the prescription the name of the Specialist who has approved its use.
**These drugs require the approval of the Director of Clinical Services before they can be prescribed.

PRINCIPLES OF THERAPEUTICS

Make an accurate diagnosis: is drug therapy necessary?

- **Choice of Drug**: consider the properties of the drug in the light of the patient profile and drug profile.

- **Patient Profile:** age, weight, sex, race, allergies, smoking history, alcohol history, renal, hepatic, cardiac status, pregnancy, lactation, complete problem list, current therapy.
- **Drug profile:**
  - name, class, alternatives
  - pharmacokinetics (what body does to drug), oral availability, distribution, elimination, altered pharmacokinetics either physiological or in disease states.
  - pharmacodynamics (what the drug does to the body)
  - side effects
  - drug interactions
  - dose regime

- **Drug Monitoring:** achievement of desired effect, use of "therapeutic monitoring" (see below); surveillance of side effects; duration of therapy.

- **Comments**

  - know and use a few drugs well rather than many badly.
  - use the lowest dose of as few drugs for as short a time as possible
  - avoid over-prescribing - "am I treating self or patient?"
  - avoid under-prescribing - if a drug is to be used, use it.
  - write a clear, concise, correct prescription. Use capital letters, and generic name where possible. Indicate tablet strength, the dose, the route, the dose interval and the length of the course.
  - talk to the patient about the drugs and explain why they are being given and what they do. The major cause of non-compliance is poor patient education. A written list of the drugs used and reasons for giving them should usually be given to the patient on discharge.
  - periodically review all drug therapy.

THERAPEUTIC DRUG MONITORING

- **Essential:** lithum, aminoglycosides

- **Important:** phenytoin; carbamazepine; phenobarbitone; quinidine; procainamide; mexiletine; disopyramide; theophylline

- **Useful:** (if limitations understood) valproic acid; clonazepam; ethosuximide; lignocaine; digoxin; salicylate; heterocyclic antidepressants

- **Occasional:** methotrexate, 5-fluorocytosine; paracetamol

NOTE:
Sampling: 5 ml EDTA (lavender top) tubes; (10 ml for antidepressants). Always do TROUGH LEVELS (just prior to next dose) to check for accumulation, and STEADY STATE LEVELS (4 half-lives after start or change of therapy).

Interpretation: if unsure, consult Clinical Pharmacologist or Specialist in relevant area.

DRUG COSTS

The approximate cost of some of the drugs listed in these Guidelines

The following list is included to help prescribers become more cost conscious. Most of the expensive drugs mentioned in these guidelines are included in this list.

The cost for 24 hours treatment for a 70 kg patient at average dosage is given. Where appropriate however the cost for a single dose is given and the cost is then bracketed. These costs were supplied by Pharmacy, Christchurch Hospital.

DRUGS	DOSE	PREP	COST PER 24 HOURS
1. Miscellaneous Drugs			
Prednisone	60 mg	Tab	$ .19
Methylprednisolone	2 g	Inj	$ 91.00
NB Solu-Medrol. The cost will be related to the size of the vial used. For example, 2 g made up from 4x500 mg = $168.64 but if made up from a 2 g vial = $91.01.			
NB Depo-Medrol 40 mg $4.56 (1ml) also comes in a range of vial sizes.			
N.Acetylcysteine	21 g	Inj	($ 53.24)
2. Drugs used for Bleeding and Thrombotic Conditions			
Folic Acid	5 mg	Tab	$ .01
Folinic Acid	15 mg	Tab	$ 11.97
Heparin	40000U	Inj	$ 4.74
Streptokinase	3 x 10^6U	Inj	$364.64
Warfarin	5 mg	Tab	$ .03
EACA	30 g	Tab	$ 12.44
	30 g	Inj	$ 49.20
Tranexamic Acid	3 g	Tab	$ 2.76
3. Antimicrobial Drugs**			
Acyclovir	2.1 g	Inj	$214.29
	1 g	Tab	$ 9.92
Adenine Arabinoside	1 g	Inj	$ 73.00
Amoxil	750 mg	Tab	$ .59
Ampicillin	4 g	Inj	$ 7.52
Benzylpenicillin	2 megaU	Inj	$ .72
Cefuroxime	2.25 g	Inj	$ 17.13
Cephalexin	2 g	Caps	$ 2.31
Chloramphenicol	2 g	Caps	$ 1.53
	2 g	Inj	$ 13.22
Cloxacillin	4 g	Inj	$ 14.50
Co-trimoxazole	4 Adult Tabs	Tab	$ .46
Erythromycin	3 g	Tab	$ 1.92
	2.7 g	Inj	$ 31.83

Flucloxacillin	1.5 g	Caps	$ 1.70
Nitrofurantoin	200 mg	Tab	$ .14
Ticarcillin #	18 g	Inj	$ 72.28
Tobramycin +	350 mg	Inj	$ 27.45
Trimethoprim	300 mg	Tab	$ .38
Vancomycin	2 g	Inj	$ 67.76
(Cholestyramine	27 g	Pwd	$ 1.13)
Metronidazole	3.0 g	Inj	$ 51.00
	1.2 g	Tab	$ .66

#Piperacillin cost is approximately the same. +Gentamicin cost less at $9.00 / day. ** In general the newer antibiotics are expensive e.g. Moxalactam 8g, Inj, $103.60 / day and Cefotaxmine 6g, Inj, $75.00 / day.

CARDIOLOGY

HEART FAILURE

Causes

- Ischaemic heart disease, myocardial infarction.
- Arrhythmias.
- Valve lesions.
- Cardiomyopathy.
- Cardiac tamponade.
- Drugs
  - β blocker) Negative Ionotropes
  - Ca antagonists)
  - Withdrawal of frusemide etc. due to poor compliance.
  - Fluid retention (steroids, NSAIDS)
- Anaemia.
- Thyrotoxicosis - particularly in the elderly.
- Fluid overload - e.g. transfusion, renal failure.
- Hypertension.

Note: Remember mainly right sided heart failure may occur as in pulmonary embolism and cor pulmonale.

Investigations and Diagnosis

- ECG.
- Chest X-ray (may be delayed if clinical picture obvious).
- SMAC (for K^+ - urgent result out of working hours if ECG or rhythm requires it).
- Blood count can be delayed. (anaemia of sufficient severity should be clinically obvious.)
- Drug history.

Therapy

- Sit patient upright and start treatment for any obvious precipitating cause, e.g. arrhythmia.
- For the very distressed dyspnoeic cyanotic patient give oxygen 100% by mask at 6 litre/minute. Nitrobid ointment 1 1/2" to chest, a nitroderm patch, or anginine 1 tablet under tongue whilst IV inserted then morphine 10 mg IV (slow titrated dose) and further 5-10 mg as required. (Caution: do blood gases if chronic respiratory disease suspected.)
- Frusemide 40 mg IV - repeat as necessary to initiate diuresis. The effective dose will vary and a larger dose may be needed if patient is on frusemide maintenance treatment.
- Less distressed patients may not need morphine and oral frusemide may be sufficient. Be alert to poor absorption from an oedematous G.I. tract.
- If BP well maintained use vasodilator therapy. For left-sided failure pulmonary vasodilators may be useful, such as nitrates by any route, sublingual or transdermal, e.g. Nitrobid 1 1/2" 6 hourly to chest or if needed IV trinitrates. Agents acting on peripheral vessels may also be used, for example, prazosin 2 mg TDS and increase if required.

Note: First dose effect not a problem in fluid over-loaded patients. Both nitrates (venous) and prazosin (mainly arterial) may be given as vasodilators.

- Dobutamine may be necessary if persistent hypotension warrants it. Place 500 mg (2 ampoules) in 500 ml 5% dextrose (1 mg/ml) and run through paediatric drip chamber at 10 ml/hour (approximately 2.5 µg/kg/min). Increase dose as required to achieve clinical response. It may be preferable to infuse via a pump. One can give up to 10-15 µg/kg/min but at these dose levels ECG monitoring should be used.

  Note: Blood flow appears to be more important than blood pressure. Therefore if the patient is tolerating a systolic BP of 90-100 or even lower this may be acceptable. In severe cases it may be necessary to add dobutamine to allow vasodilator therapy to be used.

- Captopril therapy - often very effective. Causes hypotension thus use with care. Start with 6.25 mg t.d.s. 1 hour before meals then, depending on renal function, increase up to 25 mg q.i.d. if necessary. Blood screen (neutropenia) and SMAC (K^+ retention) required at 1 week then monthly for 6 months. Generally renders K^+ supplements unnecessary if patient on frusemide.
- Digoxin - indicated for control of atrial fibrillation. Digitalize urgently with 0.5 mg (IV or orally) then 0.5 mg after 4 hours, then 0.25 after a further 4 hours. Thereafter maintenance according to renal function and later digoxin levels. Evening dose recommended.

  Note: For the management of RVF, see p.65 and p.71

Further Management

- Daily weigh. Fluid balance in first 24 hours essential to check diuresis, thereafter unnecessary providing a daily weight is done. Check previous weights from old notes.
- Repeat chest X-ray prior to discharge - otherwise be guided by clinical signs.
- Routine heparin 5,000 units subcut b.d. unless contraindicated. Start on admission.
- Give K^+ if in doubt (except in renal failure and with captopril) and decide whether K^+ supplementation is necessary prior to discharge.
- Myocardial infarction - see next section.
- Arrhythmias - see p.13
- Cardiac tamponade. Chest X-ray may show loss of left heart contour, and an enlarged cardiac shadow or a small heart shadow (restrictive), or may be normal. A small acute increase in pericardial fluid or blood may be sufficient to compromise the heart. Consult cardiologist for urgent Echo if time allows.
- Acute valve lesions - refer urgently (consider the possibility of SBE).
- Cardiomyopathy (Beriberi) - IV thiamine (as Vit. B. complex) may be life-saving in alcoholic patients.
- Anaemia - if appropriate transfuse with packed red cells under diuretic cover.
- Thyrotoxicosis - appropriate consult and TFT's. Management similar but antithyroid drugs might be considered. The use of β blockers and/or verapamil requires specialist supervision.

MYOCARDIAL INFARCTION

Causes

- Ischaemic heart disease
- Emboli (rare)
- Spasm (Prinzmetal angina)

Investigations and Diagnosis

- History of severe crushing retrosternal chest pain radiating to neck and arms is not essential. May present as collapse, LVF, hypotension, peripheral embolus, stroke, or "malaise". A difficult diagnosis to exclude even with normal ECG. Generally if in doubt, the patient is admitted to hospital. If the ECG is normal then the diagnosis must be suspected on the basis of history alone.
- Patients under 70 considered for CCU admission (ring CCU Registrar, Princess Margaret Hospital). Patients of greater age with conditions requiring treament in CCU, e.g. arrhythmias, may be admitted at discretion of CCU registrar.
- ECG daily x 3 - repeat immediately if acute infarct pattern is present but pain resolves to document spasm. Repeat x 1 immediately prior to discharge.
- Cardiac enzymes daily x 3 - omit 2nd and 3rd if diagnosis obvious. Get MB-CPK isoenzymes only if there is a special reason to do so. CPK levels >400 are rarely due to IM injections.
- Chest X-ray may wait until normal working hours but exclude dissection urgently if in doubt, look for widened mediastinum with separation of the calcified intima.
- HB, WBC, platelets + ESR.
- SMAC
- Fasting cholesterol and triglycerides the morning after acute episode. If abnormal repeat at 6 weeks.

Therapy

- IV insertion on admission.
- Oxygen is unnecessary in uncomplicated infarcts if the patient remains well and pain-free.
- Pain relief. Continuing pain suggests ongoing ischaemia which should be treated with nitrates, Ca antagonists, β blockers plus morphine as required. Give morphine 5-15 mg IV according to severity and repeat up to 4 hourly if necessary.
- Anginine may be helpful for continuing pain particularly to test the possibility of spasm. Nitrobid ointment is also useful as it may be wiped off if blood pressure falls.
- Heparin 5,000 units subcut b.d. starting at admission.
- Diazepam 5-10 mg nocte may help some patients.
- β Blockers - continue if patient is already on them and no contraindication to using them. There is now evidence that β blockers improve prognosis and unless contraindications are present β blockers such as metoprolol or timolol should be commenced 3-5 days after infarction and continued for 1-2 years.
- Lignocaine - some ventricular ectopics are inevitable so avoid the reflex use of lignocaine. It is a cardiac depressant and may precipitate or exacerbate heart failure. Treat if ventricular ectopics -
  - fall on T wave or ST segment
  - have more than 2 foci
  - are more than 10/minute
  - occur in brief runs of 3 or more (ventricular tachycardia)

  Give lignocaine 200 mg by IV infusion over 10-20 minutes. If necessary following with infusion of 1000 mg in 500 ml 5% dextrose at 2 mg/ml. Give 1 ml or 2 mg per minute initially and reduce to 1 mg per minute if possible. One may increase to 3 mg per minute if required but if this is necessary for any length of time consider doubling the concentration to reduce fluid load. Watch for lignocaine toxicity if the patient has impaired hepatic function.

CARDIOGENIC SHOCK

- Shock following myocardial infarction implies the loss of a large area of myocardium, and has a high mortality.
- Dobutamine is probably the best drug to use for its positive inotropic effect; it causes little tachycardia and less increase in myocardial oxygen consumption than other drugs. If BP remains below 80 mmHg systolic on dobutamine a vasoconstrictor drug should probably be used (dopamine or adrenaline) to keep the BP above 80 mmHg and thus maintain coronary perfusion. Dobutamine may be combined with this to improve peripheral perfusion and renal blood flow. Digoxin is much less effective than these drugs and has little value acutely other than for control of atrial fibrillation, or other supra-ventricular tachy-arrhythmias. These should be controlled as rapidly as possible.
- Left ventricular failure requires management with diuretics, vasodilators, or inotropic drugs or combinations of these, but great care must be used in the presence of cardiogenic shock and haemodynamic monitoring is essential.
- About 20% of patients with cardiogenic shock have low LV filling pressures and may benefit from fluid infusions. These patients have usually been on diuretics previously. This should only be done with monitoring of wedge pressures. CVP monitoring in cardiogenic shock has little value.
- In young patients intra-aortic balloon pumping should be considered. All young patients (under sixty) with cardiogenic shock should be managed in CCU or ICU.

CARDIAC ARRHYTHMIAS

Causes

- Most common after myocardial infarction. Exacerbated by electrolyte and acid/base imbalance and these should be corrected.

Investigations

- ECG - check speed of paper.
  Note: An oesophageal lead is easily swallowed and may greatly aid diagnosis of SVT (such leads are to be found in CCU (Princess Margaret Hospital) or ICU (Christchurch).
- Pulse at apex and wrist. Blood pressure.
- Evidence for heart failure. Assess the need to treat urgently.
- Venous pressure waves:
  - regular V waves in junctional rhythm
  - irregular V waves in ventricular tachycardia or heart block
  - prominent A waves in right heart strain should not be confused with V waves
- SMAC (Na^+, K^+, Ca^{++}, Mg^{++}).

Treatment

Atrial Ectopics

Often normal, usually benign in MI. Look for atrial beat (may just deform preceding T wave) when diagnosing "extrasystole". Does not require treatment.

Supraventricular Tachycardia

- Sinus: Slow onset, rate below 150 is usually sinus tachycardia (a physiological response) slows with carotid sinus massage. Does not require treatment itself but should alert one to stress stimulus.

- Paroxysmal tachycardia: Sudden onset, rate >150. Carotid sinus massage causes either no response or reversion to normal or increased AV block. (Atrial flutter usually gives a rate of - 150/min and may be misdiagnosed as paroxysmal tachycardia.) If not distressed and not in failure and history of short-lived attacks either
  - do nothing, or
  - Valsalva manoeuvre
  - dive reflex - face into iced water
  - carotid sinus massage at the upper point of the thyroid cartilage for 1/2 inch up and down (one side at a time).

  Monitor the effect of these manoeuvres with ECG.

  If unsuccessful and not on β blockers
  - Verapamil 5 mg IV bolus followed by 1 mg per minute to a total of 15 mg if necessary. Do this with the patient on a monitor measuring BP and with resuscitation equipment nearby. This is best carried out in ICU or CCU.

    Note: Verapamil should never be used for a broad complex tachycardia as this may be ventricular tachycardia and collapse may result.

  If unsuccessful, proceed to cardioversion. The patient should be in CCU or ICU. Use thiopentone 100-500 mg IV (until loss of eyelash reflex). An assistant is essential to ventilate through an oral airway and maintain jaw position. Have someone available who is capable of endotracheal intubation. Alternatively, use Valium 10-20 mg IV. D.C. shock starting with 50 joules then 200 joules, then 400 joules. Do not shock more than twice with 400 joules - consult.

  If on β blockers use disopyramide 50-100 mg IV and/or consider further β blockade (make sure patient is not asthmatic) but DO NOT USE VERAPAMIL. If necessary proceed to cardioversion.

- Atrial Flutter*
  If compromised, cardiovert with low energy shock. If not compromised, digitalization 0.5 mg stat orally or IV. 0.25 mg orally 4 hours then 0.25 mg 4 hours later followed by maintenance dose the next day.

- Atrial Fibrillation*
  Initial treatment is digitalization. Cardioversion is indicated if compromised. Cautious additional verapamil (e.g. 40 mg t.d.s. orally) and/or β blockers may be useful if a high ventricular response rate persists despite digoxin. (Note: Digoxin levels may rise; quinidine may have the same effect.) Failure to control rate suggests that underlying pathology, e.g. thyrotoxicosis has been missed.

  * Do not treat Wolff-Parkinson-White syndrome with digoxin. Pre-excitation syndrome is likely if ventricular rate >200. Use a type I agent, disopyramide, or cardioversion.

Sinus Bradycardia

Check for excessive β blockade. Common after MI. Treat with atropine 0.6 mg IV if heart rate <40 and aim to keep it about 50+. Smaller additional doses of 0.3 mg may be required. Total dose of 2-2.5 mg before atropine side effects occur. One can also use isoprenaline 2 mg in 500 ml 5% dextrose (= 4 µg/ml) and start at 60 ml/hour but then run as slowly as possible (0.5-10 µg/minute) to keep heart rate >60. Note: This drug stresses the myocardium.

Sinus Arrest

Common in inferior infarction and usually benign. It may require treatment with atropine or isoprenaline but rarely needs pacing. When sinus arrest is not associated with infarction, it is due to the sick sinus syndrome and requires pacing. The sick sinus syndrome often presents as a syncopal attack in the elderly with sinus arrest or other dysrhythmia. The diagnosis may require the use of a Holter monitor (ring Princess Margaret Hospital, Senior Cardiac Registrar) and these patients generally require permanent pacing.

> Note: Inferior infarcts may have a wide range of different rhythms without having much adverse effect on myocardial performance. A-V block is commonly seen. These arrhythmias are generally not treated vigorously apart from ventricular tachycardia and fibrillation. If they are persistent and cardiac function is impaired, treatment is indicated.

Nodal Rhythms

These are common after myocardial infarction. Rarely require treatment. Remember digoxin toxicity as a cause. Slow rhythms respond to treatment with atropine and isoprenaline.

Prolonged PR Interval

- 1st degree block does not require treatment. Monitor closely in anterior infarcts and consider pacing as this may precede complete heart block.
- 2nd degree block:
  - Type I (= progressive increase in PR until beat is dropped) may be observed in inferior infarcts but take seriously in anterior infarcts. Consider pacing as it may precede complete block.
  - Type II (PR normal or increased but beats lost in unpredictable fashion). This is a serious rhythm and an indication for temporary pacing.

Bifasicular Block

Stable asymptomatic bifasicular block does not necessarily require pacing. However, following myocardial infarction it may progress to complete heart block and pacing is usually required in this situation.

Complete Heart Block

If stable with regular ventricular escape rhythm and satisfactory blood pressure, may be observed overnight. Be prepared to use isoprenaline to maintain rate if atropine is not effective. Rate required usually >50 but response sought depends on patient's clinical state. Refer for pacing urgently. Symptomatic A-V block not associated with infarction usually merits placement of a permanent rather than temporary pacemaker. Again urgent referral is necessary.

