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Before considering surgical intervention it is necessary to prepare the patient as fully as possible.

**The extent of pre-op preparation depends on:**

- Classification of surgery:
  - Elective
  - Scheduled
  - Urgent
  - Emergency
- Nature of the surgery (minor, major, major-plus)
- Location of the surgery (A&E, endoscopy, minor theatre, main theatre)
- Facilities available

**The rationale for pre-op preparation is to:**

- Determine a patient’s ‘fitness for surgery’
- Anticipate difficulties
- Make advanced preparation and organise facilities, equipment and expertise
- Enhance patient safety and minimise chance of errors
- Alleviate any relevant fear/anxiety perceived by the patient
- Reduce morbidity and mortality

Common factors resulting in cancellation of surgery include:

- Inadequate investigation and management of existing medical conditions
- New acute medical conditions

Classification of surgery according to the National Confidential Enquiry into Patient Outcome and Death (NCEPOD):

- **Elective:** mutually convenient timing
- **Scheduled:** (or semi-elective) early surgery under time limits (eg 3 weeks for malignancy)
- **Urgent:** as soon as possible after adequate resuscitation and within 24 hours

Patients may be:

- **Emergency:** admitted from A&E; admitted from clinic
- **Elective:** scheduled admission from home, usually following pre assessment

In 2011 NCEPOD published *Knowing the Risk: A review of the perioperative care of surgical patients* in response to concerns that, although overall surgical mortality rates are low, surgical mortality in the high-risk patient in the UK is significantly higher than in similar patient populations in the USA. They assessed over 19 000 surgical cases prospectively and identified four key areas for improvement (see overleaf).
1. Identification of the high-risk group preoperatively, eg scoring systems to highlight those at high risk

2. Improved pre-op assessment, triage and preparation, proper preassessment systems with full investigations and work-up for elective patients and more rigorous assessment and preoperative management of the emergency surgical patient, especially in terms of fluid management

3. Improved intraoperative care: especially fluid management, invasive and cardiac output monitoring

4. Improved use of postoperative resources: use of high-dependency beds and critical care facilities

1.1 Preoperative assessment

In a nutshell …

Preoperative preparation of a patient before admission may include:
- History
- Physical examination
- Investigations as indicated:
  - Blood tests
  - Urinalysis
  - ECG
  - Radiological investigations
  - Microbiological investigations
  - Special tests
- Consent and counselling

The preassessment clinic is a useful tool for performing some or all of these tasks before admission.

Preassessment is timed so that the gap between assessment and surgery is:
- Long enough so that a suitable response can be made to any problem highlighted
- Short enough so that new problems are unlikely to arise in the interim

The timing of the assessment also means that:
- Surgical team can identify current pre-op problems
- High-risk patients can undergo early anaesthetic review
- Perioperative problems can be anticipated and suitable arrangements made (eg book intensive therapy unit [ITU]/high-dependency unit [HDU] bed for the high-risk patient)
- Medications can be stopped or adapted (eg anticoagulants, drugs that increase risk of deep vein thrombosis [DVT])
- There is time for assessment by allied specialties (eg dietitian, stoma nurse, occupational therapist, social worker)
- The patient can be admitted to hospital closer to the time of surgery, thereby reducing hospital stay

The patient should be reviewed again on admission for factors likely to influence prognosis and any changes in their pre-existing conditions (eg new chest infection, further weight loss).

Preassessment is run most efficiently by following a set protocol for the preoperative management of each patient group. The protocol-led system has several advantages:
- The proforma is an aide-mémoire in clinic
- Gaps in pre-op work up are easily visible
- Reduces variability between clerking by juniors

However, be wary of preordered situations because they can be dangerous and every instruction must
be reviewed on an individual patient basis, eg the patient may be allergic to the antibiotics that are prescribed as part of the preassessment work-up and alternatives should be given.

Preoperative history
A good history is essential to acquire important information before surgery and to establish a good rapport with the patient. Try to ask open rather than leading questions, but direct the resulting conversation. Taking a history also gives you an opportunity to assess patient understanding and the level at which you should pitch your subsequent explanations.

