

Handbook of Emergency Anaesthesia

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Preface

This handbook has been written for junior anaesthetic staff. It is easily carried in the pocket of a white coat. In a true emergency where there is no time to obtain help or advice, it will be particularly useful. In less urgent situations, it should be used as an *aide-mémoire* and should *not* be regarded as a substitute for the assistance of senior colleagues.

The information contained in this book relates only to adult anaesthesia and is brief and dogmatic. The 'Further reading' lists the principal sources of this information, as a detailed list of references proved impossible to compile. Each section consists of an amalgamation of suggestions from several sources which I have attempted to collate in a form which my own experience suggests will be helpful.

To make best use of this book, the anaesthetist should familiarize himself with its layout. The techniques it describes should be practised during routine lists. New techniques are not easily learnt in the heat of an emergency. Having read the book, it will be obvious that Chapters 4 and 5 contain a limited number of drugs and techniques. These are sufficient to enable the anaesthetist to provide a safe and satisfactory emergency service. It does not, however, preclude him from using other techniques to achieve the same result.

By the time decisions about postoperative management have to be made, the emergency nature of the situation will be over. Detailed suggestions for postoperative care are, therefore, not included in this book.

A.J.S.

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Introduction

Patients who present for emergency surgery are nearly always less well prepared than those who appear on routine lists. Emergency anaesthesia and surgery are, therefore, more hazardous. The anaesthetist should remember the adage 'first, do no harm'. It is a mistake to allow the surgeon to rush the patient to theatre without adequate investigation and preparation. Always make an effort to see the patient before he is brought to theatre. The anaesthetist often has more medical knowledge than the surgeon and may diagnose significant disease which has been missed in the surgical assessment. Doctors from other specialties may give invaluable assistance in the diagnosis and management of non-surgical problems prior to the induction of anaesthesia. The final decision about the patient's fitness for anaesthesia should always be made by the person responsible for administering the anaesthetic. If in doubt, consult a senior anaesthetic colleague—it is a sign of strength, not failure, to recognize one's own inadequacies. If a senior colleague agrees to take over the case, the junior anaesthetist should continue to play an active part; valuable experience will be gained which may be helpful in the future.

Preoperative preparation

The sections on history and examination give a list of features which may affect the conduct of anaesthesia. An explanation should be sought for abnormal findings. If necessary, doctors from other specialties should be consulted. Chapter 9 outlines associated difficulties and suggests suitable anaesthetic techniques for the conditions mentioned.

Fitness for anaesthesia

To assess the patient's fitness for anaesthesia, answer the following questions.

- Q1.** Will the proposed operation improve the patient's life-expectancy?
Yes: see Q3.
No: see Q2.
- Q2.** Will the consequences of not operating as a matter of urgency cause unacceptable morbidity?
Yes: see Q3.
No: the patient should be regarded as a routine case and operation delayed until he meets normal criteria of fitness for anaesthesia.
- Q3.** How urgent is the operation?
Very urgent: prepare to proceed, and call for assistance if problems beyond your competence are likely to occur.
Less urgent: see Q4.
Non-urgent: the patient should be treated as a routine case.
- Q4.** Are there clinical features of the patient's condition which may represent an anaesthetic hazard?
Yes: see Q5.
No: prepare to proceed.

Q5. Are there any short-term measures to reduce this hazard?

Yes: decide what measures you consider necessary and estimate the time necessary to carry them out.

No: decide whether you are capable of anaesthetizing the patient.

In essence these questions ask, 'Should I give an anaesthetic to *this* patient for *this* operation in the *present* circumstances?'.

Having made his own decisions, the anaesthetist should discuss them with the surgeon. A joint decision on the following points should be made:

- (1) The time of the operation.
- (2) Preoperative treatment required and who is to administer it.
If you can spare the time, it is best to do it yourself.

If there is any doubt or disagreement, senior colleagues should be consulted.

History

Presenting complaint

Make your own diagnosis, remembering that pneumonia, myocardial infarction and diabetes mellitus may present as abdominal pain. Note the differential diagnosis. Choose a technique which can be modified according to the operative findings.