Ventricular Ectopics

Easily confused with atrial ectopics. Atrial origin suggested by preceding P wave, normal QRS morphology or RBBB pattern and incomplete compensatory pause. Use oesophageal lead if in doubt. Treatment indications - see section on myocardial infarction. Treatment outside the setting of an infarct is usually not required, but if in doubt consult.

Ventricular bigeminy may be due to digoxin toxicity - otherwise observe.

Ventricular Tachycardia (VT)

May be confused with SVT but cannon waves and a variable first sound are suggestive of ventricular tachycardia. ECG diagnosis depends on P waves, and these are best seen in V_1 or V_2 or an oesophageal lead if there is time. P waves independent of ventricular rate or fusion beats are diagnostic. Remember VT may be prolonged and not associated with collapse.

- Lignocaine 100 mg IV bolus and repeat before proceeding urgently to D.C. cardioversion. Sedate with Valium or thiopentone as above, if possible. If not proceed to 200-400 joule shock. Maintain on lignocaine as described previously.

Ventricular Fibrillation

D.C. shock.

CARDIAC ARREST

A precordial thump should only be used in a witnessed cardiac arrest.

Commence basic life support - using the A, B, C's of CPR. Call the Cardiac Arrest Team and trolley.
REMEMBER:

- External cardiac compression at 60/min.
- Ventilate once every 5 beats and during relaxation phase.
- Use mouth piece and bag, or mouth to mouth rather than waste time intubating unless you can guarantee success. If you insert an endotracheal tube basic life support must not stop for more than 30 seconds.
- Do not use pupils as an indication to cease resuscitation.
- When the defibrillator arrives, place jelly on the paddles and apply one paddle to the right of the upper sternum below the clavicle, and the other to the left of the left nipple in the anterior axillary line.

- IDENTIFY THE CARDIAC RHYTHM.

- If the rhythm is ventricular fibrillation:
  - defibrillate immediately using 200 Joules of delivered energy. Most authorities are now against using maximum energy of 400 Joules in the first instance.
  - check rhythm; if still ventricular fibrillation, repeat defibrillation 400 Joules
  - if unsuccessful continue basic life support
  - give adrenalin 0.5-1.0 mg (5-10 ml of 1:10,000 solution) IV
  - defibrillate again
  - if unsuccessful, continue basic life support and repeat adrenalin at 5 minute intervals and sodium bicarbonate 50 mmol at 10 minute intervals.
  - blood gases may be useful to help diagnose metabolic problems which are the most common cause of resistant VF.
  - consider using other IV drugs, defibrillating following each: lignocaine 100 mg IV; bretylium 350 mg IV bolus. (If unsuccessful this can be increased to 600 mg IV); procainamide 100 mg IV to a maximum of 1 gm; mexilitine 250 mg IV over 5 minutes; disopyramide 150 mg over 5 minutes; propranolol 1-2 mg per minute - total 5 mg.

- If the rhythm is ventricular asystole:
  - give adrenalin 0.5-1 mg (5-10 ml 1:10,000) IV
  - give sodium bicarbonate 50-100 mmol IV; repeat at 10 minute intervals
  - if ineffective, consider adrenalin infusion
  - consider transvenous or transthoracic pacing

- Bradycardia and Heart Block:
  - atropine 0.6 mg IV and repeat if necessary
  - adrenalin infusion dose dripped fast enough to maintain an adequate heart rate
  - continue basic life support as necessary
  - pacemaker (transthoracic pacing set is in ICU)

- If there is electromechanical dissociation, i.e. organised electrical activity on ECG but failure of effective myocardial contraction:
  - adrenalin 0.5-1 mg (5-10 ml 1:10,000) IV plus 50-100 mmol (1 mmol/kg) bicarbonate IV
  - repeat bicarbonate, 50 mmol at 10 minute intervals
  - consider pericardial aspiration to exclude tamponade
  - if hypovolaemia is possible give IV fluids and raise the lower limbs

POST-ARREST MANAGEMENT

- Maintain basic life support unless the patient has an adequate spontaneous circulation and respiration.
- Provide high inspired oxygen.
- Following V.F., give lignocaine 100 mg IV followed by an infusion at 1-3 mg per minute.
- Monitor ECG and transfer when stable to CCU or ICU. There consider:
  - measurement of arterial gases, pH and electrolytes
  - mechanical ventilation - fractured ribs, aspiration, coma, etc.
  - the possibility of pulmonary oedema
  - brain resuscitation measures if the patient remains comatose after restoration of an adequate circulation
- Complete the necessary forms for the record.
- Refer to Cardiologists for further cardiac assessment and long-term treatment.

HYPERTENSION (Presenting as crisis)

Causes

- Idiopathic.
- Renal - acute nephritis, renal impairment, renovascular and volume overload (especially dialysis patients).
- Endocrine - Cushings, phaeochromocytoma, Conn's, hyperparathyroidism.
- Neurological - raised intracranial pressure, autonomic neuropathy.
- Drugs - presence or absence (clonidine withdrawal).
- Stress/anxiety.

Investigation

- Blood pressure measurement - lying and standing (should be confirmed by medical staff).
- Blood for catecholamines before treatment if phaeochromocytoma suspected.
- Plain abdomen or ultrasound for renal size and calcification.

- MSU (cells ?).
- SMAC - potassium, creatinine, calcium.
- 24 hour urine collection for creatinine clearance. 24 hour protein, Na/K.

Therapy

- The excessive use of powerful IV agents may lead to severe cerebral and myocardial insufficiency. Gentle reduction over hours enables compensatory vasodilatation and cardiovascular changes to develop and decreases end organ damage.
- Hypertensive encephalopathy in adults is associated usually with systolic BP >200 mmHg and diastolic >140/mm Hg. Remember systolic blood pressure of 100 + age is roughly normal. Aim to reduce diastolic to 100 mmHg only. Oral therapy is generally best and only patients having convulsions require IV treatment. Measure BP frequently to monitor the effect of treatment.
- Oral therapy: give labetalol (if no β blocker contraindication) 200 mg p.o. stat then repeat as required up to 1200 mg daily. Nifedipine and captopril may also have a place in therapy or methyldopa 250-500 mg stat then 250-500 mg q.i.d.
- IV therapy: for true acute hypertensive encephalopathy, i.e. sudden severe rise in diastolic blood pressure, headache, convulsions, and neurologic signs including papilloedema; labetalol 50 mg IV over 1 minute followed by further slow IV push injections to total 300 mg. This is usually successful but hydrallazine 10 mg IV 4 hourly may be added. If necessary diazoxide 100-150 mg by rapid IV injection repeated every 15-20 minutes until blood pressure satisfactory or until 600 mg given. Nitroprusside frequently written about but little experience locally with this drug.

  Note: Do not treat cerebrovascular accidents in this way - oral therapy with a slower reduction in blood pressure is mandatory.

  If hypertension associated with acute LVF or volume overload frusemide should be used.
- Phaeochromaocytoma, if suspected, requires α plus β blockade (e.g. labetalol).
- Clonidine and other centrally acting hypertensives on withdrawal may induce a phaeo-like state, therefore avoid β blockers only. Restart clonidine and titrate down or use methyldopa (or labetalol).

AORTIC DISSECTION

Think of the diagnosis if abnormal mediastinum on chest X-ray accompanied by pain. Especially sudden pain in the back plus hypotension.

Causes

- Atheroma
- Hypertension
- Hereditary defects, e.g. Marfan Syndrome
- Cystic medial necrosis

Investigations

- ECG
- Chest X-ray - calcified intimal line separated from aortic outline. High aortic arch.
- Proceed to CT scan + arteriography after radiology consult.
- Crossmatch blood.

Treatment

- Aim to reduce systolic pressure to 100-120 mm Hg and reduce contractility of left ventricle.
- Treat with propranolol or labetalol. Avoid diazoxide and hydrallazine.
- Analgesia, morphine 10-15 mg. Give Stemetil 12.5 mg IV to prevent vomiting.
- Urgent cardiothoracic consultation.
- Monitor renal function.

PERIPHERAL EMBOLISM

Causes

- Consider when acute loss of function occurs with or without pain in limbs, gut, kidney or brain. Particularly following myocardial infarction, or in atrial fibrillation, valve disease, etc.

Investigations

- Arteriography is indicated for the pale cold limb with absent pulses. This is urgent and may help distinguish between embolism and thrombosis.
- MSU/IVU for renal embolus or arteriography.
- CT scan head to exclude haemorrhage if cerebral embolus suspected.
- Surgical consult urgently if gut embolus suspected.

Therapy

- Surgical consult for an embolus → ischaemic limb or kidney is mandatory and urgent.
- Leave an ischaemic limb alone - do not heat or cool.
- Anticoagulant or fibrinolytic therapy may be appropriate if surgery is not indicated.

BACTERIAL ENDOCARDITIS (A recent reference: Lancet i: p.603, 1984)

Fever in association with heart failure and heart murmurs must be considered suspicious. If in doubt treat after blood cultures have been taken. An urgent cardiac consultation is essential.

Investigations

- Blood cultures. Two venepunctures innoculating 3 bottles each time (even only 10 minutes apart) or 4 venepunctures (12 bottles) if antibiotics given in last 2 weeks.
- Chest X-ray.
- ECG
- MSU x 2 before therapy.
- Echocardiography.
- SMAC + baseline creatinine clearance.

Treatment

- Initial Therapy: Penicillin 5 x 10^6 units 6 hourly IV, plus gentamicin. Cloxacillin should be added if staphylococcal sepsis suspected. If normal renal function give gentamicin 3 mg/kg loading dose then 1.5 mg/kg 8 hourly modified if necessary by levels at the 3-4th dose. Prolonged therapy required.

- When Organism Identified
  Revise therapy in the light of the organism(s) isolated and their potential clinical significance and sensitivities, e.g. urgent valve replacement may be needed if staphylococcal or fungal endocarditis suspected.

- Observe closely monitoring cardiac function, renal function and antibiotic levels.

SUB-ACUTE BACTERIAL ENDOCARDITIS, PROPHYLAXIS (See Lancet ii;p.1323, 1982)

Note: These recommendations differ from the National Heart Foundation of New Zealand's 1981 standards which are still acceptable but under review.

Indications

- Previous bacterial endocarditis.
- Prosthetic valve (any implanted prosthetic object requires prophylaxis).
- Known congenital heart or acquired valve disease.

Therapy

- Dental: for extractions, scaling or surgery involving gingival tissues: 3 gm amoxycillin orally 1 hour before procedure. If allergic or recently exposed to penicillin, give erythromycin 1.5 gm orally 1-2 hours before procedure and 0.5 gm orally 6 hours later.

  If procedures are to be done under GA:
  - low risk, 1 gm amoxycillin IM before + 0.5 gm amoxycillin orally 6 hours later
  - high risk patients (previous penicillin, prosthetic valves, previous endocarditis) - as above plus 120 mg gentamicin IM.

  If allergic to penicillin 1 gm vancomycin IV plus 120 mg gentamicin IV or IM.

- Non-Dental Procedures:

  - Genitourinary: Not routinely recommended for simple urinary catheterization, if urine not infected. If urine infected, give appropriate therapy.
    GU surgery or instrumentation with sterile urine: 1 gm amoxycillin IM + 120 mg gentamicin IM + 0.5 gm amoxycillin orally 6 hours later. Those allergic to penicillin - give 1 gm vancomycin IV + 120 mg gentamicin IV or IM.

  - Obstetric and Gynaecological Procedures: Prophylaxis not necessary for minor O and G procedures (D and C, IUCD removal, vaginal delivery) unless patient has a prosthetic valve. Give these patients antibiotics as for GU surgery.

  - Gastrointestinal Procedure: Prophylaxis not recommended for endoscopy or barium studies except for prosthetic valves - give antibiotics as for GU surgery.

  - Other Procedures: Tonsillectomy or adenoidectomy should be treated as for dental procedure under general anaesthetic. Prophylaxis is not required for bronchoscopy but other surgery or instrumentation

of the respiratory tract under GA requires 1 gm amoxycillin IM before induction and 0.5 gm IM 6 hours later.
Patients with prosthetic valves should have an additional 120 mg gentamicin at induction. If penicillin allergy, give 1 gm vancomycin IV + 120 mg gentamicin IV or IM.

Note: 1 gm IM amoxycillin is given with 2.5 ml 1% Lignocaine. If in doubt consult Cardiologist.
Prophylaxis is indicated for surgery on all heavily colonized, infected, or contaminated tissues.

ENDOCRINOLOGY / METABOLIC DISORDERS

ADRENAL INSUFFICIENCY

Causes

- Primary adrenal failure
  - autoimmune
  - tuberculosis
  - haemorrhage
- Secondary
  - pituitary failure
  - adrenal suppression - steroids stopped or not increased at time of stress. May occur with topical or aerosol administration
  - aminoglutethimide

Investigations

- SMAC - low Na, high K, high urea, lowish glucose. (may look like inappropriate ADH).
- Blood screen - may be eosinophilia and neutropenia.
- Chest x-ray - cardiac size (may be decreased).
- Draw blood for cortisol, ACTH, renin and aldosterone (25 ml into EDTA tubes). Contact Biochemistry for immediate 4°C centrifugation and freezing. Contact Steroid Laboratory re assays after discussion with Endocrine Department.
- ECG - to exclude a silent myocardial infarction since this may be present as unexplained hypotension.
- Blood gases - for unrecognised acidosis.
- 24 hour urine for sodium and potassium excretion and creatinine clearance.

Treatment

- Fluid replacement with normal saline to restore arterial and venous pressure. In critical situations a CVP line may be needed. May require up to 1 litre over 2 hours. May require 5%-25% dextrose to raise glucose levels. Amount of potassium infused (if any) based on plasma levels.
- Hydrocortisone 200 mg IV then 50 mg 6 hourly, continue at this level until the patients' condition has stabilised. Then reduce daily dose of hydrocortisone gradually down to a long term maintenance level of 20-30 mg per day, 9α fludrocortisone may also be required.
- Diagnostic work-up should be completed in consultation with the Endocrine Department.
- Steroid induced adrenal suppression may be managed by prednisone 20-60 mg per day which is then rapidly reduced to 7.5 mg daily over 10-14 days. Then reduced by 1 mg each week and hold at 3 mg per day. Leave at this level until Synacthen test shows adequate increment. May need to decrease to 2 mg daily if no increment seen after 2 months. The tailing off process of steroid medication will need to be slowed if the patient is unwell.
- Antibiotics will be needed acutely if there is any suggestion of sepsis. Take appropriate base line cultures. If no particular organism is suspected then broad spectrum therapy, e.g., IV cefuroxime and tobramycin.

Management of Stress Situations in Patients on Maintenance Steroids

- All patients should have a steroid card and medic alert.
- Minor procedures, e.g. dental extraction under local anaesthetic - one should double the daily dose.
- Major surgery or stress
  - 100 mg hydrocortisone IM or IV ½ hour preoperatively. Then 100 mg over the 4 hours of surgery, thereafter 50 mg 6 hourly and reduce as above.

DIABETIC KETOACIDOSIS

Causes

- Insulin dependent)
- Insulin independent) complex aetiologies proposed
- Pancreatitis.
- Insulin withdrawal.
- Stress.
- Sepsis.
- Steroids, thiazides and other drugs.
- Dextrose infusions.

Investigations

- SMAC (creatinine may be falsely elevated if ketones high, due to interference with assay).
- Ketones.
- Blood gases.
- Blood screen including ESR.
- Cultures of blood and urine and any other cultures as indicated.
- Chest x-ray.
- ECG.

Treatment

- IV fluids
  - normal saline 1 litre over 1 hour. Then 500 ml + 10 mEq KCL over 1 hour and then 500 ml 2-4 hourly with 20 mEq KCL. Do not commence K^+ infusion unless K^+ <6.0 mmol/l. The rate of fluid infusion is dictated by the JVP or CVP.
  - Hypotonic saline only used if Na > 150 mmol/l.
- Bicarbonate - give only enough to raise pH to >7.1, do not correct fully. Approximately 50-100 mEq Na HCO_3 may be given over 1 hour.
- Insulin
  - 10 units IV loading dose then put 500 units in 500 ml Haemacell or normal saline. Flush 50 ml through the tubing then run at 6-10 ml per hour (piggy backed) via infusion pump. Increase or decrease according to rate of blood sugar fall. Aim to normalize sugar over 24 hours - no faster. When glucose 12-15 mmol/l start to slow the infusion. Give 5% dextrose 500 ml 4 hourly and slow insulin infusion to 1-2 units per hour. This will allow ketone bodies to be metabolized. Keep normal saline with added potassium, piggy backed if necessary.
  - Then change to background insulin i.e. Monotard 10 units subcut a.m. and 5 units subcut p.m. and stop insulin infusion 2 hours after the last injection. Additional subcut doses of actrapid may be needed according to the blood sugar level:

- > 20 mmol 10 units
- > 15 mmol 5 units
- > 12 mmol 2 units

After 24 hours compute the total dose of insulin given over this period and administer this as a longer acting insulin, e.g. Monotard or Leo Retard giving ⅔ am and ⅓ pm . Stop dextrose drip when patient has been eating satisfactorily for 12 hours.

Note:

- The underlying principle is to avoid hypoglycaemia. Once ketosis is controlled do not strive for excessively rapid control.
- IM insulin is a possible alternative to the IV route. (e.g. 20 units Actrapid stat, then 6 units IM hourly).

MANAGEMENT OF OTHER DIABETIC PROBLEMS

Non-Ketotic Hyperosmolar Diabetic Coma

Such patients are not acidotic and do not need $NaHCO_3$. They will be profoundly dehydrated and ½ normal saline is required if Na is >150.

Management of the Starved Diabetic

- If on oral agents omit drug. Restart when eating for at least 12 hours.
- If on insulin give ⅓ of the normal a.m. dose. Give IV 5% dextrose, the volume and rate being dictated by the clinical situation.
- Check glucose and give actrapid insulin subcut according to the scale given above.

Again a high blood glucose for a brief period does not matter but hypoglycaemia does. Give normal insulin when eating satisfactorily for 12 hours.

Management of the newly detected diabetic

Diagnosis

It is essential that all previous notes are examined to see whether there have previously been raised blood glucose values which makes the diagnosis of inadequate secretion or release of insulin much more likely.

Obstetric history will also be helpful in determining whether there is true carbohydrate intolerance present.

Subsequently, a further blood sugar should be estimated at an appropriate time, remembering that normal blood glucose values in ambulant people are 3.6 to 6.8 mmol/l (4.9 mmol/l ± 2SD).It is unnecessary to undertake a standard glucose tolerance test if more than two blood glucose values are over 11 mmol/l at any time.

Normalization of blood glucose

If the patient is more than 20% above ideal body weight, the first line of treatment will be consultation with the dietitians and a diet begun which allows the patient's weight to slowly fall. The patient should be weighed daily and reviewed every second or third day to see that weight loss is continuing. There is a need to achieve a "dry" body weight before one sees whether calorie restriction actually leads to weight loss. Most people in

medical wards do not lose weight on diets of 3-4 MJ/day.

Patients from ideal to 20% above ideal body weight in older age-groups probably do well on a small dose of 5-10 mg Daonil in the morning. Subsequent blood sugars should return to within the normal range.

Patients requiring insulin treatment (e.g. glucose persistently greater than 14 mmol/l. with no insulin resistance) can be commenced on b.d. insulin forthwith - usually two injections of Monotard daily with two thirds of the dose in the morning and one third at night. The commencing dose is usually between 12 and 20 units and should be adjusted every second or third day. Such patients usually need supplemental insulin Actrapid.

Hospital specialists have been found to be less effective at referring newly diagnosed or previously undiagnosed diabetics to the diabetes education programme than are general practitioners. In a recent review of diabetic patients admitted to hospital over the last three years, only 16% were referred for diabetes education. This compares poorly with the over 80% of newly diagnosed diabetics referred by general practitioners to the Christchurch Diabetes Centre for education for better understanding of the control of their raised blood sugar.

