Preoperative Anaesthetic Assessment

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Pre-operative assessment ensures that the patient is as fit as possible for the surgery and anaesthetic. It minimises the risk of late cancellations by ensuring that all essential resources and discharge requirements are identified and co-ordinated. It also establishes that the patient is fully informed and wishes to undergo the procedure.

Pre-operative assessment should:

- Assess the patient’s fitness for surgery and anaesthesia and provide an assessment of the risks and benefits of the proposed surgery and anaesthesia, and confirm the patient wishes to have the operation in the light of these risks and benefits.

- Identify any condition that may require intervention prior to admission and surgery and take appropriate action, e.g. patients taking warfarin.

- Ensure any necessary investigations are performed; results are available and any necessary actions are taken. This should reduce any unnecessary duplication of investigations.

- Assess the patient’s suitability for day surgery.

- Identify requirements to aid scheduling of the surgical procedure, including requirements for the post-operative stay, e.g. critical care beds.

- Provide information about the anticipated post-operative recovery, e.g. rate of mobilisation, measures to relieve pain, etc.

- Provide an opportunity to discuss with patients any self-help matters to improve the outcome of their surgery, e.g. stopping smoking, losing weight, etc.

- Prepare the multi-disciplinary pre-operative documentation.

Timing of pre-operative assessment

The timing and extent of preoperative assessment depends on the NCEPOD category. In an emergency situation, obviously, the available time is limited and resuscitation and assessment of vital parameters should happen concurrently.

In scheduled and elective cases ideally an initial pre-operative assessment should be performed immediately following the decision to operate. If the patient is fit and undergoing simple surgery, this could be a one-stop service. Early pre-operative assessment ensures that patients with medical conditions requiring further investigation or treatment are identified early and appropriate action is taken. It reduces the peri-operative
workload of the anaesthetist, as patients should arrive for surgery optimised and informed. The discussion on the day of surgery between the anaesthetist and patient can then be directed entirely at the proposed anaesthetic and post-operative course, rather than assessing fitness and searching for investigation results.

Table 1.1 The NCEPOD (National Confidential Enquiry into Patient Outcome and Death) categories:

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
<th>Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>NCEPOD 1</td>
<td>Immediate life saving operation, resuscitation simultaneous with surgical treatment (e.g. trauma, ruptured aortic aneurysm)</td>
<td>Within one hour</td>
</tr>
<tr>
<td>NCEPOD 2</td>
<td>Operation as soon as possible after resuscitation (e.g. irreducible hernia, intussusception, oesophageal atresia, intestinal obstruction, major fractures)</td>
<td>Within 24 hours</td>
</tr>
<tr>
<td>NCEPOD 3</td>
<td>An early operation, but not immediately life-saving (e.g. malignancy)</td>
<td>Within 3 weeks.</td>
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<tr>
<td>NCEPOD 4</td>
<td>Operation at a time to suit both patient and surgeon (e.g. cholecystectomy, joint replacement)</td>
<td>At time to suit patient &amp; surgeon</td>
</tr>
</tbody>
</table>

Fasting guidelines

For safety reasons, patients should not eat or drink prior to anaesthesia.

- The AAGBI recommends the minimum fasting periods based on the American Society of Anaesthesiologists (ASA) guidelines:
  - 6 hours for solid food, infant formula, or other milk.
  - 4 hours for breast milk.
  - 2 hours for clear non-particulate and non-carbonated fluids.

- The following patients should not be fasted for a long period without hydration and may require intravenous fluids prior to surgery:
  - Elderly patients.
  - Patients who have undergone bowel preparation.
  - Sick patients.
  - Children.
  - Breast-feeding mothers.

Preoperative investigation

The request for pre-operative investigations should be based on:

- Factors apparent from the clinical assessment
- The likelihood of asymptomatic abnormalities
The severity of the surgery contemplated

The National Institute of Clinical Excellence (NICE) has come with more elaborate guidelines for preoperative investigations in various patient populations scheduled for different surgical procedures based on their age and co-morbid conditions.