A detailed chapter on taking a surgical history can be found in the new edition of the PasTest book MRCS Part B OSCES: Essential Revision Notes in Information Gathering under Communication Skills. In summary, the history should cover the points in the following box.
CHAPTER 1

5. Drug history and allergies
List of all drugs, dosages and times that they were taken. List allergies and nature of reactions to alleged allergens. Ask directly about the oral contraceptive pill and antiplatelet medication such as aspirin and clopidogrel which may have to be stopped preoperatively.

6. Social history
Smoking and drinking – how much and for how long. Recreational drug abuse. Who is at home with the patient? Who cares for them? Social Services input? Stairs or bungalow? How much can they manage themselves?

7. Family history

8. Full review of non-relevant systems
This includes all the systems not already covered in the history of the presenting complaint, eg respiratory, cardiovascular, neurological, endocrine and orthopaedic.

Physical examination
Detailed descriptions of methods of physical examination can only really be learnt by observation and practice. Don’t rely on the examination of others – surgical signs may change and others may miss important pathologies. See MRCS Part B OSCEs: Essential Revision Notes for details of surgical examinations for each surgical system.

General examination: is the patient well or in extremis? Are they in pain? Look for anaemia, cyanosis and jaundice, etc. Do they have characteristic facies or body habitus (eg thyrotoxicosis, cushingoid, marfanoid)? Are they obese or cachectic? Look at the hands for nail clubbing, palmar erythema, etc

Cardiovascular examination: pulse, BP, jugular venous pressure (JVP), heart sounds and murmurs. Vascular bruits (carotids, aortic, renal, femoral) and peripheral pulses

Respiratory examination: respiratory rate (RR), trachea, percussion, auscultation, use of accessory muscles

Abdominal examination: scars from previous surgery, tenderness, organomegaly, mass, peritonism, rectal examination

CNS examination: particularly important in vascular patients pre-carotid surgery and in patients with suspected spinal compression

Musculoskeletal examination: before orthopaedic surgery
1.2 Preoperative laboratory testing and imaging

When to perform a preoperative FBC
In practice almost all surgical patients have an FBC measured but it is particularly important in the following groups:
- All emergency pre-op cases – especially abdominal conditions, trauma, sepsis
- All elective pre-op cases aged >60 years
- All elective pre-op cases in adult women
- If surgery is likely to result in significant blood loss
- If there is suspicion of blood loss, anaemia, haematopoietic disease, sepsis, cardiorespiratory disease, coagulation problems

Urea and electrolytes (U&Es)
U&Es provide information on the following (normal ranges in brackets):
- Sodium (133–144 mmol/l)
- Potassium (3.5–5.5 mmol/l)
- Urea (2.5–6.5 mmol/l)
- Creatinine (55–150 µmol/l)

The incidence of an unexpected abnormality in apparently fit patients aged <40 years is <1% but increases with age and ASA grading (American Society of Anesthesiologists).

Blood tests

Full blood count (FBC)
FBC provides information on the following (normal ranges in brackets):
- Haemoglobin concentration (12–16 g/dl in males; 11–14 g/dl in females)
- White cell count (WCC 5–10 × 10⁹/l)
- Platelet count (150–450 × 10⁹/l)

Also it may reveal details of red cell morphology (eg macrocytosis in alcoholism, microcytosis in iron deficiency anaemia) and white cell differential (eg lymphopenia, neutrophilia).
CHAPTER 1

When to perform a preoperative U&E
In practice almost all surgical patients get their U&Es tested but it is particularly important in the following groups:

- All pre-op cases aged >65
- Positive result from urinalysis (eg ketonuria)
- All patients with cardiopulmonary disease, or taking diuretics, steroids or drugs active on the cardiovascular system
- All patients with a history of renal/liver disease or an abnormal nutritional state
- All patients with a history of diarrhoea/vomiting or other metabolic/endocrine disease
- All patients on an intravenous infusion for >24 hours