INAPPROPRIATE ADH

Causes

- Tumours - particularly bronchogenic carcinoma.
- Sepsis.
- Drugs:
  - cyclophosphamide
  - vincristine
  - clofibrate
  - NSAID
  - chlorpropamide
  - thiazides
  - carbamazepine

  May not be easy to distinguish from the sodium loss and water replacement often associated with diuretics.

Investigations

Diagnosis established by the following tests associated with the appropriate clinical picture. (Includes normal renal function).

- Plasma osmolality < urine osmolality. (Normal plasma osmolality 285-299 mOsm/kg).
- Low plasma sodium and chloride.
- Urinary sodium usually > 30-40 mmol/l
- ADH levels. Take 10 ml blood into EDTA. Put on ice, centrifuge at 4°C and freeze. If ADH level is deemed necessary then Biochemistry will need to be contacted.

Management

- Water restriction 500-1000 ml over 24 hours.
- Subsequently relax fluid restriction in response to improved plasma osmolality and serum sodium levels.
- Chest x-ray (to exclude tumour).
- Withdraw inappropriate drugs (may include diuretics).

- Treat sepsis.
- If unsuccessful consider drugs acting on ADH release /action.

NB Hyponatraemia is common in many illnesses, therefore take care not to confuse this with inappropriate ADH.

HYPONATRAEMIA NOT DUE TO INAPPROPRIATE ADH

Hyponatraemia with low ECF

- Renal:
  - Addison's disease
  - Diuretics
  - Chronic renal disease
- Extra Renal:
  - Gastrointestinal losses
  - Burns
  - "Third space" losses

Management

- Treat with isotonic saline (sometimes up to 5-10% body weight). Bicarbonate and potassium may also be required.

Hyponatraemia with raised ECF

- Acute renal failure.
- Cardiac failure.
- Liver disease.
- Nephrotic syndrome.
- Inappropriate IV fluids.

Management

- If clinically important restrict fluid to:
  1000 ml/day if Na < 130 mmol/l
  500 ml/day if Na < 120 mmol/l

Hyponatraemia with normal ECF

- Syndrome of inappropriate secretion of ADH (SIADH) (see above).
- Antidiuretic drugs.
- Glucocorticoid deficiency.
- Hypothyroidism.
- Severe potassium depletion.
- Chronic renal disease.

Management

- Treat as for inappropriate ADH.

HYPERCALCAEMIA (if marked this is a medical emergency)

Causes

- Malignant disease - particular myeloma, carcinoma (e.g. breast, renal).
- Hyperparathyroidism.
- Milk/alkali syndrome.
- Thiazide diuretics.
- Sarcoidosis.

- Thyrotoxicosis.
- Vitamin D intoxication.
- Bed rest.

Investigations

- SMAC - calcium, magnesium, phosphate, alkaline phosphatase, total protein, albumin, creatinine.
- Ionised calcium level (10 ml blood plain tube, fill to top. Advise Princess Margaret Hospital Biochemistry, and send directly via courier minimizing any delays).
- ? parathormone levels (10 ml clotted blood separated and then stored at 4C . Contact Princess Margaret Hospital, Biochemistry).
- Creatinine clearance (renal function).
- Chest x-ray ± plain abdominal x-ray (? calculi).
- Blood screen and ESR.
- Protein electrophoresis and immunoglobulin levels.
- Spine x-ray (metastatic disease) ± skull x-ray (myeloma).
- X-ray hands (best site for hyperparathyroidism).

Note:

Observed calcium levels will need to be corrected if there are major alterations in plasma albumin levels.

Correction formula:

Corrected calcium = observed calcium + [(40-albumin g/l) x 0.02 mmol/l]

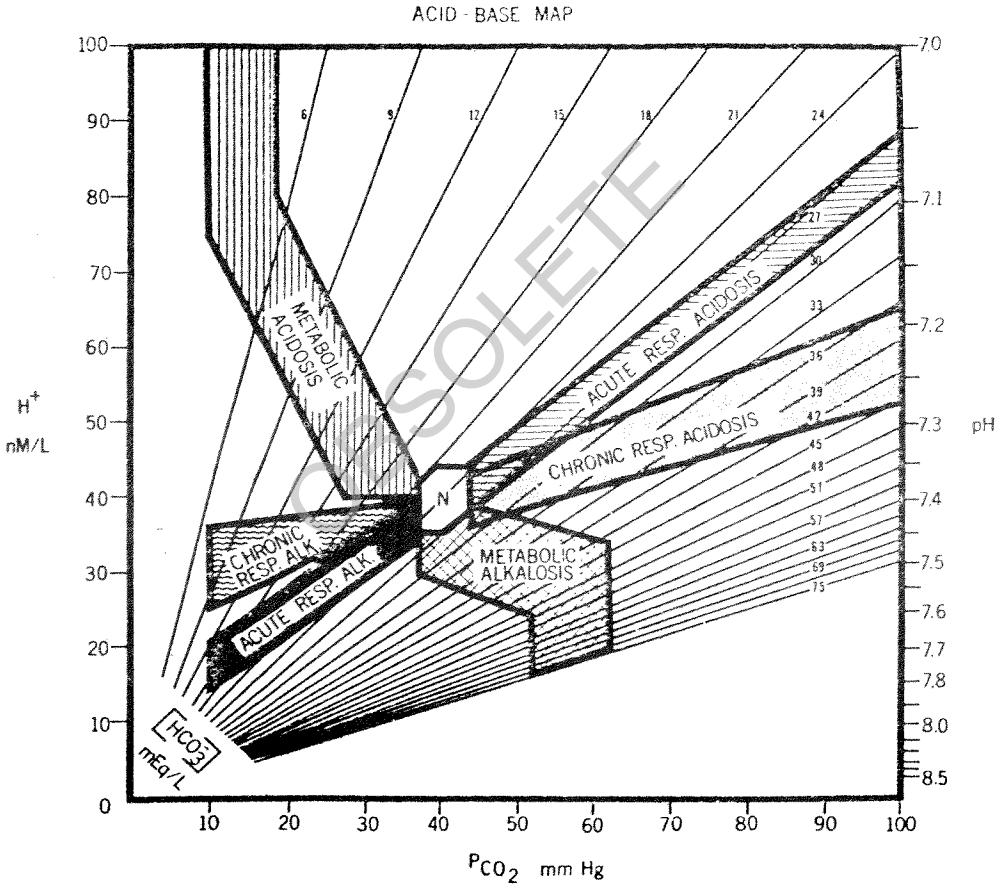
Management

This will depend on the severity and clinical context. Minor elevations of serum calcium will usually not require additional therapy apart from ensuring adequate hydration and monitoring any rise associated with immobilization. A marked elevation is a medical emergency. If hypercalcaemia is causing significant symptoms and active treatment is deemed appropriate then the following is recommended.

- Fluids
  - correct dehydration with 4-5 litres in 24 hours orally and IV. Monitor closely to avoid fluid overload. Start with 1 litre normal saline over 2 hours then 0.5 litres normal saline 3-4 hourly and reassess at 18-24 hours. Potassium supplements 10-20 mEq KCL per 500 ml may be required.
- Diuretics
  - 40 mg frusemide IV after initial 1 litre hydration should be given then a further 10 mg frusemide to each 500 ml IV bag.
- Hydrocortisone
  - 100 mg IV 6 hourly or oral prednisone 60-80 mg daily should be given if malignant disease sarcoid or hypervitaminosis is the underlying cause.
- Stop thiazides.
- Mithramycin, although toxic, may be given and acts within 12-36 hours. The need for this is rare and requires appropriate consultation.
- Calcitonin has a place and will lower plasma calcium temporarily
- Oral phosphates may be helpful. Do not give phosphates IV.
- Hypercalcaemic patients who have or may have an underlying malignancy, such as myeloma, deserve the opinion of a Haematologist or Oncologist as soon as possible.
- Parathyroid surgery (Endocrine and Surgical consultation).

ACIDOSIS / ALKALOSIS

The diagram shown below allows easy interpretation of most clinical disorder of acid / base balance.



A diagnosis of **respiratory acid/base disturbance** reflecting abnormal pulmonary function should be investigated and managed as discussed in the respiratory section. In general, respiratory acidosis is managed by increasing effective ventilation and reducing $paCO_2$.

The diagnosis of metabolic acidosis may be more difficult. Acidosis may be associated with an increased anion gap which is of some value in diagnosis. The gap may be increased by ketones, lactate, some poisonings e.g. salicylates and in late renal failure.

ANION GAP = (sodium concentration) - (chloride concentration + bicarbonate concentration) and is usually <15 mmol/l.

Causes of Metabolic Acidosis

- Diabetic ketoacidosis.
- Renal acidosis
  - renal failure
  - renal tubular acidosis
- Lactic acidosis (biguanide induced, severe shock, post alcoholic binge).
- Formic acid (in methyl alcohol poisoning; may need treatment with ethanol urgently).
- Ethylene glycol poisoning.
- Salicylate poisoning.

Investigations

- SMAC.
- Blood gases.
- Toxicology - as appropriate.
- Lactate level if lactic acidosis suspected.

Treatment

- Na HCO_3 to correct severe acidosis.

  Deficit = 0.3 x base deficit x weight in kilograms

  Give half this as mEq HCO_3 over 10 minutes and remaining half over hour. Do not over correct, aim for pH = 7.2

- Treatment where appropriate for toxic agents.

GASTROENTEROLOGY

HAEMATEMESIS

Causes

- Peptic ulceration
  - gastric
  - duodenal
- Gastric erosions
  - alcohol
  - drug induced - especially salicylates and NSAIDS
  - acute "stress" erosions
- Reflux oesophagitis.
- Oesophageal or gastric varices (associated with portal hypertension).
- Mallory - Weiss Syndrome.
- Swallowed blood from mouth or nasopharynx.
- Gastric or oesophageal tumour.
- Hereditary haemorrhagic telangiectasia.
- Abnormal haemostasis.

Investigations

- Blood screen, ESR.
- SMAC.
- Crossmatch 3-6 units resuspended cells and / or whole blood depending on amount and rate of blood loss.
- Coagulation profile.
- Gastroscopy and gastroenterology consultation - the former may be delayed 12-24 hours without reducing diagnostic value.
- Barium meal may be indicated after gastroscopy but is seldom necessary.
- Chest x-ray (aspiration).
- Blood alcohol.

Management

- Treat blood loss with saline, SPPS and then blood replacement. Stop any offending drugs.
- Nasogastric tube may be used to reduce risk of aspiration and monitor bleeding rate.
- Ice and water via NG tube are useless.
- Antacids and H_2 blockers do not stop or reduce bleeding from ulcers, but may be prescribed later to promote ulcer healing.
- Cimetidine 200 mg IV 4 hourly may reduce bleeding from gastric erosions; Auldrox 30 ml orally 2 hourly should also be given.
- Bleeding associated with varices may respond to intravenously administered vasopressin. Give either 20 units vasopressin in 100 ml 5% dextrose over 20 minutes, which may be repeated 4 hourly, or 0.2 units/kg/hr by continuous infusion. Use with caution in the elderly and in patients with coronary artery disease. May require ECG monitor.
- Consult surgeon or gastroenterologist as variceal injection with sclerosing fluids may be helpful.

An urgent surgical consult is important if:

- known ulcer continues to bleed or bleeding recurs
- > 3 units of blood are required
- perforation suspected

ACUTE DIARRHOEA

History

- Initial clinical assessment is very important, including the severity of the diarrhoea, passage of blood, history of surgery or radiation. Recent drugs including antibiotics and recent travel abroad. Any contact with similar illness? Details of food recently eaten. Occupational history important.

Investigations

- Must include a rectal examination. A sigmoidoscopy ± rectal biopsy may be necessary.
- **Stool Examination** - if clinically warranted 3 stools should be sent, one every second day. Analysis may include:

  - Microscopy - for leucocytes (pus) and red cells.
  - Fresh stool - for parasites and bacteria - sent to lab promptly. If there is a delay then a stool sample should be collected in a bottle of PVA/HgCl mixture, obtainable from the Microbiology Department. (e.g. giardiasis).
  - Culture for bacterial pathogens e.g. Salmonella / Shigella / Campylobacter. The latter requires special culture media and thus must be specifically requested on the pathology form.
  - Cl difficile cytotoxin assay on fresh stool if antibiotic associated pseudomembranous colitis is suspected. This result can be available within six hours.

- **Radiology** - Plain x-rays of the abdomen are essential to detect colonic dilatation if toxic megacolon is suspected and to detect perforation. Barium enemas are contraindicated in acute diarrhoea. They may be done when the diarrhoea has settled to define the extent of inflammatory bowel disease.

Management

- Intravenous fluids if necessary. Remember that as faecal losses increase, the electrolyte composition of faecal fluid changes to approach that found in plasma. When faecal losses exceed 2-3 l/day Na losses will be about 100-120 mmol/l and K losses 5-15 mmol/l.
- Avoid constipating drugs such as diphenoxylate, loperamide and codeine in any patient with an acute diarrhoea. There is good evidence that they may prolong an infectious diarrhoea, and they may adversely affect the course of inflammatory bowel disease.
- Salmonella / Shigella / Campylobacter dysenteries are usually self limiting and antibiotics should be resorted to only when the illness is severe with systemic upset and / or septicaemia. These are notifiable diseases - (see appendix).
- Pseudomembranous Colitis: Always suspect this when antibiotics have been taken within the past 3-4 weeks. Sigmoidoscopy may not show the characteristic pseudomembranes and reveal only a mild non-specific and non-friable proctitis.
  If there is reason to suspect this diagnosis you need not delay therapy. If you are uncertain of the diagnosis cholestyramine may be started while waiting for laboratory confirmation. Cholestyramine (Questran) may be given at the beginning of a meal in a dose of one scoop (or 9 gms) 8 hourly. Cholestyramine should not be given at the same time as vancomycin and metronidazole. If you are confident of the diagnosis or

the toxin has been demonstrated the treatment of choice is vancomycin 125-500 mg 6 hourly orally (use parenteral vials of vancomycin) until the patient has fully recovered. There is about a 20% relapse rate, which will respond to a second course of vancomycin. Metronidazole may also be effective in this condition and is cheaper.

- Toxic Megacolon: In a person with inflammatory bowel disease with signs of toxicity and increasing diarrhoea always suspect toxic dilatation of the colon. Check with x-rays and if need be follow daily. Check abdominal girth daily. Give IV fluids / blood, hydrocortisone (400 mg /day), oral salazopyrin, limit oral intake. Consult a Gastroenterologist, and always get a surgeon involved as soon as possible to plan management. Unless clear improvement is seen within 48 hours an emergency colectomy should be considered. The mortality rate from toxic megacolon increases rapidly over the age of 50.
- Many other causes of acute diarrhoea may need to be considered.

TREATMENT OF HEPATIC ENCEPHALOPATHY

Causes

- Chronic liver disease with acute deterioration precipitated by:
  - G.I. haemorrhage
  - Sepsis - particularly gram negative infections
  - Drugs especially diuretics
  - Hypokalaemia
- Acute severe hepatic necrosis:
  - Carbon tetrachloride -consider dialysis
  - Hepatitis - acute viral (rare). (Submassive hepatic necrosis)
  - Paracetamol poisoning (see overdose section)

Investigations

- SMAC.
- Screen and full coagulation profile.
- Drug screen - collect in heparinised tubes with beads. If non-urgent store overnight in fridge at $4^{o}C$. Consult toxicology in light of possible drug exposure. Urine may also be needed.
- Hepatitis B testing. It is important to establish this status early and patients should be treated as infectious until proven otherwise. Haemagglutinin test results can be available within a few hours.
- Blood ammonia - requires Biochemistry staff to process blood at the bedside.
- Blood group and hold serum.

Management

- Treat hypokalaemia.
- Treat sepsis.
- Withdraw offending drugs - use Valium 5 mg if requred for sedation. Remember sensitivity to opiates and phenothiazines.
- High carbohydrate diet initially with nil protein. Then commence low protein diet (20-40 gm/day) increasing gradually to the maximum the patient can tolerate without developing encephalopathy.
- Gut sterilization neomycin 1 gm 4 hourly or lactulose 30 ml t.d.s. and adjust to produce 3 loose stools per day.
- Treat hypoglycaemia as required with IV dextrose.
- Coagulation defects. Vitamin K IV and / or orally may be helpful. Fresh frozen plasma if required is obtained from Blood Bank.
- Consult Gastroenterologist.

MANAGEMENT OF HAEMORRHAGIC DISORDERS

Platelet disorders usually result in surface bleeding such as epistaxis and petechiae. Coagulation disorders on the other hand produce deep bleeding such as haemarthroses or muscle haematomas. There may be a mixed pattern of bleeding in DIC. Fatal intracranial haemorrhage may occur however in either severe thrombocytopenia or a severe coagulation deficiency.

Investigation of a Patient Presenting with a possible Haemorrhagic Disorder

- Family history, history of pattern of bleeding; recent drugs; dietary history.
- Blood cell count, especially platelets, ESR, blood film examination.
- Prothrombin time, partial thromboplastin time, thrombin time and fibrinogen level. Use coagulation profile tubes if possible and these can be obtained from the Haematology Department. Otherwise use Citrate (prothrombin tubes). Take care to add the correct amount of blood to these tubes and avoid heparin contamination from "SMAC" tubes, heparin containing IV lines etc.

  Take blood samples before any transfusions are given.

  Note: These are only screening tests and do not necessarily exclude mild defects which may nevertheless result in abnormal bleeding following trauma.

Treatment

- This is entirely dependent on the results of the initial tests obtained. If a severe thrombocytopenia is present then this constitutes a medical emergency. Patients with known coagulation defects (haemophilia A, Christmas Disease, etc) present special problems and consultation (day or night) is essential when these patients are admitted outside the Haematology Service. Patients with an established coagulation defect may carry a card giving essential details of their condition. Those living around Christchurch will have record cards available in the Haematology Department and Ward 29 giving the relevant Factor levels and some clinical details. Always take a suspected bleed seriously; always take careful note of any advice the patient gives you, in this context they are usually right.

- In haemophilia A and von Willebrand's disease life threatening bleeding requires immediate IV Factor VIII infusion, with either cryoprecipitate or more concentrated freezedried preparations. A rough guide is given by the following formula which is suitable for cryoprecipitate and other Factor VIII concentrates.

  $$\text{Units of Factor VIII required} = \frac{\text{weight in kilograms} \times \%\ \text{rise desired.}}{2}$$

  Note: 1 pack of cryoprecipitate = approximately 70 units.

- You will need to know what level of Factor VIII it is desirable to achieve in any particular clinical situation and therefore urgent Haematology consultation is essential. In Christmas Disease (Factor IX deficiency) plasma or Factor IX concentrates are the treatments of choice. Consult Haematologist for this and less common coagulation

disorders. The management of a severe thrombocytopenia will depend on its cause but serious or life threatening bleeding will require platelet transfusions.

MANAGEMENT OF SEVERE ANAEMIA

The following management is suggested for severe anaemia (a haemoglobin of 50g/l or less) in the absence of acute blood loss or shock. Some causes include: iron deficiency, B12 and folate deficiency, leukaemias, aplasia, haemolysis, renal failure.

Investigations

- Blood cell count note particularly haemoglobin, MCV, white cell count, differential, platelets and reticulocytes.
- MCV <80 fl - probable iron deficiency, get Fe/transferrin and ? ferritin.
- MCV >100 fl - could merely reflect retics ↑ - haemolysis / blood loss, but if retics normal B12 and folate levels should be done.
- MCV 80-100 fl - consider renal failure, thyroid hypofunction and acute blood loss.

Decide whether a bone marrow is required. Consider direct Coombs test etc if haemolysis suspected. These generalizations do not necessarily apply to patients with mild or moderate anaemia.