Past medical history

- (1) Ask specifically about rheumatic fever, hepatitis and diabetes mellitus.
- (2) Excessive bleeding after tonsillectomy or dental extraction may indicate a bleeding diathesis.
- (3) Ask about other **current** or past illnesses, particularly those requiring admission to hospital.
- (4) Note any problems relating to previous anaesthetics; e.g. vomiting, chest infection, postoperative ventilation or care in an intensive therapy unit, deep vein thrombosis, pulmonary embolism, jaundice, difficult intubation. Consider the causes and the measures to prevent recurrence.

Recent medical history

Many drugs interact with anaesthetic agents—see Appendix 1.

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Allergies

A patient may be allergic to rubber, iodine or adhesive strapping as well as to drugs.

Family history

Malignant hyperpyrexia and porphyria cause anaesthetic deaths. Postoperative ventilation may be necessary due to plasma cholinesterase deficiency.

Social history

- (1) Cigarettes: beware of a stormy induction, postoperative chest infection, chronic bronchitis and ischaemic heart disease.
- (2) Alcohol: acute intoxication causes delayed stomach emptying and a reduced requirement for induction agents. Chronic intake is associated with addiction and cirrhosis.
- (3) Location of relatives/friends. After a brief general anaesthetic or a local anaesthetic, a relative or friend must be available to accompany the patient home and nurse him for the next 12–24 hours.

Direct questions

General

- (1) Age.
- (2) Dentition.
- (3) Time of last food and drink.

Cardiovascular system

- (1) *Angina*: causes include hypertension, aortic stenosis, thyrotoxicosis, anaemia and ischaemic heart disease. Angina of long duration may be due to myocardial infarction.
- (2) *Palpitations*: causes include anxiety and dysrhythmias.
- (3) *Orthopnoea and paroxysmal nocturnal dyspnoea*: causes include lung disease and left ventricular failure. The patient may not be able to lie flat for an operation under local anaesthesia.

- (4) *Exercise tolerance*: this is often inversely proportional to the severity of heart or lung disease.

Respiratory system

- (1) *Dyspnoea*: causes include many lung diseases and left ventricular failure. The patient may be unable to lie flat for an operation under local anaesthesia.
- (2) *Productive cough*: beware of laryngeal spasm and coughing at induction.
- (3) *Non-productive cough*: causes include early left ventricular failure, tuberculosis, laryngeal nerve palsy, distortion of trachea or bronchi, and bronchial irritability. Make the diagnosis if possible, and avoid irritant gases and drugs which cause bronchospasm.
- (4) *Sputum*: pink and frothy sputum is caused by left ventricular failure. Purulent sputum indicates infection. Consider preoperative postural drainage and physiotherapy. If the sputum is mucoid, consider preoperative physiotherapy and use a technique which allows early resumption of coughing.

Gastrointestinal system

- (1) *Weight loss*: serum proteins may be low, causing altered drug binding.
- (2) *Nausea and vomiting*: may occur at induction. Consider passing a nasogastric tube for obstructive lesions or giving an anti-emetic.
- (3) *Heartburn*: caused by a hiatus hernia. There is an increased risk of regurgitation at induction.

Genitourinary system

- (1) *Poor urine output*: caused by hypovolaemia, dehydration or imminent renal failure.
- (2) *Menorrhagia*: causes anaemia.

Nervous system

- (1) *Dizziness*: causes include dysrhythmias, postural hypotension and cerebrovascular insufficiency.

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- (2) *Fits*: causes include epilepsy, head injury and cerebral tumour.
- (3) *Blackouts*: causes include dysrhythmias, aortic stenosis, pulmonary stenosis, postural hypotension and vasovagal attacks.
- (4) *Abnormal sensation and power*: causes include neuropathy, myasthenia gravis and cerebrovascular accident.
- (5) *Amnesia after recent head injury*: the patient will require head injury observations. Avoid general anaesthesia if possible; if not, avoid giving drugs which may mask signs of a developing haematoma.

Musculoskeletal system

Stiff joints: beware of intubation problems and difficulty with positioning the patient on the table.