Amylase

- Normal plasma amylase range varies with different reference laboratories
- Perform in all adult emergency admissions with abdominal pain, before consideration of surgery
- Inflammation surrounding the pancreas will cause mild elevation of the amylase; dramatic elevation of the amylase results from pancreatitis

Random blood glucose (RBG)

- Normal plasma glucose range is 3–7 mmol/l

When to perform an RBG

- Emergency admissions with abdominal pain, especially if suspecting pancreatitis
- Preoperative elective cases with diabetes mellitus, malnutrition or obesity
- All elective pre-op cases aged >60 years
- When glycosuria or ketonuria is present on urinalysis

Clotting tests

Prothrombin time (PT)

- 11–13 seconds
- Measures the functional components of the extrinsic pathway prolonged with warfarin therapy, in liver disease and disseminated intravascular coagulation (DIC)

Activated partial thromboplastin time (APTT)

- <35 seconds
- Measures the functional components of the intrinsic pathway and is prolonged in haemophilia A and B, with heparin therapy and in DIC

International normalised ratio (INR)

- 0.9–1.3 for normal person; range varies for those on warfarin depending on reason for treatment
- INR is a ratio of the patient’s PT to a normal, control sample
Sickle cell test
Different hospitals have different protocols, but in general you would be wise to perform a sickle cell test in all black patients in whom surgery is planned, and in anyone who has sickle cell disease in the family. Patients should be counselled before testing to facilitate informed consent.

Liver function tests (LFTs)
- Perform LFTs in all patients with upper abdominal pain, jaundice, known hepatic dysfunction or history of alcohol abuse
- Remember that clotting tests are the most sensitive indicator of liver synthetic disorder and may be deranged before changes in the LFTs. Decreased albumin levels are an indicator of chronic illness and sepsis

Group and save/cross-match
When to perform a group and save:
- Emergency pre-op cases likely to result in significant surgical blood loss, especially trauma, acute abdomen, vascular cases
- If there is suspicion of blood loss, anaemia, haematopoietic disease, coagulation defects
- Procedures on pregnant females

Urinalysis
When to perform pre-op urinalysis:
- All emergency cases with abdominal or pelvic pain
- All elective cases with diabetes mellitus
- All pre-op cases with thoracic, abdominal or pelvic trauma

A midstream urine (MSU) specimen should be considered before genitourinary operations and in pre-op patients with abdominal or loin pain.

A urine pregnancy test should be performed in all women of childbearing age with abdominal symptoms, or who need a radiograph.

Electrocardiography
A 12-lead electrocardiogram (ECG) is capable of detecting acute or long-standing pathological conditions affecting the heart, particularly changes in rhythm, myocardial perfusion or prior infarction.

Note that the resting ECG is not a sensitive test for coronary heart disease, being normal in up to 50%. An exercise test is preferred.

When to perform a 12-lead ECG:
- Patients with a history of heart disease, diabetes, hypertension or vascular disease, regardless of age
- Patients aged >60 with hypertension or other vascular disease
- Patients undergoing cardiothoracic surgery, taking cardiotoxic drugs or with an irregular pulse
- Any suspicion of hitherto undiagnosed cardiac disease

Radiological investigations
Radiological investigations may include:
- Plain films: chest radiograph, plain abdominal film, lateral decubitus film, KUB (kidney, ureter, bladder) film, skeletal views
- Contrast studies and X-ray screening: Gastrografin, intravenous (IV) contrast
- Ultrasonography: abdominal, thoracic, peripheral vasculature
- Computed tomography (CT): intra-abdominal or intrathoracic pathology
- Magnetic resonance imaging (MRI): particularly for orthopaedics, spinal cord compression, liver pathology
**Chest radiograph**
When to perform a pre-op chest radiograph:
- All elective pre-op cases aged >60 years
- All cases of cervical, thoracic or abdominal trauma
- Acute respiratory symptoms or signs
- Previous cardiorespiratory disease and no recent chest radiograph
- Thoracic surgery
- Patients with malignancy
- Suspicion of perforated intra-abdominal viscus
- Recent history of tuberculosis (TB)
- Recent immigrants from areas with a high prevalence of TB
- Thyroid enlargement (retrosternal extension)

**Plain abdominal film**
Plain abdominal films should be performed when there is:
- Suspicion of obstruction
- Suspicion of perforated intra-abdominal viscus
- Suspicion of peritonitis

The role of radiological investigation in diagnosis and planning is discussed further in Chapter 2, Surgical technique and technology.