Treatment

- Once blood samples have been taken and a bone marrow has either been performed or been deemed unnecessary, treatment may be started with oral iron and / or oral folic acid and / or IM hydroxylcobalamin if one of these haematinic deficiencies seem likely. Recommended preparations are ferrous gluconate 300 mg b.d., folic acid 5 mg daily and hydroxylcobalamin 1 mg every other day for 6 doses, followed by maintenance treatment.
- At this degree of anaemia transfusion should be given with extreme caution, if at all, if a deficiency state is present. A partial exchange transfusion may be needed for someone in heart failure and in elderly patients. Close observation and diuretics will be needed. Transfusion may make subsequent diagnosis difficult particularly in cases of haemolytic anaemia and some deficiency states.
- If in doubt a phone consultation with the Haematologist may be helpful as the appearances of the blood film may give further information of practical value (e.g. in haemolytic anaemias).

MANAGEMENT OF SEVERE NEUTROPENIA

- If the neutrophil count is $<0.5 \times 10^9/l$ there is a significantly increased risk of severe or fatal sepsis. Try to identify the cause of this abnormal blood count.
- Drug toxicity, severe sepsis, leukaemias, aplasia are a number of possible causes.
- Unless the cause is obvious and temporary, investigations should include examination of the bone marrow.

Treatment

- The initial treatment should consist of isolation of the patient. At least place the patient in a single room and institute strict hand washing for the attending staff. Restrict the number of visitors.

Consider gut "sterilization".

- If febrile take blood cultures and other appropriate investigations. If fever is maintained above 38°C for more than 4 hours parenteral broad cover antibiotics such as cefuroxime, tobramycin and ticarcillin or tobramcyin and piperacillin should be given. Suitable dosages for these antibiotics are as follows.
  - Tobramycin 3 mg/kg IV stat. then 1.5 mg/kg 8 hourly, given in 100 ml saline over 30 minutes or by IV bolus. Get pre and post antibiotic levels around the 3rd or 4th dose. Thereafter monitor with levels according to the clinical state. Note dosage reduction will be needed if renal impairment is present and if necessary seek advice. Recommended dosages for adults for cefuroxime are 0.75-1.5 gm 8 hourly IV, ticarcillin 3g 4 hourly IV, and piperacillin 4 g 8 hourly IV. All these drugs may be given by IV bolus or 30 minute infusion. It is a mistake to await the results of cultures in this situation. A Haematologist should be consulted.

THE USE OF ANTICOAGULANTS AND RELATED DRUGS

Heparin

- The anticoagulant effect is immediate. Heparin is best given by continuous infusion in syringe pump or rate controlled drip with an initial 5,000 IU IV bolus. Check PT and PTTK before starting treatment. Control with PTTK and aim for a time of 80-120 seconds. Check PTTK 2-3 times daily till controlled then daily. Dose required usually lies between 20,000-80,000 IU/24 hours, and it is reasonable to start at a rate of 30,000-40,000 IU/24 hours.

Warfarin

- Anticoagulant action begins in hours to days related to the half lives of the factors affected (II, VII, IX, X). Antithrombotic action takes some days to achieve. Check PT and PTTK before starting treatment. "Loading" dose not necessary and may increase danger of bleeding. Recommended initial dosage is 5-10 mg/day if pre-treatment PT ratio < 1.4 and aim to start 4-5 days before it is planned to stop heparin. During this time check PT and PTTK at least daily. The prothrombin ratio should be a reliable guide to warfarin dosage provided PTTK is <100 seconds. Start at the lower dose if there is any reason to suppose that the patient will be sensitive to warfarin e.g. initial PT raised, abnormal liver function tests or drugs known to cause increased sensitivity to oral anticoagulants (see below). The "therapeutic" range is a prothrombin ratio of between 2-4.
  An initial or starting dose schedule for warfarin administration was recently reported and may be helpful (**BMJ 1984; 288; 1269**).

Drug interactions with Coumarin type oral anticoagulants (Ref: BMJ 1982; 285; 274)

Drugs expected to potentiate oral anticoagulants

Alcohol-dose dependent
Allopurinol
Anabolic steroids
Aspirin & its analogues-in large doses
Chloramphenicol
Clofibrate
Chlorpromazine
Cimetidine
Glucagon
Ketoprofen
Ketaconazole
Mefenamic acid
Naproxen
Neomycin
Oxyphenbutazone
Phenylbutazone

Co-trimoxazole
Danazol
Dextrothyroxine
Disulfiram
Ethacrynic acid
Quinidine
Salicylates (see aspirin)
Thyroxine

Drugs which antagonise or may antagonise anticoagulant therapy

Antacids
Antihistamines
Barbiturates
Carbamazepine
Cholestyramine
Corticosteroids
Glutethimide
Griseofulvin
Mercaptopurine
Oral contraceptives
Phenytoin
Primidone
Rifampicin
Vitamin K-only K_1 & K_2

Drugs potentiated by oral anticoagulants

Chlorpropamide
Phenytoin
Tolbutamide

Streptokinase (Fibrinolytic Therapy)

- Indications for usage still not clear. May be recommended for recent large vein thrombosis (e.g. ilio-femoral, axillary) or life threatening pulmonary embolus if no contraindications are present. Take citrate specimen to measure antistreptase antibodies and give 250,000 IU over 30 minutes followed by 100,000 IU hourly either by pump or rate controlled drip. We recommend controlling streptokinase treatment with thrombin times aiming for 2-4 times the control value. The length of the streptokinase infusion will depend on the clinical situation. IV heparin should be commenced before thrombin time drops below twice normal. Hydrocortisone may be used to prevent allergic reactions. The Haematologist should be consulted as this treatment is more hazardous than heparin and any abnormal bleeding tendency is not easy to reverse.

TREATMENT OF ANTICOAGULANT OVERDOSAGE

Heparin

- Note short half life (about 30 minutes). Reversal only necessary if serious bleeding. Protamine sulphate must be given slowly and may cause serious allergic adverse reactions. If necessary give protamine sulphate IV 1 mg per 100 IU of heparin estimated to be remaining in circulation. Neutralization tests can be performed but are of limited value.

Warfarin

- Rapidity and extent of reversal will depend on clinical situation. For example if ratio is high and there is no bleeding, withdrawal of warfarin may be sufficient. In desperate situations immediate but transient reversal may be obtained with IV 1-2 units of fresh frozen plasma. For delayed but complete reversal give IV 5 mg Vitamin K slowly. For delayed but partial reversal with return of ratio to therapeutic range but not to normal IV Vitamin K 1 mg. In general Vitamin K takes about 4 hours to produce its effect.

Streptokinase

- Abnormal haemorrhage may be very difficult to correct at least for some hours. Consult Haematologist.

PERIPHERAL VENOUS THROMBOSIS

Clinical

- Difficult (? impossible) to diagnose clinically especially if thrombus is restricted to calf veins. There is usually swelling, bluish discolouration, pain and tenderness.

Precipitating Causes

- Surgery. Immobilization including travel. High oestrogen oral contraceptives. Stilboestrol. Polycythaemia. Thrombocytosis. Malignancy. Anti thrombin III or protein C deficiency (check for family history of thrombosis).

Investigations

- Venography is the most sensitive test **(Lancet 1984; ii: 716)** and this should be carried out on a semi-urgent basis. If you think a DVT is possible get venography done. Hospital admission may be avoided if venography is carried out on patients presenting to A & E with suspected DVT. However remember that if the thrombosed vein is totally occluded it may not be detected on venography. Thus clinical judgment will be needed to make a final decision if the venogram is reported as negative. In the middle of the night it could be reasonable to give heparin if DVT is strongly suspected and perform venography to confirm the diagnosis the following day. Remember however that heparin can be lethal. Check:-

    - Blood screen, ? polycythaemia, ? raised platelets
    - PT, PTTK before starting anticoagulant treatment
    - If venogram negative consider arthrography if ruptured Baker's cyst is a possibility

Management

For dosage details see section on anticoagulant drugs.

- Heparin - the duration of treatment can be reduced to 4 days if the thrombosis is limited to calf or lower femoral veins. For ilio-femoral thrombosis or for pulmonary embolism a 7-10 day heparin infusion is still recommended. If a 4 day heparin infusion is planned warfarin will need to be started at the same time.
- If massive thrombosis and no contraindication consider fibrinolytic therapy.
- If ruptured Baker's cyst - bedrest, 40 mg Depo-Medrol into the joint. Rheumatology consult.
- Investigate a thrombotic tendency on completing warfarin therapy if the family history is suggestive, patient is young or there are no obvious precipitating causes.

MEDICAL ONCOLOGY

Superior Vena Cava Obstruction

This condition usually evades medical diagnosis for several weeks after the patient presents with a sensation of fullness in the head. Consequently, the condition is often well advanced by the time the patient is seen by a hospital specialist. Speed in consultation with an Oncologist, Radiotherapist or Haematologist is recommended as more than 95% of superior vena caval obstructions are due to an underlying malignancy, usually carcinoma of the bronchus or malignant lymphoma. Response to radiotherapy and/or chemotherapy is suboptimal if thrombosis has occurred, consequently urgent referral as soon as possible is desirable.

Hypercalcaemia

A high proportion of hypercalcaemia patients will have an associated underlying malignancy, the commonest being myeloma and breast cancer. Patients with these malignancies who develop hypercalcaemia should be referred immediately to their Oncologist or Haematologist. Any patient with hypercalcaemia who is strongly suspected of having an underlying malignancy should also be referred as early as possible.

The measures described in the Endocrinology section will ameliorate the hypercalcaemia, but the problem must also be tackled at its basic level. The hypercalcaemia of most malignancies will not be controlled satisfactorily unless the cancer is treated specifically. In particular, the hypercalcaemia associated with myeloma and breast cancer often resolve within 24-48 hours of specific chemotherapy. It is unwise to try to control the calcium in isolation and early consultation with the appropriate specialist is recommended.

Inappropriate secretion of ADH and other para-neoplastic syndromes

There are too many of these to list and unquestionably, inappropriate secretion of ADH is the one most commonly seen in clinical practice. The most common cause of this syndrome and the other paraneoplastic syndromes is bronchogenic carcinoma. Small anaplastic cell bronchogenic carcinoma is the most common tumour to be associated with these syndromes and this is, in the short term, eminently treatable and consultation is advised.

NEPHROLOGY

ACUTE RENAL FAILURE

Defined by elevation of plasma urea and creatinine as 30% of these patients are not oliguric. The following are among the most important aspects in the management of acute renal failure.

- Hyperkalaemia.
- Correction of dehydration.
- Relief of urinary tract obstruction.

Causes

There are many causes - some important ones are listed below:

- Pre-renal
  - hypovolemia or hypotension
- Renal
  - nephrotoxins including drugs and chemicals
  - acute glomerulonephritis
  - haemolytic uraemic syndrome
  - acute-on-chronic renal failure, e.g. polycystic disease, analgesic nephropathy, diabetic nephropathy
- Post-renal obstruction
  - **tubular** - urates or Bence Jones Protein
  - **ureteric** - single kidney with calculus, bilateral uric acid sludging, retroperitoneal involvement by tumor or fibrosis. Pelvic involvement by carcinoma of bladder or cervix
  - **prostatic**

Investigations

Evaluation of the state of hydration is crucial in the management of these patients. Therefore initially one must assess hydration by means of weight, blood pressure (lying and standing), and jugular venous pressure or possibly central venous pressure.

- Rectal and vaginal examination to detect prostatic enlargement or pelvic masses.
- Urine - microscopy, culture and biochemistry. Ward should test for blood and protein.
- Blood screen and SMAC, the latter at least daily. Serum potassium may be required more often.
- Renal ultrasound to exclude obstruction.

Management

- Stop nephrotoxic drugs.
- Ensure optimal hydration with appropriate fluid - blood, albumin, SPPS, or normal saline. When hydration is normal give 600 ml plus urine output and other losses per 24 hours, either as oral fluid intake or 5% dextrose. Replace sodium losses as normal saline within this volume.
- Do not give diuretics unless fluid overloaded. Then try 40 mg IV frusemide doubling 2 hourly to a maximum of 500 mg, unless already on nephrotoxic drugs.
- Ureteric obstruction - consult urologists immediately.
- Outlet obstruction - suprapubic drainage probably best. Refer to urologists urgently.

- Hyperkalaemia. This should be treated according to its severity.

5.5-6.5 mmol/l	Resonium-A 15-30g orally or rectally 3-4 times daily.
6.5-7.5 mmol/l	As above plus ECG and 25-50 ml 25-50% dextrose + 12 units IV actrapid insulin. $NaHCO_3$ 80-120 mmol IV, but not if fluid overloaded
>7.5 mmol/l	as above but also give 10-30 ml 10% calcium gluconate IV. Consult re immediate dialysis

- Indications for immediate dialysis:
  - urea >35 mmol/l
  - K>7.5 mmol/l
  - pericarditis
  - cardiac failure or fluid overload

Note:

Care should be taken with IV line insertion - veins may be required for shunt or fistula formation. Try to use the dominant arm and avoid the forearm veins. Try to avoid radial and brachial artery for blood gas sampling from the non-dominant arm. However, it would be inappropriate if the patient was inadequately resuscitated because good veins were not used due to a fear that they might be required for vascular access at some time in the future.

Interpretation of urine biochemistry in oliguric patients, without cardiac or liver disease and not given diuretics, to distinguish pre-renal from renal causes of oliguria.

MEASUREMENT	REVERSIBLE OLIGURIA (PRE-RENAL ARF)	ESTABLISHED OLIGURIA (ARF)
Osmolality (mmol/l)	> 500	< 400
Na (mmol/l)	< 20	> 40
Urine:Plasma Urea	> 10-20	< 3
Urine:Plasma creatinine	> 30	< 20
Fractional excretion Na $\frac{U:P\ Na \times 100\%}{U:P\ Creatinine}$	< 1*	1

*Also in acute glomerulonephritis

DRUGS AND THE KIDNEY

- Most drugs (or their metabolites) used in hospital practice are excreted in whole or in part through the kidneys.
- The dose of most drugs prescribed in hospital practice should be modified in patients with renal insufficiency according to the fraction excreted unchanged and the creatinine clearance. This is particularly important for drugs such as the aminoglycosides, cephalosporins, cimetidine, digoxin, procainamide, captopril, and some of the B-blockers. The fraction of the drug excreted unchanged is readily found in standard textbooks. Drugs which are mainly metabolized do not usually

require dose adjustment in renal insufficiency unless an active metabolite is excreted through the kidney.
- Some drugs should be completely avoided or used with very great care in the presence of renal insufficiency - tetracyclines (except doxycycline), co-trimoxazole, nitrofurantoin, nalidixic acid, potassium-sparing diuretics (spironolactone, amiloride, triameterene) and the non-steroidal anti-inflammatory drugs.
- The plasma creatinine alone is not a sufficiently accurate guide to the glomerular filtration rate, particularly for the small or elderly patient.
- Cookcroft and Gault **(Nephron 1976, 16:31-41)** developed a simple bedside formula to predict the creatinine clearance without having to collect urine and using the variables of plasma creatinine, body weight, sex and age. The formula is as follows:

$$C_{Cr}\ (ml/sec) = \frac{(140 - age) \times weight\ (kg)}{48869 \times plasma\ creatinine\ (mmol/l)}$$

For females the predicted creatinine clearance can be derived from the formula minus 15%. This formula has not been tested in infants or young children, but is accurate from the age of 12 years onwards.
- If in doubt concerning the prescribing of a drug in a patient with renal insufficiency seek advice.

ACUTE PYELONEPHRITIS

- A syndrome of fever (>37.8°C) ± rigors, loin pain or tenderness together with infected urine.
- Lower urinary tract symptoms may be absent.
- Symptoms may be unilateral or bilateral.
- Patients with severe acute pyelonephritis require hospitalization.

Causes

- Acute pyelonephritis may occur in a structurally normal urinary tract or as a complication of some underlying urinary tract disorder.

Investigations

- The clinical features are usually clear-cut, but the diagnosis must be confirmed bacteriologically. In a patient with symptoms and signs suggestive of acute pyelonephritis a single voided clean-catch mid-stream urine specimen containing >100 x 10^6 organisms/l has a high confidence limit. Significant pyuria (> 10 x 10^6 white cells/l) will invariably be present. However bacterial counts of < 100 x 10^6/l may also be consistent with the diagnosis, particularly if the patient has marked frequency of micturition. To eliminate the problem of contamination of voided urine samples it is preferable to obtain urine by suprapubic aspiration from a distended bladder. A specimen obtained in this manner can be examined microscopically and if any organisms are seen then treatment can be started at once. Moreover a suprapubic aspirate may be stored for several hours and still allow an accurate bacterological diagnosis to be made.
- Rectal and vaginal examinations are essential.
- Full blood count and ESR.
- SMAC.
- Blood cultures.
- Serum protein electrophoresis should be done in the elderly.
- Ultrasound examination to exclude urinary tract obstruction.

Management

- The patient will frequently be dehydrated and vomiting and IV normal saline or 5% dextrose will be necessary.
- Parenteral antibiotics should be given initially, and continued until the patient can tolerate oral antimicrobial therapy. Treatment should continue for at least 5 days, although shorter courses may be successful. Parenteral ampicillin or oral amoxycillin should not be used, at least until the anti-bacterial sensitivity profile is known, as more than 40% of E.Coli locally are now resistant to these antibiotics.
- The choice of parenteral agents is either tobramycin (2.5 mg/kg loading dose and 1.0 mg/kg/8 hourly maintenance dose if renal function is normal) or a cephalosporin e.g. cefazolin (1g 8 hourly). If renal functional impairment is present the maintenance dose of tobramycin should be reduced according to the measured or assessed creatinine clearance and pre and post dose serum tobramycin levels.
- After the patient has improved and is taking food and fluids a switch to oral antimicrobial therapy can be considered. The latter is discussed in the following section.
- The urine must be recultured 7 days after completion of therapy.
- After recovery a 24 hour urine should be collected to measure the creatinine clearance and protein excretion.
- A cytoscopy will rarely be indicated.
- All patients with acute pyelonephritis should have an intravenous urogram.

LOWER URINARY TRACT INFECTIONS

Cystitis

Cystitis is the syndrome of frequency and dysuria. Other lower urinary tract symptoms may or may not be present. As many as one-half of all women with this syndrome do not have a bacterial infection and are considered as having non-bacterial cystitis (urethral syndrome). The etiology of the latter is unknown.

Bacterial Cystitis and Covert Bacteriuria

Patients with bacterial cystitis will have the typical lower urinary tract symptoms together with pyuria. Some patients, particularly women who are sexually active, pregnant or elderly may have covert (asymptomatic) bacteriuria. Only about one-half of these asymptomatic patients will have pyuria ($>10 \times 10^6$ WBC/l) indicating urinary tract inflammation.

Causes

- More common in certain groups - elderly, sexually active, pregnancy.
- Following urinary tract instrumentation or in diabetics.
- An abnormal urinary tract, e.g. prostatic obstruction, renal calculi, analgesic nephropathy, etc.

E.coli is the commonest pathogen followed by Staphylococcus epidermidis (saprophyticus) and Proteus mirabilis.

Diagnosis

- The diagnosis is confirmed by culturing either an MSU specimen or urine obtained by suprapubic bladder aspiration. For those patients with mild or no lower urinary tract symptoms 2 consecutive MSU samples

should be obtained before concluding that a urinary tract infection is present.

Investigations

- All infants, children and males must have an IVU following the first documented urinary infection. Children under 5 years of age must have a voiding cystourethrogram to exclude vesico-ureteric reflux. Always ask the question - **"Is this urinary tract infection a pointer to some underlying abnormality in the urinary tract?"**
- Women with a urinary tract infection only require an IVU if:
  - they had problems prior to the commencement of sexual activity
  - have suffered acute pyelonephritis
  - the infections have become closely spaced
  - are due to an unusual organism e.g. a Proteus species
  - microsopic haematuria persists, or
  - single dose therapy has failed
- Cystoscopy should be considered for most males and elderly women.
- All pregnant women should have their urine cultured in the first trimester, and ideally in each trimester. The diagnosis and treatment of covert (asymptomatic) bacteriuria in pregnancy will avoid the risk of acute pyelonephritis in late pregnancy or the puerperium.

