Pre-operative Assessment - Examination and Tests

Every year more than three million operations are performed. It is common practice to perform routine testing on patients before they go to theatre. Commonly used investigations are discussed below. (A careful history should have been taken initially in order for as much information to be obtained as possible from the patient before any examination or investigations occur.)

Examination

General
A general systems examination should identify obvious abnormalities:

- Cardiovascular system - heart murmur. With the exception of emergency surgery, patients should be haemodynamically stable and their vital signs normal before starting anaesthesia.
- Respiratory system - abnormal breath sounds.
- Gastrointestinal system - abdominal masses, previous scars.
- Musculoskeletal system - skeletal malformations such as kyphoscoliosis.
- General - local skin infection.

Airway assessment
How easy or difficult it will be to intubate a patient depends on the following points:

- Are they obese?
- Do they have a short neck and small mouth?
- To what extent can they open their mouth?
- Is there any soft tissue swelling at the back of the mouth or are there any limitations in neck flexion or extension?

Investigations

The doctor should ask whether the result of the test is going to alter the patient’s management. Ordering unnecessary tests is neither helpful nor cost-effective.

Following reviews on the available evidence of the value of routine pre-operative testing in healthy or asymptomatic adults, the National Institute for Health and Care Excellence (NICE) produced guidance on the subject. It covers tests that are often carried out when a patient is scheduled for elective surgery. They may be performed by a variety of health professionals, in different settings. It makes recommendations on the circumstances in which the tests should be done, not done, or considered. Whether a certain test is recommended may depend on the patient’s risk factors, or how serious the planned operation is.

Online tools also exist which will recommend which tests are necessary for an individual patient, based on age, comorbidities and type of procedure scheduled (see under Further reading & references, below).

FBC
This will demonstrate anaemia. This increases the risk of intra-operative hypoxia or increased cardiac workload. There is also an increased risk of myocardial infarction or cerebrovascular event and delayed healing. It is also useful as a baseline measure of haemoglobin if the proposed operation is expected to cause substantial blood loss.
U&Es
This detects underlying renal deficiency and the possibility of developing acute kidney failure after major surgery. It may also influence the choice of drugs given within the anaesthetic.

LFTs
Does the patient have any underlying malnutrition? This may affect the patient's ability to heal. Is there a clotting problem?

Calcium
Is there a suggestion of underlying malignancy? Abnormal calcium levels can impact on heart rhythm and so may need to be corrected prior to any surgery.

Clotting
Clotting and platelet function is relevant for the many patients who take aspirin or warfarin; also, for patients with known clotting disorders, or in those with altered LFTs for any reason.

Group and save (or hold)
Anticipating that there may be a requirement for blood but not routinely for this procedure, the patient's blood type is identified and held, pending a possible (later) request for units of blood or blood products.

Cross-match
A requirement for transfusion needs to be anticipated to avoid high demand/unavailable resource. The surgeon makes a prediction (in units of blood) for the procedure. That amount, typed specifically for that patient, is held in the blood bank for 24 hours. The decision about whether to cross-match serum or to order group and save should be judged on the current haematological status of the patient as well as the estimated blood loss.

Urinalysis
Urine dipstick or analysis is useful to detect undiagnosed diabetes or urinary tract infection. It may also detect haematuria or abnormal protein loss.

CXR
Royal College of Radiology guidelines (available as an online tool, for purchase - ‘iRefer’) give clear indications for CXR pre-operatively. If unselected, CXR may contribute little to patient management in routine surgery. However, CXR may be used to rule out infection and prevent last-minute delay in anaesthetic. It is also an aid to diagnosis if the patient has a poor response to general anaesthetic. It may also help plan for postoperative physiotherapy.

A CXR should only be requested by the anaesthetist for assessment, or if they felt the patient may need admission to ITU postoperatively. In patients with rheumatoid arthritis, the majority of patients have some degree of involvement. CXR results have been found to have little influence on airway management. Patients with ankylosing spondylitis can have a semi-fused spinal column and the anaesthetist should bear this in mind when extending the patient’s neck during intubation.