**Microbiological investigations**
The use and collection of microbiological specimens is discussed in *Surgical microbiology*.

**Investigating special cases**

**Coexisting disease**
- A chest radiograph for patients with severe rheumatoid arthritis (they are at risk of disease of the odontoid peg, causing subluxation and danger to the cervical spinal cord under anaesthesia)
- Specialised cardiac investigations (eg echocardiography, cardiac stress testing, MUGA scan) used to assess pre-op cardiac reserve and are increasingly used routinely before major surgery
- Specialised respiratory investigations (eg spirometry) to assess pulmonary function and reserve

**Investigations relating to the organ in question**
- Angiography or duplex scanning in arterial disease before bypass
- Renal perfusion or renal isotope imaging or liver biopsy before transplant
- Colonoscopy, barium enema or CT colonography (CTC) before bowel resection for cancer

**1.3 Preoperative consent and counselling**

**Deciding to operate**
It is often said that the best surgeon knows when not to operate. The decision to undertake surgery must be based on all available information from a thorough history, examination and investigative tests. All treatment options, including non-surgical management, and the risks and potential outcomes of each course of action must be discussed fully with the patient in order to
achieve informed consent. In some specialties, clinical nurse practitioners or other support staff may support the patient (e.g., a breast-care nurse before mastectomy, a colorectal nurse specialist before an operation resulting in a stoma). This helps to prepare the patient for surgery, gives them an opportunity to ask further questions and provides a support network.

Counselling
Medical staff spend most of their working life in and around hospitals, so it is easy to forget how the public view hospital admission, surgical procedures and the postop stay on the ward. It is important to recognise that all patients are different—in their ages, in their beliefs and in their worries.

Presenting information to patients
- Discuss diagnoses and treatment options at a time when the patient is best able to understand and retain the information
- Use up-to-date written material, visual and other aids to explain complex aspects of surgery
- Use accurate data to explain the prognosis of a condition and probabilities of treatment success or the risks of failure
- Ensure distressing information is given in a considerate way, and offer access to specialist nurses, counselling services and patient support groups
- Allow the patient time to absorb the material, perhaps with repeated consultations or written back-up material
- Ensure voluntary decision-making: you may recommend a course of action but you must not put pressure on the patient to accept it. Ensure that the patient has an opportunity to review the decision nearer the time.

Responding to questions: you must respond honestly to any questions that the patient raises and, as far as possible, answer as fully as the patient wishes.

Withholding information: you should not withhold information necessary for decision-making unless you judge that disclosure of some relevant information would cause the patient serious harm (not including becoming upset or refusing treatment). You may not withhold information from a patient at the request of any other person including a relative.

If a patient insists that he or she does not want to know the details of a condition or a treatment, you should explain the importance of knowing the options and should still provide basic information about the condition or treatment unless you think that this would cause the patient some harm.

Records: you should record in the medical records what you have discussed with the patient and who was present. This helps to establish a timeline and keeps other members of staff informed as to what the patient knows. You must record in the medical records if you have withheld treatment and your reasons for doing so.
General concerns of the surgical patient
Is this the first time the patient has been in hospital?
Never forget that all surgical procedures are significant to the patient, no matter how simple we believe the case to be.

Good communication is essential so that the patient knows what to expect beforehand and can make an informed decision:
- Check that you know the patient well enough and understand the problem enough to explain it to him or her
- Choose the setting
- Explain the diagnosis in terms that they will understand
- Explain the possible options
- Explain the difference between between conservative and surgical managements of the condition
- Ask if the patient has any thoughts about the options
- Ask if he or she has any questions
- Give the patient the option to ask you questions later

Think about potential questions from the patient and address them in your explanation:
- What are the risks of anaesthetic and surgery?
  - Colostomy
  - Transplantation
  - Amputated limbs
  - What if things go wrong?
  - How long will I stay in hospital?
  - Will I die?