Management

- For patients with bacterial cystitis or covert bacteriuria a single dose of an appropriate antimicrobial agent is as effective as a conventional 5 day course of the same drug. Because of the high incidence of bacterial resistance, amoxycillin is no longer a first choice drug. Suggested drugs to use are:

SINGLE DOSE	**5 DAY COURSE**
Trimethoprim 400-600 mg	Trimethoprim 300 mg q24h
Co-trimoxazole 1.92g (4 tabs)	Sulphamethizole 1 g q8h
Netilmicin 150 mg (I.M.)	Co-trimoxazole 0.96 g q12h (2 tablets b.d.)
Amoxycillin 3g (results inferior to above 3)	Nitrofurantoin 50 mg q8h (ineffective for Proteus spp)
	Nalidixic acid 0.5 g q8h (ineffective for Staph. spp)
	Amoxycillin 0.25 g q8h (Streptococcus faecalis may be only indication now)

- Follow-up: all patients should have a urine specimen taken for culture 7 days after completing treatment.

Prophylatic Therapy for Patients with recurrent Urinary Tract Infections

Recurrent urinary tract infections (e.g. >3 UTI's in 6 months) with normal renal function and a normal urinary tract merit the cautious use of prophylactic antimicrobial therapy.

- Try simple measures - treatment of cervical erosion or vaginitis, increase fluid intake, increase the frequency of micturition, post coital voiding, application of antiseptic cream to the periurethral area prior to intercourse (e.g. 0.5% cetrimide + 0.1% chlorhexidine in the form of Savlon).
- Drugs which have been shown to be effective include:
  - nitrofurantoin 50 mg
  - trimethoprim 100 mg
  - co-trimoxazole 0.24 g (1/2 tablet)
  - hexamine hippurate 1 g (less effective)

  If patients have renal insufficiency cephalexin 125 or 250 mg or cephradine 250 mg can be used for prophylaxis.

- Prophylactic treatment should only be started after a urinary tract infection has been treated with a curative course of therapy and the post-treatment culture is sterile. Prophylactic treatment should be continued for 3-6 months, although the patient may wish for this to continue longer.
- Recent trials have shown that a dose on alternate nights or even 3 nights a week or just after intercourse may be equally effective.

NEUROLOGY

NEUROLOGICAL EXAMINATION

Some points to remember are:

- Dilatation of the pupils by mydriatic drops should be avoided in neurologic patients, particularly those who are ill.

- **Abbreviated Mental Test Score - (Each question scores one mark)**

  A quick routine test of mental function is highly recommended, particularly in the elderly:

  Age.
  Time (to nearest hour).
  Address for recall at end of test - this should be repeated by the patient to ensure it has been heard correctly: 42 West Street.
  Year.
  Name of hospital.
  Recognition of 2 persons (doctor, nurse, etc).
  Date of birth.
  Year of First World War.
  Name of present Monarch.
  Count backwards 20-1.

- The principal spinal segments responsible for the most commonly tested reflexes are:

Biceps jerk	: C5, 6 Musculocutaneous nerve
Brachioradialis reflex	: C5, 6 Radial nerve
Triceps jerk	: C7, 8 Radial nerve
Knee jerk	: L3, 4 Femoral nerve
Ankle jerk	: S1, 2 Tibial nerve

- The segmental innervation of the skin is illustrated overleaf. This can be more readily recalled by remembering certain "key" dermatomal levels e.g.:

C7	:	middle finger
T4	:	nipples
T10	:	umbilicus
L1	:	groin
L3	:	knee
Sacral	:	buttocks

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  Age.
  Time (to nearest hour).
  Address for recall at end of test - this should be repeated by the patient to ensure it has been heard correctly: 42 West Street.
  Year.
  Name of hospital.
  Recognition of 2 persons (doctor, nurse, etc).
  Date of birth.
  Year of First World War.
  Name of present Monarch.
  Count backwards 20-1.

- The principal spinal segments responsible for the most commonly tested reflexes are:

Biceps jerk	: C5, 6 Musculocutaneous nerve
Brachioradialis reflex	: C5, 6 Radial nerve
Triceps jerk	: C7, 8 Radial nerve
Knee jerk	: L3, 4 Femoral nerve
Ankle jerk	: S1, 2 Tibial nerve

- The segmental innervation of the skin is illustrated overleaf. This can be more readily recalled by remembering certain "key" dermatomal levels e.g.:

C7	:	middle finger
T4	:	nipples
T10	:	umbilicus
L1	:	groin
L3	:	knee
Sacral	:	buttocks

STROKE

Causes

- Infarction
  - thrombotic
  - embolic (arteriosclerotic plaque, valve disease, SBE, atrial fibrillation).
- Haemorrhagic (hypertensive, bleeding disorders, complicating infarct, A-V malformation).

Investigations and Management

This depends on the character of the initial illness and other factors such as age.

- **Completed strokes** - investigations as listed below unless embolic or due to a non atheromatous disease such as arteritis when further tests will be needed. Rehabilitation.
- **Stroke in Evolution** - urgent CT to distinguish haemorrhage from infarction.
  - Intracerebral haematomas, particularly those involving the posterior fossa may warrant evacuation. Consult Neurologist / Neurosurgeon re angiography and further management.
  - Infarction - heparin in full dosage should be considered. Consult with regard to the duration of this treatment and to whether oral anti-coagulants should subsequently be given.
- **Transient Ischaemic Attacks** - defined here as a neurological deficit which resolves completely within 24 hours.
  - Treat hypertension if moderate or severe. Non postural agents are preferred, e.g. labetalol, B blockers.

  Vertebro-basilar territory
  - exclude subclavian steal. Take BP in both arms.
  - aspirin 650 mg b.d. (+ dipyridamole in females.)
  - give oral anticoagulants if attacks still occur, with extra care to control blood pressure in this situation.

  Carotid territory
  - anti platelet drugs as above but consult Neurologists with regard to the advisability of angiography.
- **Investigations** common to all these problems should include haemoglobin, WBC, differential and platelets (? polycythaemia, ? thrombocytosis), ESR (arteritis) and syphilis serology, SMAC, ECG (rhythm), chest x-ray (heart size and malignancy). Some patients with infarcts may need Ig levels, blood lipids, auto antibodies, echocardiograms, etc. Some completed strokes and TIA's will need a C.T. scan and this should be discussed with the Neurologist. If a haemorrhagic tendency is suspected get a full coagulation profile.

SUBARACHNOID HAEMORRHAGE

Causes

- Aneurysms and arteriovenous malformations.
- A-V malformation more common under 20 years.

Note: Cerebal aneurysm is more common over 40 years. A third of aneurysms rebleed in 6 weeks and a further third rebleed by 12 months with a mortality of approximately 30% per bleed.

Investigations

- If the patient is conscious with meningism but has no focal neurologic signs, proceed to lumbar puncture and if this confirms a bleed consult a Neurologist / Neurosurgeon that day with regard to C.T. / angiography. Aim at surgical intervention if this is practicable within 48 hours.
- If the patient has an impaired conscious level or has focal neurological signs, do not do a lumbar puncture but seek immediate consultation with Neurosurgeon / Neurologist and get a C.T. scan. If C.T. scan is normal proceed to lumbar puncture. A lumbar puncture should not be done if C.T. shows haemorrhage. If intracerebral haematoma with significant mass effect the patient may need urgent angiography and surgical evacuation. If less critical, surgery may be delayed until the patient has improved.

Treatment

- Raised blood pressure should be treated only if:
  - the patient was already on hypertensive drugs before the bleed.
  - the diastolic is > 110 mmHg for several hours in the absence of any evidence of high intracranial pressure or coning. Avoid hypotension or large swings in blood pressure.
- Strict bed rest.
- Analgesics - paracetamol, codeine or low doses of pethidine (50 mg).
- Fluids "physiological" replacement.
- Avoid straining. Antiemetics if needed plus stool softeners.
- Give fibrinolytic inhibitors (e.g. EACA 36 gm per 24 hours orally or IV) if these can be started within 72 hours of the haemorrhage.

STATUS EPILEPTICUS

Causes

- Commonest cause is anticonvulsant withdrawal or non-compliance in a known epileptic.
- If the patient is not known to be epileptic consider whether the cause is primarily intracranial or secondary to some toxic-metabolic disorder.
- Remember alcohol withdrawal, hypoglycaemia and infection.

Investigations

Draw blood for blood screen, SMAC (glucose) and anticonvulsant levels (T53 EDTA tube, and orange cap heparinised tube for drugs and toxins) if aetiology unclear. Blood gases. Check pulse carefully. ECG may raise the possibility of cardiac dysrhythmia.

Management (useful reference NEJM 1982; 306:1337)

- Ensure adequate airway and oxygenation. Endotracheal intubation necessary in some. Respiration is impaired by continued seizures, and by

many anticonvulsants. In general a patient still fitting after 60 min should be transferred to ICU.

- IV line.
- If no PH of epilepsy IV infusion Vitamin B complex (Parentrovite) and bolus 50 ml 50% glucose.
- Diazepam 5-10 mg over 2-3 minutes. Give further 5 mg increments if needed but stop if respiratory or cardiovascular depression.
- If patient is not already receiving anticonvulsants start phenytoin. Place phenytoin in 100 ml N saline and give 15 mg/kg IV slowly, no faster than 50 mg/min. Monitor BP and ECG. A total of approximately 1 gm can therefore be given over 20-30 minutes. Thereafter maintenance phenytoin 100 mg 6-8 hourly IV, orally or via N/G tube. In the elderly, those who are hypotensive or those with cardiac disease it may be safer to administer all or part of the same loading dose via N/G tube.
  Phenytoin precipitates in all IV solutions except normal saline or Hartmann's because of pH incompatability. Phenytoin also precipitates in tissues if given IM so this route is contraindicated.
- If seizures persist while awaiting a therapeutic response from phenytoin give diazepam infusion, 50 mg in 500 ml normal saline 4-6 hourly or depending on response.
- If the patient is already known to be on anticonvulsants, obtain urgent blood level. If the level is subtherapeutic continue to administer the same drug in modified dose. If the anticonvulsant level was "therapeutic" at presentation start on a second drug. Best choices are phenytoin, phenobarbitone IM, or carbamazepine via N/G tube.
- Sedation and respiratory depression may result. Early ICU consultation and transfer may be necessary.

Further Points

- Once status is controlled, it is mandatory to establish its cause. CT, LP, drug screen, EEG, chest x-ray may be required if underlying cause is not obvious.
- Avoid the IM use of diazepam. The absorption is erratic and unpredictable.
- The simplest way of managing status is with one anticonvulsant (in addition to diazepam) rather than using multiple drugs. Ensure full dosage with adequate blood levels before discontinuing a drug as ineffective.

EPILEPSY : THE PATIENT PRESENTING WITH A SINGLE SEIZURE

Diagnosis

- Is clinical. Diagnosis is established on the basis of the patient's account and more particularly on the eye-witness account.

Investigations

- Neurologic examination.
- Hb, WBC, platelets, ESR.
- SMAC.
- Syphilis serology.
- Toxoplasma and leptospiral serology and viral studies if appropriate.
- Chest X-ray.
- EEG useful if diagnosis is in doubt; to give clue to the epileptic type (e.g. distinguishes the "absence" of Temporal Lobe epilepsy (TLE) from that of Petit Mal) and to show any lateralised abnormality.
- CT indicated if:
  - focal features to the seizure (including TLE)

- focal features on clinical examination.
- focal features on EEG
- the epilepsy presentation is as status epilepticus
- the epilepsy is of adult onset (over approximately 25-30 years) and not of long standing or of known underlying cause (e.g. previous severe head injury).

Treatment

- Most patients following a single seizure who have recovered and are well do not require hospital admission.
- Generally, do not commence anticonvulsant therapy following a single seizure if no obvious underlying cause is demonstrated. If a second seizure occurs within 1 year, commence treatment.
- If the seizure occurs as the result of a focal structural lesion in the cerebral hemisphere, commence anticonvulsants after the first fit.
- Phenytoin or carbamazepine are the drugs of first choice for grand mal epilepsy and TLE.
- Do not discount one anticonvulsant drug as being ineffective without having shown that the therapeutic blood levels have been achieved.
- All patients should be advised against driving a motor vehicle - even if having experienced a single seizure - for 6-12 months. Patient should also be advised of potential risk of swimming alone and of working at heights.
- Phenytoin has dose dependent kinetics with a rapid rise in level for small increase in dosage. Therefore use 30-50 mgs daily dosage increases when blood level is near the therapeutic range. Adult dose around 300 mg/day may be given in a single dose.

RAISED INTRACRANIAL PRESSURE

Causes

- Include intracranial mass effect, obstruction to the flow of CSF, and brain swelling.

Investigations

- Urgent CT is mandatory to establish cause of the raised intracranial pressure. Note that papilloedema may be a late sign of raised ICP or may never appear. The presence of retinal venous pulsation usually means ICP is not high at the time of the examination. Do not dilate pupils. Consult Neurosurgeon / Neurologist.

Management

- Consider dexamethasone 4 mg 6 hourly, especially if tumour. Give dexamethasone 12 mg IV stat if the patient is drowsy. If the mental state declines further the patient may need 20% Mannitol 1-2 gm/kg IV over 5-10 minutes. In an acute situation consider hyperventilation while awaiting neurosurgical intervention.
- Close observation with 15-30 minute neurological recordings may be needed in drowsy or deteriorating patients. This will require a special nurse. Do not however, substitute observation for action since this may be needed urgently. Consult Neurosurgeon / Neurologist.

MENINGITIS

Must be considered if headache, meningism, photophobia and fever.

Causes

- **Bacterial**
  - H influenzae, paediatric usually
  - Meningococcus (more common in young adults)
  - Pneumococcus (more common in the elderly)
  - Listeria monocytogenes (immunosuppressed patients, or pregnancy)
  - T.B.
  - Syphilis, leptospirosis
- **Viral.**
- **Other** e.g. amoebae, fungi.

Note:
- may be spontaneous or as part of a septicaemia.
- may be associated with head or neck sepsis. Evidence of sinus, dental and ear infections must be sought.
- may follow head injuries / CSF leak.

Investigations

- Blood count, ESR.
- SMAC.
- Blood cultures and throat swab for viral and bacterial culture.
- Stool for viral examination.
- Any lesions should also be cultured e.g. embolic foci or vesicles.
- Lumbar puncture - Collect 3 sterile CSF bottles numbered in order of collection. Send to Microbiology. Routine tests done are cell count, sugar, protein and culture. Gram stain, antigen detection tests, and viral culture are done if the WBC is > 5 x 10^6 cells /l.
- Request special investigations for amoeba, cryptococcus, TB, and viruses Discuss with Microbiologist.
- CSF cytology for malignant cells (discuss with Haematology).
- Chest x-ray (TB, lobar pneumonia).
- Sinus x-rays.
- ? CT scan, ? EEG, the latter may have a diagnostic pattern in herpes encephalitis.
- IV fluids - remember inappropriate ADH common in this situation.

Antibiotics

- Unless Gm-ve bacilli are suspected or seen give benzylpenicillin 2 million units every 2 hours IV. This is effective for pneumococcus and meningococcus.
- Ampicillin 2 gm IV 4 hourly is effective against some H influenzae in addition to the above 2 organisms. If in doubt concerning the sensitivity of H influenzae to ampicillin give additional chloramphenicol 4-6 gm / day in 4-6 divided doses IV. If the patient is allergic to penicillin use chloramphenicol. Ampicillin is the treatment of choice for Listeria meningitis. Since this is usually associated with septicaemia additional gentamicin is indicated. If other Gm-ve infections (such as E.coli) are suspected, drugs such as chloramphenicol, or an aminoglycoside may be given. Intrathecal therapy may be needed with aminoglycosides but seek advice first from the neurosurgeons.
- Rifampicin may be used to treat meningococcal contacts with positive throat cultures.

- For other organisms consult the microbiologists.
- If herpes encephalitis is suspected, early treatment with acyclovir may be effective. Consult neurologists and microbiologists
- If TB is suspected investigations should include - chest x-ray, sputum (or gastric washings) and urine (EMU) examinations for TB, Mantoux, ZN stain of CSF, and bone marrow (+ liver biopsy). Early empiric treatment may be required if a successful result is to be obtained. Consult respiratory physicians re possible transbronchial biopsy. Appropriate chemotherapy for adults is isoniazid 8-12 mg/kg daily in divided doses with 100 mg pyridoxine daily, rifampicin 600 mg daily and ethambutol 15 mg/kg daily. Additional therapy with pyrazinamide and possibly streptomycin (IT) may be considered.

SPINAL CORD COMPRESSION

Causes

- Trauma.
- Tumour - extrinsic / intrinsic.
- Haemorrhage.
- Extra dural abscess.
- Disc prolapse.

Investigations and Management

- Remember that quick action may avoid irreversible paraplegia.
- The urgency is dictated by the duration, the rate of progression, and the degree of the neurological deficit. Try to establish the level of cord involvement.
- X-rays of spine at the appropriate level plus chest x-ray should be done.
- If recent onset, rapid progression, and/or significant neurological deficit for immediate **(i.e. at once)** neurological/neurosurgical consultations re myelography + CT scanning. The CSF can be examined at that time. Do not do a lumbar puncture before myelogram is performed.
- Will also need screen, ESR, SMAC and may need Ig levels and acid phosphatase. In selected patients a search for a specific malignancy, e.g. multiple myeloma or lymphoma should be carried out and some of the above tests may be helpful in this regard.
- Catheterize for retention.
- Regular turning to avoid pressure sores.
- Remember that in some tumours, e.g. myeloma, a non surgical approach with radiotherapy and / or chemotherapy may be the treatment of choice. Urgent consultation with a Haematologist or Oncologist is recommended.
- If patients with a known malignancy develop spinal cord compression it is desirable that the doctors who have already been supervising their care be contacted immediately.

SUBDURAL HAEMATOMA

- An index of suspicion is the key to diagnosis, especially in the elderly, chronic alcoholics, and patients on anticoagulants.
- A preceding history of trauma is not necessary for the diagnosis to be considered.
- Consider a subdural haematoma if there is a:
  - history of headache plus progressive clouding of consciousness and localizing signs
  - picture of headache, intellectual change, alteration in alertness and signs of bilateral hemisphere dysfunction
- It is uncommon for gross unilateral focal signs to be present e.g. a

dense hemiplegia in an alert patient is unlikely to be due to a subdural.
- Fluctuation of signs from day to day or hour to hour is not uncommon.
- Diagnostic error common. Most frequent misdiagnosis is stroke.

Investigation and Management

- CT scan. Modern scanners reduce the risk of false negative results due to an isodense subdural haematoma. Skull x-ray is unnecessary. Carotid angiography is definitive if a CT scanner is not available.
- Commence neurologic recordings and consult Neurosurgeon for further advice on management.

PAIN MANAGEMENT

Principles

- Pain is a symptom which requires thorough and complete evaluation. The aim is to control pain adequately while treatment of the primary disease continues.
- Therapy depends on:
  - the type of pain
  - its cause
  - the severity
- Individualise therapy. Titrate agent and aim for minimum side effects. Do not change a drug until it has been fully evaluated.
- Liver and renal disease may reduce drug metabolism and excretion. Dose frequency may therefore need to be reduced. All opiates should be given cautiously to patients with respiratory disease. Morphine and omnopon may cause bronchospasm in addition to the well recognised respiratory depression.

SEVERE ACUTE PAIN

- Opiates (morphine, omnopon and pethidine) are the drugs of choice (see dosages below). It probably takes more than two weeks for physical dependence to develop.
- For routine use e.g. post operative, give IM up to 3-4 hourly (see table) providing the respiratory rate is greater than 10 per minute.
- Sublingual buprenorphine may be used for less severe pain thereby avoiding injections.
- For severe acute pain give IV injection or infusion and adjust according to pain relief ± side effects.
- For the shocked hypovolaemic patient the IV route is mandatory.

- **Side effects of importance include:-**

  - Respiratory depression. If the respiratory rate is less than 10 per minute, the effect of the opiate should be reversed by slow IV injection of 0.2-0.4 mgs of Naloxone. This will reverse the analgesia but its effect may be brief. Verbal encouragement will often increase the patient's respiratory rate. Close supervision of respiratory depression is needed and consultation re the need for ventilation should be made when appropriate.
  - Nausea and vomiting. IM prochlorperazine (Stemetil) 12.5 mg or IV metoclopramide 10-30 mg (Maxolon) can be given.