The following types of surgery do require a CXR if not already performed as part of work-up:

- Abdominal, cardiac and thoracic and some oesophageal surgery.
- Thyroidectomy or head and neck surgery.
- Neurosurgery - because of prolonged nature of anaesthesia and need for postoperative ITU.
- Lymph node surgery.

Spirometry
Spirometry tests are a good measure of pulmonary physiology and are useful in patients with obstructive or restrictive patterns of disease.
ECG
This will show any silent myocardial ischaemia or infarction. It is also a baseline to compare against possible postoperative events. It also demonstrates arrhythmias.

Sickle cell testing
It is important to offer testing pre-operatively to identify risk before the anaesthetic - surgical or dental. This is important for ethnic groups who have a family history of homozygous sickle cell anaemia or sickle cell trait, particularly where there is no previous surgical history.

At-risk groups include:

- African
- Caribbean
- Eastern Mediterranean
- Middle Eastern
- Asian

It has also been found in Cypriot people.

Appropriate counselling is important, so that the patient realises the implication of both positive and negative results and is able to give informed consent.

Pregnancy testing
The need to test depends on the risk to the fetus from the surgery and anaesthetic. These risks should be explained to the patient.

The woman should be asked sensitively if there is any possibility of pregnancy. If there is any doubt, a test should be done with the woman’s consent. Similar questioning should be carried out before a CXR.

Assessment

The American Society of Anesthesiologists’ (ASA) grades [5]

<table>
<thead>
<tr>
<th>Grade</th>
<th>Status</th>
<th>Absolute Mortality (%)</th>
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<tbody>
<tr>
<td>I</td>
<td>A normal healthy patient. The process for which the operation is being performed is localised and causes no systemic upset.</td>
<td>0.1</td>
</tr>
<tr>
<td>II</td>
<td>Mild systemic disease. All patients older than 80 years are put into this category.</td>
<td>0.2</td>
</tr>
<tr>
<td>III</td>
<td>Severe systemic disease. This from any cause that imposes a definite functional limitation on their activity - eg, chronic obstructive pulmonary disease.</td>
<td>1.8</td>
</tr>
<tr>
<td>IV</td>
<td>Incapacitating systemic disease which is a constant threat to life.</td>
<td>7.8</td>
</tr>
<tr>
<td>V</td>
<td>Moribund patient unlikely to survive 24 hours with or without surgery.</td>
<td>9.4</td>
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Recommendations on which pre-operative investigations are necessary are based on ASA grade and level of surgery or specialty; there are special recommendations for neurosurgery and cardiac surgery. Any comorbidity (eg, cardiovascular, respiratory or renal) are also taken into account.
For example, grade 1 surgery:

- Fit children (ie <16 years), who are ASA grade I, require no pre-operative testing.
- ASA grade 1 adults: consider ECG if aged >40 years and U&E if aged >60 years.
- ASA grade 2 adults with cardiovascular disease require an ECG. Also consider:
  - CXR if aged >40 years.
  - FBC - any age.
  - U&E - any age.
  - Urinalysis.

Grading of surgical procedures by severity - examples[^1]

**Grade 1**
- Release of peripheral nerve entrapment at wrist.
- Drainage of middle ear.
- Tooth extraction.

**Grade 2**
- Electroconvulsive therapy.
- Partial excision of breast.
- Extraction of lens.
- Haemorrhoid operations.
- Evacuation of retained products of conception.

**Grade 3**
- Thyroidectomy.
- Open operation on bladder.
- Total mastectomy.
- Vaginal repair or hysterectomy.

**Grade 4**
- Operations on the lung.
- Excision of the colon/stomach/rectum.
- Kidney transplant.
- Total hip replacement.

Further reading & references

- [Routine preoperative tests for elective surgery; NICE Guidelines (April 2016)](#)
- Preoperative assessment of elective surgical patients; NHS
- Consent guidance: patients and doctors making decisions together; General Medical Council

[^1]: Preoperative tests for elective surgery; NICE Clinical Guideline (June 2003)
[2]: Duncan K et al; Preoperative CXR prior to elective surgery, Royal College of Radiologists, 2008
[5]: ASA Physical Status Classification System; American Society of Anesthesiologists

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