Table 1.2 Indications for preoperative investigations

<table>
<thead>
<tr>
<th>Investigation</th>
<th>Indication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full blood count</td>
<td>All adult women</td>
</tr>
<tr>
<td></td>
<td>Men over the age of 60 years</td>
</tr>
<tr>
<td></td>
<td>Cardiovascular, Respiratory, Renal or Haematological disease</td>
</tr>
<tr>
<td></td>
<td>Major surgery</td>
</tr>
<tr>
<td>Urea &amp; electrolytes</td>
<td>All patients over 60 years</td>
</tr>
<tr>
<td></td>
<td>Cardiovascular, Respiratory and renal disease</td>
</tr>
<tr>
<td></td>
<td>Diabetics</td>
</tr>
<tr>
<td></td>
<td>Patients on steroids, diuretics, ACE inhibitors</td>
</tr>
<tr>
<td></td>
<td>Cardiovascular and major surgery</td>
</tr>
<tr>
<td>ECG</td>
<td>All patients over 60 years</td>
</tr>
<tr>
<td></td>
<td>Cardiovascular, Renal disease</td>
</tr>
<tr>
<td></td>
<td>Diabetics</td>
</tr>
<tr>
<td></td>
<td>Cardiothoracic surgery</td>
</tr>
<tr>
<td>Chest X-ray</td>
<td>Cardiovascular and respiratory disease</td>
</tr>
<tr>
<td></td>
<td>Malignancy</td>
</tr>
<tr>
<td></td>
<td>Major thoracic and upper abdominal surgery</td>
</tr>
<tr>
<td>Sickle cell test</td>
<td>Should be considered in patients from following ethnic origins</td>
</tr>
<tr>
<td></td>
<td>North Africa, west Africa, South/Sub Saharan Africa</td>
</tr>
<tr>
<td></td>
<td>Afro Caribbean</td>
</tr>
<tr>
<td>Blood group and cross match</td>
<td>If the anticipated blood loss is &lt; 15% of total blood volume and the Hb&gt;13 gm/dl, group and save the sample.</td>
</tr>
<tr>
<td></td>
<td>If the anticipated blood loss is &gt; 15% of total blood volume then cross matched blood should be available for peri-operative period. One should refer to the local guidelines on Maximum Blood Ordering Schedule (MBOS).</td>
</tr>
</tbody>
</table>

Evaluation of patients with cardiac problems:

Preoperative cardiac evaluation must be carefully tailored.

- Acute surgical emergency: rapid assessment of cardiovascular vital signs, volume status, and electrocardiogram (ECG).
- In patients in whom myocardial revascularization is not an option, it is often not necessary to perform a test
• In less urgent circumstances, situation may include cancellation of an elective procedure, the special needs of patients with co-morbid disease who undergo surgery must be considered

History
• Identify serious cardiac conditions such as prior angina, recent or past MI, congestive cardiac failure, and symptomatic arrhythmias.
• Risk factors such as peripheral vascular disease, cerebrovascular disease, diabetes mellitus, renal impairment, and chronic pulmonary disease.
• Any recent change in symptoms.
• Current medications and dosages.
• Functional capacity (exercise tolerance).

Examination
• General appearance cyanosis, pallor, dyspnoea during conversation or with minimal activity, poor nutritional status, obesity, skeletal deformities, tremor and anxiety.
• Acute heart failure: pulmonary crackles and chest x-ray evidence of pulmonary congestion correlate well with elevated pulmonary venous pressure.
• Chronic heart failure: however, these findings may be absent. An elevated JVP or a positive hepatojugular reflux are more reliable signs. Peripheral edema is not a reliable indicator.
• Cardiac auscultation
  o A third heart sound at the apical area suggests a failing left ventricle.
  o A murmur may suggest the presence of valvular disease.
  o Significant aortic stenosis poses a high risk for noncardiac surgery.
  o Significant mitral stenosis or regurgitation increases risk of cardiac failure.
  o Aortic regurgitation and mitral regurgitation predispose the patient to infective endocarditis. If mitral regurgitation is rheumatic in origin or due to mitral valve prolapse, consideration must be given to endocarditis prophylaxis.

Clinical Predictors of Increased Perioperative Cardiovascular Risk

Major
• Unstable coronary syndromes.
  – Recent MI (>7 days but ≤30 days) with evidence of important ischemic risk by clinical symptoms or noninvasive study.
  – Unstable or severe angina. May include “stable” angina in patients who are unusually sedentary.
• Decompensated congestive heart failure.
• Significant arrhythmia.
  – High-grade atroventricular block.
  – Symptomatic ventricular arrhythmias in the presence of underlying heart disease.
  – Supraventricular arrhythmias with uncontrolled ventricular rate.
• Severe valvular disease.