SEVERE CHRONIC PAIN

- Oral opioid rather than parenteral medication is preferable.
- Analgesia should be given regularly, never "as required."
- Increase the opioid dose before increasing the dosage frequency.
- Rectal administration may be of value for patients who have difficulty taking oral medication.
- Morphine when used orally requires about six times the parenteral dose. Methadone may be useful because of its long duration of action (see dosages below).
- Pethidine is unsuitable.

- **Side effects relating to chronic therapy:**

  - Nausea. Oral stemetil 5 mgms 8 hourly or maxolon 5-10 mgs 6-8 hourly may be used initially and then withdrawn in most cases. Vomiting

will require IV therapy as above.
Constipation, bowel softeners such as Metamucil 1 tsp t.d.s. and a mild laxative such as Senokot should be considered for chronic constipation.

- Opioid requirements may be reduced by the use of anti-inflammatory drugs, sedatives or tricyclic anti-depressants.

- Other treatment such as nerve blocks, neuro surgical procedures, TENS etc., may all have powerful effects. Consultation with the Pain Clinic (Department of Anaesthetics) may be helpful.

Equianalgesic doses and duration of action of some commonly used Opioids

Analgesic	Parenteral Dose (mg/kg for patients >10 kg)	Average Adult Parenteral Dose (mg)	Average Adult Oral Dose (mg)	Duration of Analgesia (hrs)
Morphine	0.15	10	60	3-4 *
Papaveretum (Omnopon)	0.3	20	-	3-4 *
Methadone	0.15	10	10-20	8-48 *
Pethidine	1.5	100	200-300	2-3
Pentozocine (Fortral)	0.4-0.8	60	100-150	2-3
Buprenorphine (Temgesic)	0.004-0.008	0.3-0.6	Start with 0.2mg b.d. & increase in increments to 0.4-0.8	6-8

*(May accumulate in renal disease)

LESS SEVERE PAIN

- mild analgesics and non steroidal anti-inflammatory drugs (NSAIDS) are used at dose intervals corresponding to their elimination half lives. Aspirin has a faster onset of action than most other NSAIDS. Food will delay drug absorption, but may reduce GI side effects. Some equanalgesic dose recommendations are:

  - Soluble aspirin 600 mg 4 hourly
  - Paracetamol 1 gm 4 hourly
  - Codeine 30 mg 4 hourly (synergistic effect with aspirin)

Other NSAIDS may be useful e.g.:

- naproxen 500 mgs b.d. or
- sulindac 200 mgs b.d.

These both have the advantage of longer half lives, but other NSAIDS may also be tried e.g. ibuprofen, indomethacin etc. It is important to try a number of NSAIDS before deciding that they are not effective as a group for a patient. **All NSAIDS** may produce GI lesions, although aspirin is the most likely to do so. The use of suppositories may reduce this complication. NSAIDS may modify renal function and some of these may alter the sensitivity to warfarin. Aspirin should be avoided for patients on anticoagulants. Dextropropoxyphene, a weak opioid, is currently out of favour (eg Doloxene and Digesic).

POISONS AND DRUG OVERDOSAGE

A useful reference is a recent weekly series of articles "ABC of Poisoning" beginning **BMJ 1984; 289:39.** Photocopies of these articles are held in the Library and the Emergency Department.

GENERAL POINTS

- Stomach contents, urine and blood levels are a guide to the material ingested. If in doubt request a drug screen and do not rely on patients history. However drug analyses are not routine and most can wait until normal working hours.
- Delayed absorption may occur. Gastric lavage is often relatively ineffective in eliminating the poison (frequency less than 10% removed). For large doses of potentially toxic drugs (e.g. theophylline, digoxin, paraquat etc) whole bowel lavage should be considered. Because of the potential for complications with this technique as well as the toxicity of the drugs demanding its use, it should normally be performed in ICU.
- The management of most acute poisonings is by supportive therapy. The main problem is cardio-respiratory support - if in doubt discuss with ICU re need for overnight supervision. If a bed is available it is cheaper than getting a special nurse.
- Medical intervention is important in some cases of poisoning.
- Convulsions occur in poisoned patients for several reasons:
    - As a convulsant effect of the poison; tricyclic antidepressants are the commonest cause.
    - After cerebral hypoxia from respiratory or cardiovascular depression.
    - From hypoglycaemia.
    - As severe muscle spasms due to spinal or peripheral effects on the mechanisms controlling muscle tone.
    - Owing to withdrawal in physicially dependent subjects; the agents usually responsible are alcohol, opioids, barbiturates, and benzodiazepines.
    - Occasionally an epileptic patient may be poisoned and epileptic control loss.
- Advice is also available from the National Poisons Unit (Dunedin).

COMMON PATTERNS OF POISONING INCLUDE

Coma, hypotension, flaccidity
benzodiazepines; barbiturates; glutethimide, trichlorethanol; ethanol; opioids; beta-blocking drugs and many others.

Coma, hyperreflexia, tachycardia, dilated pupils
tricyclic antidepressants; anticholinergic agents; phenothiazines.

Malaise, restlessness, nausea, weakness
carbon monoxide, addictive states and withdrawal; solvents; insecticides; lead, mercury, arsenic.

Restlessness, hypertonia, hyperreflexia, pyrexia
monoamine oxidase inhibitors; anticholinergic agents; strychnine; phencyclidine; amphetamine

Behavioural disturbances
psychotropic drugs; anticholinergic drugs; adverse effects of prescribed or brought drugs, for example, corticosteroids, pseudoephedrine; addictive states and withdrawal; solvent abuse; psilocybe mushrooms; datura.

Burns in mouth, dysphagia, abdominal pain, distension
Corrosives; caustics; paraquat.

Renal Failure
Paracetamol; inorganic mercurial compounds; acids (phosphoric, formic, oxalic); phenols (disinfectants, wood preservers); secondary to rhabdomyolysis or shock; arsine, stibine, lead.

Jaundice, hepatic failure
Paracetamol, carbon tetrachloride; amanita phalloides; phosphorus; organic lead.

Convulsions may be associated with:
tricyclic antidepressants; phenothiazines; carbon monoxide; monoamine oxidase inhibitors; mefenamic acid; ethylene glycol; opioids; theophylline; isoniazid; hypoglycaemic agents; organophosphate insecticides; salicylates; lithium; amphetamines; strychnine; lead; cyanide; alphachloralose; withdrawal states.

THE LABORATORY TESTING AND MEASUREMENT OF DRUGS IN ACUTE POISONING

- Samples of blood, urine, gastric aspirate or contaminated items should be collected for analysis as follows:
  - Blood collection: 2 SMAC tubes for **specific** drug measurement.
  - Urine or gastric contents: 50 ml in a clean container with no preservatives for a **drug screen.**
- Analysis of these samples should be requested according to these guidelines:
  - If the patient is seriously ill (or deteriorating) then a drug screen may be necessary at once
  - If a specific drug is suspected, will the knowledge of the actual concentration affect the immediate therapy?
  - If possible leave toxicological analysis until normal working hours (8 am - 5 pm Mon.-Sat.). Analysis out of hours should be requested only if necessary (this costs $60-$100).
  - Particular problems should be discussed with the Toxicologist, Clinical Pharmacologist or Chemical Pathologist.

ELIMINATING POISONS

- The indications for **forced diuresis** are few but this should be considered in the following situations. This requires intensive monitoring and is best managed in ICU.

Alkaline diuresis	**Acid diuresis**
• Phenobarbitone	• Phencyclidine
• Salicylates	• Amphetamine*
• Phenoxyacetate	• ? Fenfluramine*

Note: the excretion of quinine does not appear to be increased by acid diuresis.

* sedation alone is usually sufficient.

- **Drugs which may require peritoneal dialysis, haemodialysis or haemoperfusion** if there is severe intoxication, clinical deterioration or high drug concentrations include the following (discuss with ICU and Nephrologist).

Peritoneal dialysis
salicylates; phenobarbitone; (but not short acting barbiturates; methanol/ethanol; ethylene glycol; lithium; isopropanol; salt poisoning (following attempts at emesis).

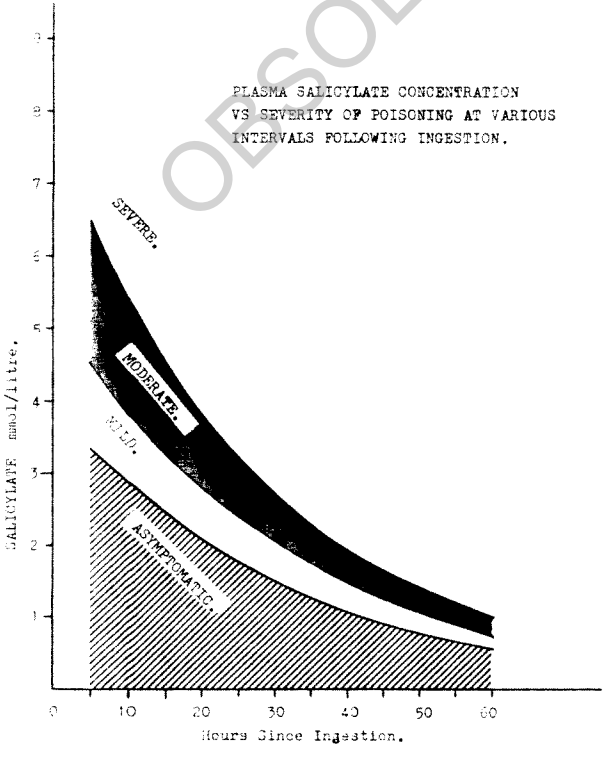
Haemodialysis
salicylates*; phenobarbitone*; methanol/ethanol*; ethylene glycol*; lithium*; Isopropanol*.

Haemoperfusion
salicylates*; paraquat; phenobarbitone*; short and medium acting barbiturates; glutethimide; meprobamate; trichlorethanol derivatives; disopyramide; theophylline.

* Haemodialysis and haemoperfusion are two to three times more efficient than peritoneal dialysis.

MANAGEMENT POINTS FOR COMMON DRUG OVERDOSES

Aspirin (BMJ 1984; 289:820) - Blood levels are helpful. These should be done urgently in a seriously ill patient when the blood gases are abnormal, or if a significant amount of salicylate has been ingested. Symptoms occur at about 2.0 mmol/l (30 mg/100 ml). Above 3.0 mmol/l (50 mg/litre) alkalinise urine but only if blood pH < 7.5. Aspirin levels > 6.0 mmol/l or clinically unwell should be considered for dialysis. (See diagram below).

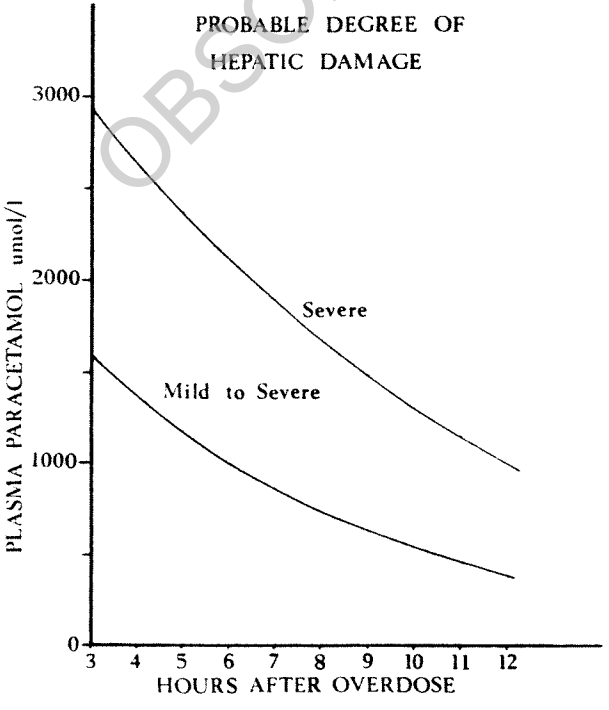


Tricyclics and Tetracyclics (BMJ 1984; 289:820) - problems with loss of consciousness, convulsions, urinary retention and cardiac dysrrhythmias. As with all drug overdoses it is difficult to be certain of amount taken, therefore admit all patients initially to ICU and await drug levels. These can be delayed until normal working hours.

- After washout leave activated charcoal in stomach. Active metabolites are secreted via enterohepatic circulation therefore charcoal 2-3 hourly followed by suction 20 minutes later may remove additional ? 15-20% of the drug.
- Not dialysable.
- Treat each arrhythmia with appropriate management.
- Duration of cardiac monitoring again proportional to levels.

Paracetamol (BMJ 1984: 289:907) - contained in Panadol, Digesic, Codcomol and others. Overdose with > 15 gm may lead to hepatic necrosis. Take blood levels no earlier than 3 hours but no later than 10 hours after the time of the overdose. Treat with N.acetylcysteine if indicated (see diagram). This needs to be initiated promptly as considerable hepatic damage can occur if treatment is delayed beyond 10 hours. If toxic levels are found collect a further specimen for a repeat analysis 12 hours post overdose to determine the need for continued therapy. If it is decided to use N.acetylcysteine give:-

150 mg/kg in 100 ml 5% dextrose over 15 minutes, then
50 mg/kg in 500 ml 5% dextrose over 4 hours, then
100 mg/kg in 1000 ml 5% dextrose over 16 hours.



Benzodiazepines

- Management is supportive.
- Drug analysis is unnecessary unless the other drugs are suspected.

Antipsychotic Drugs - (Phenothiazines and Butyrophenones)

- Gastric lavage should be performed up to 6 hours after ingestion.
- Activated charcoal should given.
- Supportive care is the mainstay of treatment.
- Dystonic reactions normally respond rapidly to procyclidine 5-10 mg or orphenadrine 20-40 mg given intramuscularly or intravenously.
- Dantrolene is the drug of choice in the neuroleptic malignant syndrome, (muscular rigidity, hyperthermia, rapid pulse and respiration, lethargy, and coma. Mortality is 30%).

Carbon Monoxide Poisoning

- If suspected, get urgent carboxyhaemoglobin (COHb) level.
- Hyperbaric oxygen is the therapy of choice in all but the mildest cases. While it is being organised, it is crucial that the following be done:
  - Place patient on O_2 mask at maximum flow rate. If unconscious, intubate to provide 100% O_2, and to protect the airway. If in doubt, consult ICU staff.
- Take blood for urgent estimation of haemoglobin, oxygen saturation, and COHb content. Repeated levels of COHb are not necessary. Remember COHb levels do not necessarily correlate with the severity of symptoms.
- Urgent referral to Hyperbaric Team if:
  - Coma or history of coma, IRRESPECTIVE OF COHb LEVEL.
  - Any neurological signs or symptoms, psychiatric or behavioural disturbance either prior to or at the time of admission, except mild headache and nausea, and irrespective of COHb level or time since exposure.
  - COHb level > 30%.
- The Hyperbaric Unit should be contacted by ringing PMH Operator. Ask him/her to "Alert Hyperbaric Team". Give the Operator your name and contact telephone number. Once a member of the Medical Staff has been contacted he will return the call. Trying to contact individual doctors can result in delay. However, in normal working hours, it would also be worth ringing the Department of Anaesthesia, Christchurch Hospital, Ext: 613.
- Make arrangements for immediate escorted transfer to PMH Hyperbaric Unit:
  - On O_2 (High Flow).
  - Ensure safe airway.
- Clinical assessment is very important. CNS involvement may occur in some patients despite low COHb levels. Hyperbaric oxygenation may prevent CNS sequelae, even if COHb levels have returned to normal.
- Consider the diagnosis and the need for treatment in all burns; smoke inhalation or attempted suicide cases. CO poisoning has been the most common cause of successful male suicide in Christchurch in recent times.

Paraquat

Small amounts may be fatal. GI tract absorption is both slow and prolonged. Paraquat damages the lungs and this damage is made worse by giving oxygen therapy.

ICU and Nephrology have a detailed protocol for treating paraquat poisoning and ICU should be contacted immediately such patients present. At the same

time the following must be done.

- Gastric lavage - if necessary give a general anaesthetic. Do not rely on emetics. Following gastric lavage instil into the stomach:

    - 20% Mannitol in a dose of 3 ml/kg, and either
      15% Fullers Earth (150 gm in 1 litre of water) giving a loading dose of 15 ml/kg into the stomach, or
      7% Bentonite (70 gm in 100 ml glyceryl BP in 1 litre of water). Again use 15 ml/kg.

- Initial appropriate samples for Toxicology:
    - First lavage returns
    - Serial urine samples
    - Initial plasma sample. Blood should be taken into heparin and kept on ice if plasma cannot be separated immediately.

  Transfer to ICU following consultation.

- Subsequent management includes:

    - Further doses of Mannitol / Fullers Earth.
    - Whole gut irrigation.
    - Avoidance of supplemental oxygen. Possibly nitrogen therapy, haemoperfusion, haemodialysis and plasma exchange may be needed.

Organo-Phosphate

- Absorbed via skin or after inhalation or ingestion.
- Toxicity due to cholinergic effects (anti-cholinesterase inhibitor)
- A cholinesterase analysis should be done (SMAC tube to Biochemistry before initiating therapy).
- Manage in ICU (respiratory complications).
- Gastric washout with activated charcoal left in the stomach.
- Atropine 2 mg IM and repeated p.r.n. to control parasympathetic excess symptoms.
- Muscle weakness may require treatment with Pralidoxine 1 gm over 5 mintues IV p.r.n. 8-12 hourly x 4 doses.
- **Charcoal Haemoperfusion** - consult Nephrologists.

Theophylline

- If a severe overdose (cardiac/CNS irritability), an urgent analysis is necessary.
- ICU management and prophylactic anticonvulsants might be needed.

Lithium

- Urgent analysis is essential since dialysis may be necessary (analysed at PMH).

Lead Poisoning

- useful reference relating to adults is Medicine 1982; 62:221.

Alcohol Intoxication

- Supportive management.
- Occasionally an urgent blood alcohol may help.

- Manage withdrawal symptoms as below.

ALCOHOL WITHDRAWAL SYNDROME

- Occurs in heavy and dependent drinkers 6-48 hours after cessation of drinking and enters into the differential diagnosis of many acute disease states.
- Consider the possibility early when signs may be mild, e.g. tremor, sweats, flushing, anxiety, agitation, insomnia, restlessness, nausea and or vomiting.
- Alcohol hallucinosis may occur in an "orientated" patients.
- Delirium tremens is a life threatening condition and may progress to coma and death..
- Problems occur with:.
    - Fits (usually grand mal)
    - Fluid and electrolyte imbalance
    - Vitamin deficiency
    - Respiratory complications
    - G.I. bleeding

Investigations

- Blood count.
- SMAC (Electrolytes, glucose, liver function).
- CXR (? sepsis, aspiration).
- Blood gases (? hypoxia) or other investigations to confirm or exclude other serious pathology which might cause agitation or confusion. Therefore if suspected do CT scan for ? subdural, urgent glucose for ? hypoglycaemia, blood cultures for ? sepsis etc.

Treatment

- Liver disease affects drug susceptibility.
- Appropriate fluid and electrolyte replacement.
- Treat other conditions e.g. hypoxia, sepsis.
- Sedation:
    - Early - intermediate phase of withdrawal
      Chlormethiazole 500-1500 mg q.i.d.
      OR oxazepam 10-30 mg q.i.d.
    - Alcoholic hallucinations
      Haloperidol 5 mg IM then 1-3 mg b.d. maintenance. Oral therapy when appropriate. **NB** - may provoke fit or hypotension
    - Delirium tremens
      Valium 2.5-10 mg IV infusion then maintenance dose 10-20 mg 8 hourly infusion. Oral therapy when appropriate.
      Or chlormethiazole 50-100 ml 0.8% solution over 3-5 minutes then 500-1000 ml over 6-12 hours to maintain light sleep.
      NB: Avoid oversedation and review patient regularly. Watch airway.
      NB: Phenothiazines are to be avoided because they are epileptogeneic

- Seizure prevention is required for patients who have past history of seizures. Use carbamazepine 400 mg stat. then 200 mg t.d.s. for 5 days or alternatively some authorities also recommend phenytoin or sodium valproate. To treat seizures use Valium and see section on epilepsy.
- Vitamin deficiency should be treated with Parentrovite 10 mg (2 ampoules) IV stat. and repeated daily for 3 days or give IM preparation and 1 months oral multivitamins. Remember glucose infusions and failure to correct thiamine deficiency may precipitate Wernicke's encephalopathy.