Examination

General

- (1) *Abnormal facies*: this is often diagnostic; e.g. congenital abnormalities, endocrine diseases, Parkinson's disease, myasthenia gravis.
- (2) *Skeletal abnormalities*: may cause respiratory insufficiency or a difficult intubation. Such patients require careful movement and positioning on the table.
- (3) *Obesity*: see Chapter 9.
- (4) *Cachexia*: use reduced doses of drugs.
- (5) *Weight*: gives a rough guide to drug doses.
- (6) *Respiratory insufficiency*: manifests as dyspnoea at rest and inability to complete a sentence in one breath.
- (7) *Conjunctivae*: note anaemia.
- (8) *Central cyanosis*: causes include ventilation/perfusion abnormality (improved by oxygen), methaemoglobinaemia and sulphaemoglobinaemia (not improved by oxygen).
- (9) *Peripheral cyanosis*: causes include cold, heart failure, hypovolaemia, shock, fear and Raynaud's disease.
- (10) *Purpura*: causes include old age and bleeding problems.
- (11) *Clubbing*: causes include arteriovenous fistula, cyanotic congenital heart disease, chronic suppurative lung disease, bronchial carcinoma, subacute infective endocarditis and cirrhosis. Congenital clubbing is not significant.

- (12) *State of veins*: note sites for cannulation. Poor filling is caused by cold, fear or hypovolaemia.
- (13) *Dentition*: note any intubation problems and crowns.
- (14) *Shape, length and mobility of neck*: note intubation problems with short, fat and/or rigid necks.
- (15) *Ability to open mouth*: note any intubation problems.
- (16) *Receding chin*: note a possible intubation problem.
- (17) *Pyrexia*: consider avoiding atropine and monitor temperature. Look for possible sources of infection.

Cardiovascular system

Pulse

- (1) *Character*:
 - (a) low volume with normal upstroke: causes include shock, mitral stenosis and pericardial effusion.
 - (b) plateau: causes include aortic stenosis and hypertrophic cardiomyopathy.
 - (c) collapsing: causes include pyrexia, anaemia, pregnancy, aortic regurgitation, patent ductus arteriosus, arteriovenous fistula and aortic atherosclerosis.
 - (d) bisferiens: combined aortic stenosis and regurgitation.
 - (e) alternans: is a sign of left ventricular failure.
 - (f) paradoxus: occurs in normal patients but if it is exaggerated consider pericardial effusion and constrictive pericarditis.
- (2) *Rate*:
 - (a) normal range is 60–100 beats per minute.
 - (b) bradycardia: causes include physical fitness, drugs, myxoedema and complete heart block.
 - (c) tachycardia: causes include pyrexia, thyrotoxicosis, hypovolaemia, myocardial ischaemia, fear and pain.
- (3) *Rhythm*: abnormal rhythm requires an ECG for diagnosis.

Blood pressure

- (1) *Normal range*: varies with age.
- (2) *Hypertension*: causes include renal disease, Cushing's disease, phaeochromocytoma, primary aldosteronism, coarctation and obesity. Serial readings are required before hypertension is diagnosed.

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- (3) *Hypotension*: causes include hypovolaemia, dehydration and shock.

Internal jugular central venous pressure

- (1) *Normal range*: 2–4 cmH₂O vertically above the sternal angle when subject reclines at 30° to horizontal.
- (2) *Elevated CVP*: causes include right ventricular failure, superior vena caval obstruction, tricuspid valve disease, pericardial effusion, constrictive pericarditis, cardiac tamponade, fluid overload and hyperdynamic circulatory states (e.g. anaemia, arteriovenous fistula, Paget's disease).

Apex beat

- (1) *Normal position*: in fifth intercostal space in the mid-clavicular line.
- (2) *Displacement*: is due to myocardial hypertrophy or mediastinal displacement.
- (3) *Impalpable apex beat*: may be due to obesity, emphysema, pericardial effusion, shock or dextrocardia.

Thrills

The presence of thrills always indicates organic heart disease.

Heart sounds

- (1) *Third and fourth heart sounds*: always indicate organic heart disease in patients over 40 years of age.
- (2) *An opening snap*: is diagnostic of mitral stenosis.

Murmurs

- (1) *All diastolic, continuous and pansystolic murmurs*: indicate significant heart disease.
- (2) *Loud systolic murmurs*: may indicate significant disease.
- (3) *Soft late systolic murmurs*: are usually benign.