Specific considerations of the individual

Knowledge
- How much does the patient know and understand?
- Is the patient’s understanding influenced by what he or she has read (eg on the internet) or by previous experience, either personal or through people whom he or she knows

Employment
- Will surgery affect a return to work?

Social network
- What support does the patient have? Family, friends, carers?
- What responsibilities does the patient have, eg children, dependants
- When can I drive?

Physical issues/deformity

Psychological issues

Recovery and what to expect
- How long will I be in hospital for?

Complications
- What potential complications may result in readmission (eg wound infection, unsuccessful operation)?
Obtaining consent
The General Medical Council gives the following guidelines (GMC 2008).

Ask patients whether they have understood the information and whether they would like more before making a decision. Sometimes asking the patient to explain back to you, in his or her own words, what you have just said clarifies areas that the patient does not really understand and may need more explanation.

The legal right to consent
The ability to give informed consent for different patient ages and groups is discussed fully in Chapter 8, Ethics, Clinical Governance and the Medicolegal Aspects of Surgery.

Obtaining consent
Provide sufficient information:
- Details of diagnosis
- Prognosis if the condition is left untreated and if the condition is treated
- Options for further investigations if diagnosis is uncertain
- Options for treatment or management of the condition
- The option not to treat
- The purpose of the proposed investigation or treatment
- Details of the procedure, including subsidiary treatment such as pain relief
- How the patient should prepare for the procedure
- Common and serious side effects
- Likely benefits and probabilities of success
- Discussion of any serious or frequently occurring risks
- Lifestyle changes that may result from the treatment
- Advice on whether any part of the proposed treatment is experimental
- How and when the patient’s condition will be monitored and reassessed
- The name of the doctor who has overall responsibility for the treatment
- Whether doctors in training or students will be involved
- A reminder that patients can change their minds about a decision at any time
- A reminder that patients have a right to seek a second opinion
- Explain how decisions are made about whether to move from one stage of treatment to another (eg chemotherapy)
- Explain that there may be different teams of doctors involved (eg anaesthetists)
- Seek consent to treat any problems that might arise and need to be dealt with while the patient is unconscious or otherwise unable to make a decision
- Ascertain whether there are any procedures to which a patient would object (eg blood transfusions)
1.4 Identification and documentation

**Patient identification**
Patient identification is essential. All patients should be given an identity wristband on admission to hospital, which should state clearly and legibly the patient’s name, date of birth, ward and consultant. He or she should also be given a separate red wristband documenting allergies. Patient identification is checked by the nursing team on admission to theatre.

**Documentation**
Medical documents (medical notes, drug and fluid charts, consent forms and operation notes) are legal documents. All entries to the notes should be written clearly and legibly. Always write the date and time and your name and position at the beginning of each entry.

Documentation often starts with clerking. Record as much information as possible in the format described above for history and examination. The source of information should also be stated (eg from patient, relative, old notes, clinic letter, GP).

Accurate documentation should continue for each episode of patient contact, including investigations, procedures, ward rounds and conversations with the patient about diagnosis or treatment.

File documents in the notes yourself; otherwise they will get lost. This is important to protect both the patient and yourself. From a medicolegal point of view, if it is not documented then it didn’t happen.

1.5 Patient optimisation for elective surgery

Morbidity and mortality increase in patients with comorbidity.

Optimising the patient’s condition gives them the best possible chance of a good surgical outcome. Do not forget that this includes nutrition.