RESPIRATORY MEDICINE

RESPIRATORY FAILURE

Classically defined as P_aO_2 <60 mmHg or P_aCO_2 >50 mmHg. Most commonly results from acute on chronic failure. Gases of this order in a non respiratory patient mean the patient should be managed in the Respiratory Unit or ICU. See page 28 for diagram to assist interpretation of blood gas results.

Causes

- Ventilatory failure
  - drugs
  - Guillain Barré syndrome, myasthenia gravis
  - Massive obesity
- Chronic obstructive airways disease
  - Emphysema / Chronic bronchitis
- Pneumonia.
- Asthma.
- Left ventricular failure.
- Pneumothorax.
- Pulmonary embolism.
- Acute Respiratory Distress syndrome (ARDS).
- Aspiration pneumonia.
- Interstitial lung disease e.g. fibrosing alveolitis, lymphangitis carcinomatosis.

Investigations

- Blood gases.
- Chest x-ray.
- Blood count plus ESR.
- SMAC.
- ? lung scan - difficult to interpret in chronic respiratory patients - not a screening test. Consider need for ventilation as well as perfusion scans.
- ECG.

Management

- Drug Depression: - opiates may be reversed with naloxone 0.2-0.4 mg IV. As naloxone has a short half life respirations should be monitored frequently and naloxone repeated if necessary. Airway protection is the main management feature for all drug overdoses. If in doubt seek ICU advice. Special nurse indicated.

- Neurological causes: - often complicated by bulbar paralysis. Be alert to this and stop oral intake. Remember liquids are even more likely to be aspirated. Nasogastric tube indicated plus regular suction. Clinical assessment of respiratory state is often difficult. It is best to use vital capacity or peak flow measurements (for urgent vitalograph assessment contact ICU or Respiratory Unit Technician). If vital capacity <1.0 litre or peak flow <200 l/minute consult ICU or Respiratory Unit re transfer for observation and/or assisted ventilation. Consult these Units early as there may be a dramatic deterioration when the respiratory workload exceeds the available respiratory reserve. If unexpected hypoxaemia is found on blood gases or hypoxia increases in severity, again seek early advice.

CHRONIC OBSTRUCTIVE AIRWAYS DISEASE

Causes

- smoking - chronic bronchitis and emphysema.
- Other causes:
  - mucoviscidosis
  - α1 anti-trypsin deficiency
  - post viral infection

- Acute deterioration due to:

  - exacerbation of infective bronchitis - the infection may be relatively mild
  - bronchopneumonia
  - pneumothorax
  - drug withdrawal or non-compliance
  - heart failure

Investigations

- As above although lung scan not normally indicated.
- Sputum and blood culture if febrile.
- Theophylline level if taking these drugs.

Old Notes: Previous blood gases critical in knowing what to aim for and/or justification for considering assisted ventilation. Chest x-ray may be delayed until morning if gases not worse than previously.

Management

- Oxygen 28% is safe to start and increase freely to achieve a P_aO_2 of between 50-60 since one then approaches >90% Hb saturation. Once in this range there is little need to use higher O_2 concentrations to raise P_aO_2 further. Remember to wait 10 minutes after inspired O_2 change before repeating gases. High P_aCO_2 alone in the absence of acidosis (i.e. adequate compensation) is not an indication for ventilation if P_aO_2>60. Seek advice re ventilation. If rapid improvement not expected and patient tired transfer to ICU or Respiratory Unit.
- Treat precipitating factors.
- Infection - IV ampicillin 500 mg 6 hourly or erythromycin 300 mg IV 6 hourly if allergic to penicillin. Cefoxitin 1 gm, or Cefuroxime 1.5 g, both IV 8 hourly, are alternatives particularly if aspiration a serious consideration. Steroids even in absence of bronchospasm may reduce bronchial inflammation thereby helping to relieve obstruction. Give hydrocortisone 300 mg IV stat. then 200 mg 6 hourly. Get on to an equivalent dose of oral steroids as soon as able to tolerate oral medications.
- Xanthines - aim to achieve serum theophylline peak level of 50-100 umol/l . Give IV aminophylline, loading dose 5.6mg/kg, and infuse over 20 minutes. Give zero to half loading dose if patient known, or suspected, to be on a theophylline preparation. Maintenance dose 0.7-0.9mg/kg/hr, reducing the dose with age, and to as low as 0.3mg/kg/hr if heart failure or liver disease is present. Adjust with close serum theophylline monitoring.
- Salbutamol via the nebulizer 1 ml of 5 mg/ml solution diluted to 2 ml in normal saline 4 hourly (increase to 2 hourly if required to cover an acute crisis).
- Heart failure - treat with diuretic etc as required (see Cardiology) but be careful not to treat systemic venous hypertension over vigorously.

Often adequate RV function in patients with cor pulmonale depends on a high RV filling pressure.
- Pneumothorax - if you are competent to do so put in an intercostal drain, if not seek help. (See Below).

Note:
Pneumothorax needs to be either under tension and affecting cardiac function, or causing major lung collapse (say >50%), generally to merit this active treatment. Note that percentage collapse is a volume assessment and this must be borne in mind when viewing a 2 dimensional chest x-ray. However, smaller pneumothoraces may require treatment if respiratory function is marginal. Respiratory consultation is essential since a pneumothorax in this situation is likely to be life threatening.

Note:
Steroids are often reduced too rapidly. 7-14 days high dose steroids are often necessary. Steroids should be tailed off over a similar period. High dose steroid inhalation may be useful and should be started during the tailing period, e.g. beclomethasone (Becotide) up to 4 puffs b.d. or even q.i.d. (total daily dose = 800 mcg).

Note:
These patients normally merit antibiotics, steroids and bronchodilators, even in the absence of obvious infection or bronchospasm an improvement in P_aO_2 gives tremendous gain in O_2 saturation with resultant clinical improvement.

SEVERE ASTHMA

Causes

- Severe airways obstruction due to:
  - allergic/irritant/toxic challenge
  - infection
  - retained secretions
  - intrinsic (vagal) reflexes
  - inadequate/inappropriate treatment (e.g. B blockers)

Key Signs

- Tachypnoea, tachycardia, pulsus paradoxus, exhaustion, confusion, respiratory muscle failure, with paradoxical abdominal movements indicating diaphragm failure.

- Differential diagnosis includes left heart failure, diffuse pneumonia, bronchiolitis, and spontaneous pneumothorax.

Investigations

- Blood gases - this is a crucial investigation since it gives an objective assessment of severity and provides a baseline to judge improvement or deterioration (see note below).
- Chest x-ray.
- Serum theophylline.
- SMAC.
- Sputum, urgent smear and culture.
- Peak flow monitoring.
- Complete blood count.
- ECG.

Treatment

- Oxygen - at least 40% O_2 using Hudson mask, until O_2 therapy controlled by blood gas studies.
- Sympathomimetics - nebulised Ventolin, or Berotec, or Bricanyl, all 2.5-5.0 mg, usually plus Atrovent 250-500 ug, given up to 2 hourly. Consider IV Ventolin as an alternative or supplemental to IV Aminophylline, using 0.2 ug/kg/min. infusion with careful cardiac / ECG monitoring.
- Xanthines - aim to achieve serum theophylline peak level 50-100 umol/l. Give IV aminophylline, loading does 5.6 mg/kg, infuse over 20 minutes. Give zero to half loading dose if patient known, or suspected, to be on a theophylline preparation. Maintenance dose 0.7-0.9 mg/kg/hr, reducing the dose with age, and to as low as 0.3 mg/kg/hr if heart failure or liver disease present. Adjust with close serum theophylline monitoring.
- Steroids - IV hydrocortisone, 300 mg stat. then a maintenance dose of 300 mg 6 hourly, or more, depending on clinical severity. Beware of the salt retaining effects of steroids in at-risk patients, e.g. the elderly or those with marginal LV function.
- Antibiotics. Consider giving broad spectrum, antibiotic cover (e.g. - ampicillin)
- Correct dehydration and electrolytes. Watch potassium level.
- Physiotherapy.

Note:

Blood Gases - P_aCO_2 falls steadily as a severe attack worsens, then rises rapidly as patient becomes severely obstructed - so a high-normal P_aCO_2 is alarming, and any hypercapnia usually indicates the need for assisted respiration, unless alveolar ventilation can be immediately improved.

Assisted Ventilation - must be started early, if airways obstruction cannot be relieved rapidly, if patient becomes exhausted, if there is evidence of respiratory muscle (diaphragm and intercostal) failure, or if P_aO_2 problems cannot be corrected.

Changing from IV to oral therapy - start prednisone 30-50 mg a day reducing at a rate and to a level based on pre-admission oral steroid history, the severity of the attack, and on ability to take steroid aerosol. Oral theophylline - start slow release theophyllines with serum theophylline monitoring.

SUBSEQUENT MANAGEMENT AFTER AN ACUTE ASTHMA ATTACK HAS BEEN CONTROLLED

Once the acute attack has subsided it is necessary to sit down with the patient and retake the history, trying to assess long term severity, quality of management, compliance and the need for a crisis plan, asthma education or Respiratory Clinic referral. In general, Respiratory Unit referral is recommended.

How severe has the asthma been?

- The frequency of hospital admissions, emergency treatments, or acute attacks in the last year.
- Time lost at work or school in the last year.
- Number of nights in the month awoken with asthma.
- Interference with exercise, sport and recreation.
- Average bronchodilator aerosol use in 24 hours.
- Number of steroid courses in the last year.
- Peak flow records.

Is the Drug Regime Appropriate?

- **Mild Asthma:** B agonist aerosol p.r.n. +- Intal or Becotide aerosol
- **Moderate Asthma:** B agonist aerosol p.r.n.- b.d. - q.i.d + Intal or Becotide aerosol +- Oral theophylline (with monitoring)
- **Severe Asthma:** B agonist aerosol p.r.n. & q.i.d. + Intal or Becotide / Becloforte aerosol + Oral theophylline (with monitoring) + oral steroid (courses / long term)

Is the Patient Compliant?

- Is prophylactic medication taken regularly
- Is aerosol technique satisfactory
- Does the patient still smoke
- Is there continuity of medical care
- Does the patient default follow up appointments
- Is there depression, alcohol / drug abuse, or serious psycho-social problems

Is the Crisis Management Satisfactory?

- **Can patient assess severity of attack?**
  - bronchodilator resistance
  - diminishing peak flow
  - rising pulse
  - subjective symptoms
- **Does the patient have a crisis plan ?**
  - increase dose bronchodilator aerosol
  - add stat. dose of prednisone
  - seek emergency care GP or A & E
- **Is the patient at high risk ?**
  - are attacks precipitate - less than 3 hours
  - has there been previous "near miss" attacks with respiratory or cardiac arrest, convulsions, loss of consciousness, I.P.P.V. or intubation.
  - what were the worst blood gases noted in previous attacks.
- **Does the high risk case need ?**
  - written crisis plan (copy to GP)
  - peak flow meter at home
  - nebulized bronchodilator at home
  - emergency oxygen supply
  - sub-cut. terbutaline for emergency self administration
  - open admission to the respiratory ward, PMH

REMEMBER 135 otherwise healthy people under the age of 70 die of asthma in New Zealand every year; if in doubt about management referral is indicated **to Respiratory Outpatients:** Contact PMH, ext 707 for patients with severe or frequent attacks, poor control or non-compliance. **Asthma Education Classes and Smoking Cessation Programmes** are probably best arranged following assessment in the Respiratory Unit.

PNEUMOTHORAX

Causes

- Spontaneous.
- Asthma.
- Emphysema.
- Trauma (including pleural aspiration, insertion of CVP lines).

Clinical Signs

- Symptoms may be relatively mild including dyspnoea and /or pain. Signs may consist of:

  - Decreased movement on affected side.
  - trachea may be displaced towards or away from the affected side depending on air pressure within the pleural cavity.
  - increased reasonance affected side.
  - distant breath sounds ± added clicks or rubs.

  Coin sign rare.

Investigations

- Chest x-ray in expiration.
- Gases.

Treatment

- This may vary from immediate life saving relief of tension to nothing. Usually no active treatment is needed. Insert intercostal tube if:

  - tension pneumothorax
  - a deteriorating patient with pre-existing lung disease.
  - substantial collapse >50% (see previous comments under COAD).

  Tube Insertion - Unless urgent, get help if you have not done this before. Remember to fill underwater seal with sterile water and provide clips for the tube. Explain to nursing staff the importance of clipping the tube to move patient in bed or to elevate water seal bottle.

PNEUMONIA

Causes

- Uncomplicated in approximate order of frequency:

  - Pneumococci
  - H influenzae
  - Mycoplasma
  - Other organisms e.g. Branhamella, Klebsiella, Aspergillus, Pseudomonas
  - rare causes include Legionella and Pneumocystis

- Staphylococcal in alcoholics or post influenzal
- Aspiration. Gram negative and anaerobic organisms commonly involved.
- Viral.
- Consider tuberculosis in apical disease ± calcification.
- Consider decreased host resistance - hypogammaglobulinaemia, dysproteinemia, immunosuppressive drugs, neutropenia.

Investigations

- Chest x-ray - beware left lower lobe pneumonia behind the heart shadow. Pneumococcal pneumonia is lobar. Klebsiella crosses pleural surfaces and often involves upper lobes. Aspiration sites are basal and posterior segments of middle and lower lobes which suggests Gm -ve and anaerobic infections.
- Sputum (not saliva) - specify if already on antibiotics. Urgent ZN stain when TB suspected.
- Blood gases.
- Consider pleural aspirate. Get decubitus film if in doubt about pleural fluid or its mobility. If chest x-ray shows a "white out" not associated with lung collapse then pleural fluid or empyema may be the cause. Urgent gram stain of pleural fluid may be helpful. Get ZN stained smear and culture for TB.
- Blood cultures.
- SMAC.
- Immunoglobulin levels.

Management

- High flow oxygen (40% via Hudson mask 6 l/min.- adjust on the basis of repeat gases).
- IV fluids.
- Antibiotics
  - Ampicillin 1g IV 6 hourly.
  - If penicillin allergy, erythromycin IV (hard on veins), or IM (hard on muscles) 600mg 6 hourly.
- If aspiration suspected, cefoxitin 1 gm 8 hourly IV or metronidazole 15mg/kg over 1 hour, then maintenance of 7.5 mg/kg/6 hours. If metronidazole is given, a second antibiotic should be added to give aerobic cover, e.g. ampicillin IV.
- Klebsiella may be treated with an aminoglycoside + a cephalosporin, e.g. cefuroxime (see below).
- Pseudomonas infections and infections in the neutropenic and immunosuppressed are probably best treated with at least 2 broad spectrum antibiotics at least until the sensitivities of the organism(s) are known e.g. tobramycin 3 mg/kg IV infusion or bolus stat then 1.5 mg/kg by 8 hourly IV adjusted according to levels and piperacillin 4 g 8 hourly. Cefaperazone and cefotaxime may also be effective.
- Include cloxacillin if staphylococcal infection likely or in fulminant cases.
- Erythromycin treats mycoplasma pneumonia (check for anaemia, direct Coombs and cold agglutinins and established by mycoplasma antibody titres) and legionnaires disease (latter shocked out of proportion to chest x-ray which shows lobar change, mainly hospital acquired, serological diagnosis). If empyema is present seek surgical advice.
- Tuberculosis is treated if smear +ve, otherwise await culture results. Consider fibre optic bronchoscopy to increase diagnostic yield in deteriorating patients. If smear +ve, patients should be in respiratory isolation.

Note:
Shock lung is a syndrome leading to progressive deterioration and is best managed in ICU or Respiratory Unit. Steroids are accepted additional therapy although there is little evidence to justify this.

PULMONARY EMBOLISM

Clinical Diagnosis

- Have a high index of suspicion. Commoner in pregnancy, after any operation especially lower abdominal or on the legs. Consider P.E. if sudden dyspnoea, chest pain, syncope or even P.U.O. Look for possible source of emboli, e.g. in the legs.

Diagnostic Investigations (for a recent discussion, see **Ann.Int.Med. 1983 98 891)**

- The extent of investigations will depend on the clinical situation. In gravely ill patients, measures to maintain circulation, if possible pulmonary angiography, heparin and / or fibrinolytic treatment may all be needed urgently. In less severely ill patients the following may be relevant.
- Blood screen - ? polycythaemia, ? thrombocytosis.
- Chest x-ray, not to establish P.E. but to diagnose other conditions, e.g. pneumothorax.
- ECG S_1,Q_3,T_3 is seen in less than 50% of extensive P.E. May see right heart strain pattern or tachycardia. Again mainly useful to diagnose other conditions such as myocardial infarction.
- Blood gases - useful but non-specific, e.g. reduced P_aO_2 and hyperventilation may be seen in both P.E. and LVF. P_aO_2 >85 in non-smokers or lack of fall of P_aO_2 in smokers make P.E. extremely unlikely.
- More specific tests
  - Perfusion lung scan.
  - Ventilation / perfusion scans require a patient able to close lips tightly around airway and to co-operate. It is essential for you to decide whether the patient will be able to co-operate sufficiently to enable a ventilation scan to be performed.
  - Pulmonary angiography. The most specific test. Essential if fibrinolytic treatment is contemplated. Consult Radiologist. Consider whether bilateral venography should be done.

Management

- Relieve pain. May need narcotics but avoid respiratory depression.
- Oxygen. 40% via ventimask at 6 l/minute. Monitor and adjust.
- Anticoagulant therapy. Consider either heparin or fibrinolytic therapy. If heparin is given this should be infused for 7-10 days and then converted to warfarin. Warfarin should then be given for 2-3 months or longer depending on the clinical circumstances. (For details of this treatment see previous section on anticoagulant therapy). Decide whether streptokinase/urokinase should be used. Consultation with a Haematologist is advisable. Fibrinolytic therapy does carry a higher risk of bleeding but may lead to less residual impairment of pulmonary function. This treatment may be important in the patients with massive P.E. or when P.E. occurs in patients who already have some pre-existing impairment of pulmonary function.
- Pulmonary embolism may cause acute RV failure usually leading to high CVP. The patient relies on a high RV filling pressure to maintain cardiac output, and the use of diuretics because of an elevated JVP will usually cause marked deterioration. Fluid loading with CVP monitoring

may be helpful and high levels of CVP may be required (20 to 30 cms of water). Inotropic drugs such as dopamine or dobutamine may also be required. (See Cardiology Section for details).

Note:
In acute circulatory obstruction thought to be due to P.E. consider immediate treatment with heparin.

ACUTE ANAPHYLAXIS

Causes

- Ingested substances.
- Inhalants.
- Drugs.

Investigations

- Nil. Beware hidden swelling under tongue and in soft palate indicative of laryngeal oedema. Look and listen for upper airway obstruction.

Treatment

- Adrenalin 0.5-1 ml. of 1 in 1000 IV given slowly is the treatment of choice and may be life saving. With moderate or severe shock this may need to be repeated or an infusion used whilst administering fluids.
- Diphenhydramine (Benadryl) 20 mg IV.
- Hydrocortisone 200 mg IV to prevent relapse then start short course prednisone 40 mg/day tapering over 7 days.
- IV fluids. Acute vasodilation may require volume expansion with normal saline up to 2 litres as appropriate, monitoring response by blood pressure and JVP. If the patient does not stabilise rapidly, CVP monitoring should be used and the use of IV colloids considered.
- Bronchospasm if persistent and not controlled by the above measures should be managed as for acute asthma.