Peripheral oedema

Causes of peripheral oedema include cardiac failure, venous incompetence, deep vein thrombosis, inferior vena caval ob-

struction, lymphatic obstruction, pre-eclamptic toxæmia, acute glomerulonephritis and low serum proteins.

Allen's test

See p. 22.

ECG

An ECG may show myocardial infarction or ischaemia, dysrhythmias and conduction defects, hypertrophy of individual chambers, pericarditis and electrolyte imbalance. It does not show the mechanical state of the heart.

Respiratory system

Accessory muscles

Use of accessory muscles of respiration indicates severe respiratory insufficiency.

Stridor

Stridor indicates tracheal or laryngeal narrowing.

Presence of protective reflexes

If the cough or laryngeal reflexes are inadequate, the risk of aspiration is increased.

Tracheal deviation

Intubation may be difficult unless the tube is passed in the direction of the deviation.

Shape of chest

Nearly all abnormalities of chest shape result from or cause respiratory insufficiency.

Respiratory rate

(1) *Normal value:* 14 breaths per minute.

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- (2) *Increased rate*: may be due to respiratory disease, cardiac failure, anxiety, pain, pyrexia, acidosis, hypovolaemia or severe brain damage.
- (3) *Decreased rate*: may be due to drug-induced respiratory depression, pain or respiratory failure.

Chest expansion

Place your hands on the patient's chest wall so that the thumbs meet in midline, posteriorly. Ask patient to inspire maximally. Less than 2 cm expansion indicates severe restrictive disease of the lungs or chest wall. Localized diminution of expansion may be due to collapse, consolidation or pleural effusion.

Percussion

- (1) *Cardiac and hepatic dullness*: are diminished by emphysema.
- (2) *'Stony' dullness*: is caused by a pleural effusion.
- (3) *Dullness*: is caused by consolidation, atelectasis or pleural thickening.
- (4) *Hyper-resonance*: may be due to pneumothorax or emphysema.

Auscultation

- (1) *Diminished breath sounds*: are caused by airway obstruction, pneumothorax, pleural effusion or pleural thickening.
- (2) *Bronchial breathing*: is caused by consolidation.
- (3) *Rhonchi*: are caused by narrowing of airways. Consider giving preoperative bronchodilators.
- (4) *Crepitations*: are caused by pulmonary oedema or secretions. Crepitations due to loose secretions may be dispersed by coughing.
- (5) *Pleural rub*: causes include pneumonia and pulmonary embolism.

Chest x-ray

A chest x-ray may confirm the clinical diagnosis. Note the position of the trachea, pneumothorax, pleural effusion, cavitating tuberculosis, bullae and pneumonic changes.

Respiratory function tests

There may be no time for formal tests, and the results rarely give an accurate prediction of the outcome of anaesthesia. Baseline values may, however, be useful postoperatively. The following tests are easy and quick to do:

- (1) *Snider match test*: the ability to blow out a match placed 15 cm from the open mouth confirms the absence of severe restrictive or obstructive disease.
- (2) *Forced expiratory time test*: the patient expires forcefully after maximal inspiratory effort while the anaesthetist listens through a stethoscope and times the period of expiration. A forced expiratory time of more than 6 seconds indicates moderate or severe obstructive airways disease.
- (3) *Arterial blood gases*: normal ranges (breathing air)
 - PaO_2 12–15 kPa
 - PaCO_2 4.5–6.1 kPa
 - $[\text{H}^+]$ 36–44 nmol/l
 - pH 7.36–7.45
 - Standard bicarbonate 21–25 mmol/l

Gastrointestinal system**Abdominal distension**

Abdominal distension may splint the diaphragm and cause respiratory insufficiency:

- (1) Due to intestinal obstruction: increases the risk of regurgitation and aspiration. Pass a nasogastric tube (see p. 21) and allow to drain freely. Aspirate pre-induction.
- (2) Due to a large abdominal mass (e.g. tumour, pregnancy): beware of hypotension due to inferior vena caval compression. The patient should be tilted 15° laterally and allowed to lie supine only when the mass has been removed.

Distended collateral veins

Causes include cirrhosis and chronic inferior vena caval obstruction.