In patients with severe comorbidity then NCEPOD recommend the following:
- Discussion between surgeon and anaesthetist before theatre
- Adequate preoperative investigation
- Optimisation of surgery by ensuring:
  - An appropriate grade of surgeon (to minimise operative time and blood loss)
  - Adequate preoperative resuscitation
  - Provision of on-table monitoring
  - Critical-care facilities are available

**Optimisation of patients for elective surgery**

**Control underlying comorbidity:** specialist advice on the management of underlying comorbidities (cardiovascular, respiratory, renal, endocrinological) should be sought. Individual comorbidities are discussed later in the chapter. Optimisation should be undertaken in a timely fashion as an outpatient for elective surgery, although some may occasionally require inpatient care and intervention before scheduling an elective procedure.

**Nutrition:** good nutrition is essential for good wound healing. Malnourished patients do badly and a period of preoperative dietary improvement (eg build-up drinks, enteral feeding, total parenteral nutrition or TPN) improves outcome.
**1.6 Resuscitation of the emergency patient**

It is essential that the acutely ill surgical patient is adequately resuscitated and stabilised before theatre. In extreme and life-threatening conditions this may not be possible (e.g., ruptured abdominal aortic aneurysm or AAA, trauma) and resuscitation should not delay definitive treatment.

Most emergency patients fall into one of two categories: haemorrhage or sepsis. The management of haemorrhage and sepsis are dealt with in detail in the Chapters 3 and 4 of this book respectively.

General principles of resuscitation are:
- **Optimise circulating volume:**
  - **Correct dehydration:** many acute surgical patients require IV fluids to correct dehydration and restore electrolyte balance. Establish good IV access. Insertion of a urinary catheter is vital to monitor fluid balance carefully with hourly measurements. Severe renal impairment may require dialysis before theatre. Dehydrated patients may exhibit profound drops in blood pressure on anaesthetic induction and aggressive preoperative fluid management is often required
  - **Correct anaemia:** anaemia compromises cardiac and respiratory function and is not well tolerated in patients with poor cardiac reserve. The anaemia may be acute (acute bleed) or chronic (underlying pathology). If anaemia is acute, transfuse to reasonable Hb and correct clotting. Consider the effects of massive transfusion and order and replace clotting factors simultaneously. Chronic anaemia is better tolerated but may also require correction before theatre

- **Treat pain:** pain results in the release of adrenaline and can cause tachycardia and hypertension. Pain control before anaesthesia reduces cardiac workload
- **Give appropriate antibiotics** early as required in sepsis. These may need to be empirical until antimicrobial treatment can be guided by blood and pus cultures
- **Decompress the stomach:** insert a nasogastric (NG) tube to decompress the stomach because this reduces the risk of aspiration on anaesthetic induction

**1.7 The role of prophylaxis**

Prophylaxis essentially refers to the reduction or prevention of a known risk. Preoperatively prophylaxis should include:
- **Stopping potentially harmful factors:**
  - Stopping medications (e.g., the oral contraceptive pill for a month, aspirin or clopidogrel for 2 weeks before surgery)
  - Stopping smoking: improves respiratory function even if the patient can only stop for 24 hours
- **Prescribing drugs known to reduce risks:**
  - Heparin to reduce the risk of DVT
  - Cardiac medications (e.g., preoperative β blockers, statins or angiotensin-converting enzyme [ACE] inhibitors) to reduce cardiovascular risk
1.8 Preoperative marking

This should be performed after consent and before the patient has received premedication. Marking is essential to help avoid mistakes in theatre. Marking while the patient is conscious is important to minimise error. Preoperative marking is especially important if the patient is having:

- A unilateral procedure (eg on a limb or the groin)
- A lesion excised
- A tender or symptomatic area operated on (eg an epigastric hernia)
- A stoma

Marking for surgery

- Explain to the patient that you are going to mark the site for surgery
- Confirm the procedure and the site (including left or right) with the notes, patient and consent form
- Position the patient appropriately (eg standing for marking varicose veins, supine for abdominal surgery)
- Use a surgical marker that will not come off during skin preparation
- Clearly identify the surgical site using a large arrow
SECTION 2
Preoperative management of coexisting disease

2.1 Preoperative medications

In a nutshell ...