Further Management

- Discuss problem with patient.
- Arrange medic alert bracelet.
- It is probably appropriate to teach the patient self administration of adrenalin . If a limited number of possible allergens can be incriminated and avoiding these is not simple then skin testing should be considered.
- Desensitization is accepted to be of some value for bee sting induced anaphylaxis but probably not for other conditions.

RHEUMATOLOGY

ACUTE SWELLING OF A SINGLE JOINT

The cause of the acute swelling must be established before any rational form of treatment can be given.

Possible Causes

- Trauma + haemorrhage.
- Infection (septic arthritis signs may be modified if on steroids).
- Crystal deposition (gout and pseudogout).
- Reactive to infections elsewhere, urethritis, bowel, rheumatic fever.
- Rheumatoid disease.
- Other conditions e.g. palindromic rheumatism, psoriasis, osteoarthritis, inflammatory bowel disease etc.

Investigations

Essential information which should be obtained at once before consulting Rheumatologist:

- Blood count for WBC and differential, platelets and ESR.
- Aspiration of joint fluid for:
  - Gram stain and culture (send aspirate in sterile tube, plugged syringe or innoculate into blood culture bottle).
  - Cell counts and differential (into SMAC tube and inverted).
  - Compensated polarised light examination for crystals (SMAC Tube)
- Blood culture - 2 sets in 24 hours. Consider possibility of gonococcus.
- SMAC for serum urate level.
- PT and PTTK if bleeding suspected.
- X-ray joint. x-ray hands, wrists and feet for evidence of rheumatoid arthritis if previous attacks of arthritis.

When indicated from history:

- Swab throat, cervix, urethra, anus (should be cultured at bed side to grow Chlamydia and N.gonorrhoea).
- Culture faeces (yersinia, salmonella, campylobacter).
- Ferritin if haemochromatosis suspected.

Treatment

- **Septic Arthritis**

  - Splint joint and give analgesia.
  - Use appropriate antibiotic
    If gram positive cocci or Staphylocci suspected give
    Penicillin 1 megaunit)
    Cloxacillin 500 mg)intravenously 6 hourly
    If allergic to penicillin erythromycin 300 mg IV 6 hourly or the more expensive vancomycin.
  - Repeat aspiration of synovial fluid daily.
  - If not settling in 48 hours may need open drainage.

- **Acute Gout or Psuedogout**

  - Initial therapy

Indomethacin 75 mg. by mouth at once then 50 mg every 6 hours **or** naproxen 750 mg at once then 250 mg every 8 hours **or** colchicine 1.0 mg at once then 0.5 mg every 2-3 hours until pain disappears or G.I. symptoms develop. Maximum dose 10 mg.

- After acute attack of gout has subsided consideration must be made about the cause of the hyperuricaemia. If uric acid lowering drugs are used it is desirable to cover the period of initiation with NSAID.

- **Haemarthrosis**

  - Immobilise join.
  - If bleeding disorder suspected do not aspirate joint before seeking advice, otherwise aspirate as much as possible at time of diagnostic tap.
  - Unless trauma clearly the cause refer to haematologist as a bleeding disorder likely. Following consultation appropriate coagulation factor replacement may be indicated. A PT ratio and PTTK in the normal range does not necessarily rule out a coagulopaothy. Significant trauma should lead to referral to an Orthopaedic surgeon.

SEPTICAEMIA

- Think of the possibility. Early diagnosis and prompt treatment are vital.
- Patients with septicaemia are usually toxic and febrile. Beware of the atypical presentation - the patient may be afebrile but look ill or be in shock. For example, a patient with chronic renal failure and a severe infection may only show a low grade fever.

Clinical Situations which may predispose the patient to septicaemia

- IV lines, urinary catheters etc.
- Septicaemia supervening upon local sepsis.
- Reduced host defence mechanisms - low immunoglobulins, post-splenectomy*, neutropenia, defective cellular immunity (e.g. following cancer treatment and tissue transplantation.)
- Steroid therapy.
- Elderly and the debilitated.
- Drug addicts and alcoholics.
- Post surgery.
  Diabetes mellitus.
- Chronic renal failure.

* Death may occur within a few hours in these patients.

Investigations

- Blood cultures - since the diagnosis is based upon culturing organisms from the blood, good technique here is vital.
  - Do 2 venepunctures, and on each occasion take 30 ml of blood and inoculate 3 blood culture bottles or tubes. In other words, a total of 2 venepunctures are done and 6 blood culture bottles are taken. If septicaemia is suspected then the situation is urgent and 5-10 minutes between venepunctures is sufficient
  - Technique - select vein. Wipe skin with Hibitane-Cetrimide-alcohol and allow to dry. Remove foil caps and cardboard from bottles or tubes. Swab rubber bottle tops with Hibitane-Cetrimide-alcohol, and leave swab on lid while cleaning skin and carrying out the venepuncture. Change the needle following venepuncture, and then inoculate the tubes. Make sure that a pool of antiseptic has not been left on the lid of the bottle. The vacuum in the bottle will draw in the correct amount of blood. Remove needle and gently invert bottles to prevent blood clotting. Send to Lab. Do not refrigerate. If lab closed, keep at room temperature
  - If endocarditis is suspected 2 venepunctures/6 bottles should be adequate, but if antibiotics have been given during the past 2 weeks do 4 venepunctures/12 bottles.
- Other cultures. Always get an MSU and throat and nose swabs. Swab any skin lesions. Swab ears if local sepsis likely. Get sputum if possible. Consider LP if meningitis possible. If fluid is aspirated from joint or serous cavities send these for culture in the aspirating syringe. Consult Microbiology if these cultures have to be stored for more than an hour or so.
- Hb, WBC and differential, platelets. Coagulation profile at least to include PT and PTTK since DIC may be present.
- Electrolytes, urea, creatinine and glucose.
- Chest x-ray. Other radiologic investigations may be needed according to

the clinical picture.
- Arterial blood gas analysis - a useful baseline as metabolic and respiratory problems are common in septicaemia.

Management

- Adequate IV hydration, initially normal saline for resuscitation then normal saline alternating with 5% dextrose. Blood or albumin may be needed. If the patient is in shock then a CVP line will nearly always be required, and larger volumes of fluids may be required. Do not do this if you are not competent to do so- you will probably do more harm than good. Probably transfer to ICU where further urgent treatment may be more easily managed. If hypotensive despite adequate rehydration with systolic pressure below 80, consider a dopamine infusion.
  Fluid management in septic shock can be difficult to assess and CVP may sometimes be misleading. Swan Ganz catheterization is frequently required.

- Antibiotics - the choice will depend on the clinical context and the individual clinician. Ask yourself the following questions. **What is the likely organism? Where is the initial focus of infection? Are the patients' defence mechanisms normal?**

  Initial therapy is thus likely to be empiric or be based on an educated guess. More than one broad spectrum antibiotic should be used. Some possible combinations follow but remember these are only suggestions (for some dosages see page Haematology Section).

  Tobramycin/cefuroxime -a useful general combination
  Tobramycin/piperacillin -if pseudomonas suspected
  } these combinations miss anaerobes and streptococci

  Tobramycin/cloxacillin -if ? staphlococcal sepsis
  Tobramycin/vancomycin -for "resistant" staphylococcal infection
  Tobramycin/cefoxitin -for abdominal sepsis
  ± metronidazole

  The latter combination misses streptococci but ampicillin is effective against these organisms.

  NOTE:
  High dose penicillin should be given for clostridial or severe pneumococcal and other B haemolytic streptococcal infections.

  Review antibiotics when organisms and sensitivities are known. Culture of organisms usually takes 24 hours and sensitivities a further 24 hours.

- High dose steroids - controversial ? effective if given early. Give methylprednisolone 30 mg/kg IV stat. and consider repeating this dose at 4-6 hours.
  Seek advice before giving further steroid therapy.

- Monitor blood gases since ARDS is common in this situation and the patient who shows progressive hypoxaemia may well need assisted ventilation. Severe acidosis may result from inadequate tissue perfusion and partial correction should be considered, (see page 29).
- Repeat platelet count and coagulation profile if abnormal bleeding is occurring. This is likely to be due to DIC and if this is so, consider heparin, platelet transfusion and coagulation factor replacement.

NOTE:

In this situation, heparin is often considered but rarely given. If it is given, close clinical and laboratory monitoring will be needed in case it should worsen the haemorrhagic tendency.

SHOCK

In most shock states the correction of any hypovolaemia is probably the most important therapeutic manoeuvre. A discussion of haemorrhagic / hypovolaemia shock is given below but see page 75 for the management of septic shock, page 13 for cardiogenic shock and page 7a for anaphylaxis.

Haemorrhagic / Hypovolaemic Shock

- Replace blood loss with blood and / or normal saline, keeping Hb in the region of 100 to 120 in patients with haemorrhage. It is important to try and restore blood volume and tissue perfusion (not just BP) to normal reasonably quickly. Prolonged shock leads to a much increased risk of acute renal failure, ARDS, DIC, metabolic acidosis, and other complications.

- Assessment of the patient should be based on skin perfusion (colour, temperature and capillary return) and peripheral pulses, as well as BP and pulse rate. The latter parameters alone are relatively late to change, and rather inconsistent. If the patient does not stabilize, or if blood loss is large, urine output should be monitored using a catheter. JVP may be difficult to assess and CVP monitoring will be useful.

- Blood loss is frequently underestimated, and by far the commonest cause of persisting shock is inadequate volume replacement. In general if the patient is not adequately resuscitated after 4 to 6 units of blood or 2 to 3 litres of crystalloid fluid, or if there is any doubt about the blood volume status before this, CVP monitoring is essential - consult with ICU.

- Some patients will require higher than normal levels of CVP (up to 15 cms H_2O or occasionally higher) to achieve adequate resuscitation. This is mainly due (at least in the context of trauma) to increased pulmonary vascular resistance and RV afterload. It is important therefore not to try to achieve any particular preconceived level of CVP, but to look at trends in response to transfusion, and to assess the response of the patients' circulatory state. Bear in mind the limitations of CVP in the presence of severe chronic airways disease, known pulmonary hypertension, ARDS, and left ventricular dysfunction.

- Oxygen therapy should also be used, with monitoring of blood gases. If the patient does not improve reasonably quickly it may be helpful to consult the ICU staff.

DISEASES NOTIFIABLE IN NEW ZEALAND

(includes suspect cases)

NOTIFIABLE INFECTIOUS DISEASES UNDER THE HEALTH ACT 1956

Section A—Infectious Diseases Notifiable to Medical Officer of Health and Local Authority

Amoebiasis.
Anthrax.
Brucellosis.
Cholera.
Diphtheria.
Dysentery (see amoebiasis and shigellosis).
Enteric fever—typhoid, paratyphoid.
Hepatitis A.
Hepatitis B.
Hepatitis non A or B.
Leptospirosis.
Meningococcal infection.
Meningoencephalitis—primary amoebic.
Plague—bubonic, pneumonic, or septicaemic.
Poliomyelitis.
Psittacosis.
Rabies.
Relapsing fever.
Salmonellosis.
Shigellosis.
Smallpox.
Trachoma.
Typhus.
Yellow fever.

Section B—Infectious Diseases Notifiable to Medical Officer of Health

Acquired Immune Deficiency Syndrome (AIDS).
Campylobacter infection.
Congenital rubella.
Encephalitis—acute arthropod-borne
- —post infection.
- —post vaccinal.

Lassa fever.
Legionellosis.
Leprosy.
Listeriosis.
Marburg virus-like disease.
Neonatal infection—Any infant who within 14 days of birth or whilst in a maternity hospital exhibits one of the following:
- —Congenital rubella.
- —Congenital syphilis.

Neonatal infection (continued)
- —Eye infection due gonococcus.
- —Gastroenteritis.
- —Listeriosis.
- —Meningoencephalitis.
- —Septicaemia.
- —Staphylococcal skin infection.
- —Streptococcal Infection Groups A and B.
- —Toxoplasmosis.

Puerperal infection—Any woman who within 14 days of childbirth or abortion or whilst in a maternity hospital, has a temperature of 38°C or over or who has any infection either generalised or local arising from the genital tract or breasts.

NOTIFIABLE DISEASES OTHER THAN NOTIFIABLE INFECTIOUS DISEASES UNDER THE HEALTH ACT 1956

Notifiable to the Medical Officer of Health

Actinomycosis.
Ancylostomiasis (hookworm disease).
Carcinoma of the nasal cavity or associated air sinuses.
Cysticercosis.
Damage to eyesight to include ulceration of the cornea or heat cataract.
Decompression sickness arising from occupation.
Decompression sickness arising from recreation.
Dengue fever.
Eclampsia.
Food poisoning — all forms (chemical, bacterial, toxic).
Hydatid disease.
Lead Absorption (not occupational) causing whole blood levels in excess of
- — for 0–10 years of age 1.45 umols/litre.
- — over 10 years of age 2.9 umols/litre.

Malaria.
Noise induced hearing impairment.
Poisoning by — Arsenic, Cadmium, Chromium, Lead, Manganese, Mercury } and their compounds
Poisoning by — any chlorinated solvent.
any organophosphate pesticide.
any other pesticide.
phosphorus.
Poisoning arising from chemical contamination of environment.
Primary malignant neoplasm of the mesothelium (mesothelioma) of the pleura or of the peritoneum.
Primary neoplasm of bladder.
Pulmonary diseases due to the inhalation of dust fibres or chemicals at work.
Ross River fever.
Schistosomiasis (Bilharziasis).
Skin diseases arising from occupation.
Taeniasis.
Tetanus.
Trichinosis.

NOTIFIABLE DISEASES UNDER TUBERCULOSIS ACT 1948

Notifiable to the Medical Officer of Health

Tuberculosis (all forms)

INFORMATION FOR THE MEDICAL PRACTITIONER

COMMUNICABLE DISEASES AND SEPTIC CONDITIONS IN RELATION TO MATERNITY PATIENTS AND INFANTS

Obstetric Regulations 1975

Regulation 18. Duty of medical practitioner to notify—If any patient in a maternity hospital develops puerperal pyrexia, or any patient or infant in any such hospital develops a septic condition or develops symptoms which could lead to the diagnosis of a communicable disease or create the suspicion that a communicable disease exists, the medical practitioner in charge of the case shall forthwith inform the medical superintendent or manager of the fact that the patient has developed puerperal pyrexia, or of the nature of the septic condition that the patient or infant has developed, or of the communicable disease from which the patient or infant is or is suspected to be suffering, (as the case may require), and, in each case, of the precautions being taken.

VENEREAL DISEASES

Duties of Medical Practitioners with Respect to Patients Suffering from Venereal Disease

Health Act 1956

Section 89—Every medical practitioner who attends or advises any patient for or in respect of any venereal disease from which the patient is suffering shall, by written notice in the prescribed form delivered to the patient—

(a) Direct the attention of the patient to the infectious character of the disease, and to the penalties prescribed by this Act for infecting any other person with that disease; and

(b) Warn the patient against contracting any marriage until he has been cured of that disease or is free from that disease in a communicable form; and

(c) Give to the patient such printed information relating to the treatment of venereal disease, and to the duties of persons suffering from such disease, as may be issued by the directions of the Minister.

Venereal Diseases Regulations 1982

Regulation 7. (1) Where any medical practitioner (including any medical officer of any hospital) has been treating any person who is suffering from syphilis, gonorrheal infection affecting any site, chancroid or venereal granuloma in a communicable form, and the patient either—

(a) Fails for 1 week after the date fixed for the purpose by the medical practitioner to attend for further treatment; or

(b) Fails on 2 or more successive occasions to attend for treatment as directed by the medical practitioner,—

the medical practitioner shall, unless he knows that the patient has in the meantime placed himself under treatment by another medical practitioner, forthwith send to the Medical Officer of Health a notice relating to the patient in form 1 in the Schedule to these regulations. (Form H 787).

(2) Where any medical practitioner has reason to believe that a patient whom he is or has been treating for syphilis, gonorrheal infection affecting any site, chancroid or venereal granuloma in a communicable form has had, within the period during which he was probably infected, intimate sexual contact with a person whose name, address, or description is supplied to the medical practitioner, or of which he otherwise becomes aware, the medical practitioner may send to the Medical Officer of Health a notice in form 2 in the Schedule to these regulations. (Form H 793).

IMMUNISATION INFORMATION FOR INTERNATIONAL TRAVEL

Information on immunisation for overseas travel is available from the Medical Officer of Health of the District.

APPENDIX 2

INDICATIONS TREATMENT AND REFERRAL OF PATIENTS TO HYPERBARIC UNIT

A double compartment air recompression chamber for the treatment of divers' ailments, such as decompression sickness and air embolism, has been operational at the Princess Margaret Hospital for 4 years. In addition, it is equipped to provide hyperbaric oxygen therapy (HBO) for other clinical conditions for which this is indicated.

Currently accepted indications (Hyperbaric Oyxgen Therapy, Undersea Medical Society Publication No.30 CR (HBO) 1983) that can be dealt with by the C.H.B. are summarised below:

- Decompression sickness.
- Gas embolism (from any cause).
- Clostridial myonecrosis or cellulitis (combined in a planned approach with surgical debridement and antibiotics).
- Carbon monoxide poisoning; cyanide poisoning.
- Mixed aerobic/anaeorbic soft tissue infections with tissue necrosis; refractory Bacteroides infections.
- Crush injury with acute traumatic ischaemia.

Referral for these conditions is **VERY URGENT.** Currently, any patient in one of these categories will be accepted for assessment and therapy on an acute emergency basis.

HBO is indicated in some other conditions, e.g. osteoradionecrosis and refractory osteomyelitic, but these require extended treatment courses and these at present cannot be provided by the C.H.B. In others, e.g. multiple sclerosis, HBO remains an experimental therapy or has insuffficient clinical experience to support its use in New Zealand except as part of controlled clinical studies.

Patient referral (inpatient and external referrals):

Since these are normally emergency referrals the following procedure will ensure the promptest response:

- Ring PMH Operator,(03) 39-169, and ask him / her to **"ALERT HYPERBARIC TEAM"**.

- Give the Operator your name and contact phone number.

- Once a member of the medical staff has been contacted by the Operator he will return the enquirer's call.

- Trying to contact individual physicians can result in delay. However, in normal working hours it would also be worth ringing the Department of Anaesthesia, Christchurch Hospital, (03) 792-900, extension 613. The Unit is administered by the Department of Anaesthesia with Dr F.M. Davis as Medical-Officer-in-Charge.

APPENDIX 3

TRANFUSION REACTIONS

The following is derived from the Standing Orders on Blood Transfusion.

Blood Transfusion Procedures in New Zealand are published in a booklet of that name. Part II **"Clinical use of blood and blood products", 1982** The booklet is available on request from Blood Bank. You are strongly urged to read it.

- The nursing staff have instructions to stop transfusions as soon as reactions occur and before notifying the Houseman. Reactions occurring during blood transfusion are extremely variable. Mild febrile reactions, temperatures less than 38.5°C, and transient skin rashes are common. Since a serious haemolytic reaction may initially present with such mild symptoms, any reaction occurring during blood transfusion must be immediately reported to the doctor responsible.

- The transfusion should not be stopped if the patient has a low grade fever and is symptom free. Mild skin reactions merely require the administration of an antihistamine.

- If more severe reactions occur with fever over 38.5°C, chills, nausea, rigors, shock, hypotension, the transfusion must be stopped immediately. The blood transfusion laboratory should be alerted and the investigation below carried out.

    - The identity of the recipient and the name on the compatibility label should be checked.
    - The unit of blood should be inspected for signs of bacterial contamination.
    - The remains of the unit together with the giving set should be sent to the laboratory.
    - 10 mls clotted blood and 5 mls of citrated blood should also be sent to the laboratory, together with a post-transfusion sample of urine.

  The blood transfusion laboratory will recheck the donor and the recipient blood groups, will repeat the crossmatch, and will assess whether the donor unit was contaminated by bacteria. Inspection of the post transfusion plasma and urine for haemoglobin will provide an immediate guide to a serious haemolytic transfusion reaction.

- If, after the above tests, no cause can be found for a moderately severe reaction, it may be presumed to have an allergic basis. The transfusion can then be restarted following the administration of either an antihistamine or hydrocortisone.