If a patient is having surgery:
- Review pre-existing medication:
  - Document preoperative medications
  - Decide which drugs need to be stopped preoperatively
  - Decide on alternative formulations
- Prescribe preoperative medication:
  - Prescribe prophylactic medication
  - Prescribe medication related to the surgery
  - Prescribe premed if needed
- Be aware of problems with specific drugs:
  - Steroids and immunosuppressants
  - Anticoagulants and fibrinolytics

Review pre-existing medication

Perioperative management of pre-existing medication
Document preoperative medications
Decide whether any drugs need to be stopped before surgery
- Stop oral contraceptive (OCP) or tamoxifen 4 weeks before major or limb surgery – risk of thrombosis
- Stop monoamine oxidase inhibitor (MAOI) antidepressants – they interact with anaesthetic drugs, with cardiac risk
- Stop antiplatelet drugs 7–14 days preoperatively – risk of haemorrhage
Decide on alternative formulations for the perioperative period
- For example, IV rather than oral, heparin rather than warfarin
Regular medications should generally be given – even on the day of surgery (with a sip of clear fluid only). If in doubt ask the anaesthetist. This is important, especially for cardiac medication. There are some essential medications (e.g., anti-rejection therapy in transplant recipients) that may be withheld for 24 hours in the surgical period but this should only be under the direction of a specialist in the field.

Prescribe preoperative medication

**Medication for the preoperative period**

**Pre-existing medication** (see above for those drugs that should be excluded)

**Prophylactic medication**
- For example, DVT prophylaxis
- For example, antibiotic prophylaxis

**Medication related to the surgery**
- For example, laxatives to clear the bowel before resection
- For example, methylene blue to aid surgical identification of the parathyroids

**Anaesthetic premedication** (to reduce anxiety, reduce secretions, etc)

Be aware of problems with specific drugs

**Steroids and immunosuppression**

**Indications for perioperative corticosteroid cover**

This includes patients:
- With pituitary–adrenal insufficiency on steroids
- Undergoing pituitary or adrenal surgery
- On systemic steroid therapy of >7.5 mg for >1 week before surgery
- Who received a course of steroids for >1 month in the previous 6 months

Complications of steroid therapy in the perioperative period

- Poor wound healing
- Increased risk of infection
- Side effects of steroid therapy (e.g., impaired glucose tolerance, osteoporosis, muscle wasting, fragile skin and veins, peptic ulceration)
- Mineralocorticoid effects (sodium and water retention, potassium loss and metabolic alkalosis)
- Masking of sepsis/peritonism
- Glucocorticoid deficiency in the perioperative period (may present as increasing cardiac failure which is unresponsive to catecholamines, or addisonian crisis with vomiting and cardiovascular collapse)

Management of patients on pre-op steroid therapy

This depends on the nature of the surgery to be performed and the level of previous steroid use.
- **Minor use:** 50 mg hydrocortisone intramuscularly/intravenously IM/IV preoperatively
- **Intermediate use:** 50 mg hydrocortisone IM/IV with premed and 50 mg hydrocortisone every 6 h for 24 h
- **Major use:** 100 mg hydrocortisone IM/IV with premed and 100 mg hydrocortisone every 6 h for at least 72 h after surgery

Equivalent doses of steroid therapy: hydrocortisone 100 mg, prednisolone 25 mg, dexamethasone 4 mg.
Anticoagulants and fibrinolytics
Consider the risk of thrombosis (augmented by postsurgical state itself) vs risk of haemorrhage.

Warfarin
- Inhibits vitamin K-dependent coagulation factors (II, VII, IX and X) as well as protein C and its cofactor, protein S
- Illness and drug interactions may have unpredictable effects on the level of anticoagulation
- Anticoagulative effects can be reversed by vitamin K (10 mg IV; takes 24 h for adequate synthesis of inhibited factors) and fresh frozen plasma (15 ml/kg; immediate replacement of missing factors)
- Stop 3–5 days before surgery and replace with heparin; depends on indication for anticoagulation (eg metal heart valve is an absolute indication, but atrial fibrillation [AF] is a relative one)
- INR should be <1.2 for open surgery and <1.5 for invasive procedures

Heparin
- Mucopolysaccharide purified from intestine
- Binds to antithrombin III and so inhibits factors IIa, IXa, Xa and XIIa
- May be unfractionated or fractionated (low-molecular-weight heparin [LMWH])

Uses of heparin include:
- General anticoagulant (should be stopped 6 h before surgery)
- Treatment of unstable angina
- Maintenance of extracorporeal circuits (eg dialysis, bypass)
- Flush for IV lines to maintain patency
- In vascular surgery before temporary occlusion of a vessel to prevent distal thrombosis

Unfractionated heparin
- Given by continuous infusion (short half-life)
- Check APTT every 6 h and adjust rate until steady state (ratio of 2:3) achieved

Fractionated heparin (LMWH)
- Inhibits only factor Xa
- Increased half-life and more predictable bioavailability (compared with unfractionated form)
- Can be given once daily (eg tinzaparin) or twice a day (eg enoxaparin)
- Heparin can cause an immune reaction (heparin-induced thrombocytopenia [HIT]); LMWH is less likely to do so
- Effects can be reversed by use of protamine 1 mg per 100 units heparin (may cause hypotension and in high doses, paradoxically, may cause anticoagulation)
- Can be used during pregnancy (non-teratogenic)

Antiplatelet agents
- Increasingly used (eg aspirin, dipyridamole, clopidogrel, abciximab)
- Decrease platelet aggregation and reduce thrombus formation
- May be used in combination
- Should be stopped 7–14 days before major surgery or there is a risk of uncontrollable bleeding
**Fibrinolytics**
- Examples include streptokinase and alteplase
- Act by activating plasminogen to plasmin, which undertakes clot fibrinolysis
- Used in acute MI, extensive DVT and PE
- Contraindicated if the patient had undergone recent surgery, trauma, recent haemorrhage, pancreatitis, aortic dissection, etc

For discussions of the management of immunosuppression in the perioperative period see *Transplantation* in Book 2. DVT prophylaxis in the perioperative period is covered in Chapter 3, section 1.2, Surgical haematology.

### 2.2 Preoperative management of cardiovascular disease

**In a nutshell ...**

Cardiac comorbidity increases surgical mortality (includes ischaemic heart disease, hypertension, valvular disease, arrhythmias and cardiac failure). Special care must be taken with pacemakers and implantable defibrillators. In general it is necessary to:
- Avoid changes in heart rate (especially tachycardia)
- Avoid changes in BP
- Avoid pain
- Avoid anaemia
- Avoid hypoxia (give supplemental oxygen)

In addition, the details of preoperative assessment before cardiac surgery is covered in Book 2.

The European Society of Cardiology has published guidelines (2009) to cover the preoperative risk assessment and perioperative management of patients with cardiovascular disease. Patient-specific factors are more important in determining risk than the type of surgery but, with regard to cardiac risk, surgical interventions can be divided into low-risk, intermediate-risk and high-risk groups:

- **Low risk** (cardiac event rate 1%): most breast, eye, dental, minor orthopaedics, minor urological and gynaecological procedures
- **Medium risk** (cardiac event rate 1–5%): abdominal surgery, orthopaedic and neurological surgery, transplantation surgery, minor vascular surgery and endovascular repair
- **High risk** (cardiac event rate >5%): major vascular surgery

Laparoscopic surgery has a similar cardiac risk to open procedures because the raised intra-abdominal pressure results in reduced venous return with decreased cardiac output and decreased systemic vascular resistance, and should therefore be risk assessed accordingly.

The Lee Index is a predictor of individual cardiac risk and contains six independent clinical determinants of major perioperative cardiac events:
- A history of ischaemic heart disease (IHD)
- A history of cerebrovascular disease
- Heart failure
- Type 1 diabetes mellitus
- Impaired renal function
- High-risk surgery

The presence of each factor scores 1 point. Patients with an index of 0, 1, 2 and 3 points correspond to an incidence of major cardiac complications of 0.4%, 0.9%, 7% and 11% respectively.