Intermediate
• Mild angina pectoris (Canadian Cardiovascular Society Class I or II).
• Prior myocardial infarction by history or pathological waves.
• Compensated or prior congestive heart failure.
• Diabetes mellitus.

**Minor**
• Advanced age.
• Abnormal electrocardiogram (LVH, LBBB, ST-T abnormalities).
• Rhythm other than sinus (e.g. atrial fibrillation).
• Low functional capacity (e.g. Unable to climb one flight of stairs with a bag of groceries).
• History of stroke.
• Uncontrolled systemic hypertension.

• **Major predictors** mandate intensive management, which may result in delay or cancellation of surgery unless it is emergent.
• **Intermediate predictors** are well-validated markers of enhanced risk of perioperative cardiac complications and justify careful assessment of the patient's current status.
• **Minor predictors** are recognized markers for cardiovascular disease that have not been proven to independently increase perioperative risk.

**Cardiac risk stratification based on surgical procedure:**

**High** (Reported cardiac risk >5%)
• Emergent major operations, particularly in the elderly.
• Aortic and other major vascular surgery.
• Peripheral vascular surgery.
• Anticipated prolonged surgical procedures associated with large fluid shifts and / or blood loss.

**Intermediate** (risk generally <5%)
• Carotid endarterectomy.
• Head and neck surgery.
• Intraperitoneal and intrathoracic surgery.
• Orthopaedic surgery.
• Prostate surgery.

**Low** (cardiac risk generally <1%)
• Endoscopic procedures.
• Superficial procedures
• Cataract surgery.
• Breast surgery.

**Functional Capacity (MET levels)**

Functional capacity is a measure of exercise tolerance and can usually be estimated from the ability to perform the activities of daily living. It is expressed in metabolic equivalent (MET) levels:
- the oxygen consumption (VO₂) of a 70-kg, 40-year-old man in a resting state is 3.5 ml/kg per minute or 1 MET.

Functional capacity has been classified as
  - **excellent** (greater than 7 METs).
  - **moderate** (4 to 7 METs).
– poor (less than 4 METs). or
– unknown.
(Climbing a flight of stairs corresponds roughly to 4 METs)

**When to get cardiology referral?**

The time available for optimisation of the general condition of the patient is determined by the urgency of the surgery. In life saving emergencies patient’s basic vital parameters are stabilised and taken to operating room. In more elective situation the degree of intervention and cardiology input depends on i) the surgical risk (high, intermediate or low) ii) the clinical predictors for cardiac risk (major, intermediate and minor) and iii) the functional capacity of the patient (MET <4 or >4). Table 1.3 is a guide, but decision should be made based on individual clinical circumstances.

Table 1.3 A general guide for cardiology referral.

<table>
<thead>
<tr>
<th>Functional capacity</th>
<th>Any</th>
<th>&lt;4MET</th>
<th>&gt;4MET</th>
<th>&lt;4MET</th>
<th>&gt;4MET</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surgery Risk</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>Major</td>
<td>Refer</td>
<td>Refer</td>
<td>Refer</td>
<td>Operate</td>
</tr>
<tr>
<td>Intermediate</td>
<td>Refer</td>
<td>Refer</td>
<td>Operate</td>
<td>Operate</td>
<td>Operate</td>
</tr>
<tr>
<td>Low</td>
<td>Refer</td>
<td>Operate</td>
<td>Operate</td>
<td>Operate</td>
<td>Operate</td>
</tr>
</tbody>
</table>

**Preoperative assessment of respiratory system**

Postoperative pulmonary complications following major surgical procedures can be as high as 25-50%. In particular cardiothoracic surgeries and abdominal procedures carry more risk of morbidities due to respiratory complications. Identification of the high risk group and proactive strategies to modify the risks can minimise these morbidities and improve outcome.

**Preoperative risk factors:**

- Age > 60 years
- Smoking
- Obesity
- Chronic lung disease, in particular, if the patient is symptomatic at the time of surgery
- Abnormal chest signs
- Abnormal chest radiograph
- PaCO₂ > 6 kPa
- Impaired cognitive function
Evaluation of respiratory system:

History and physical examination: Inexpensive and set stage for further workup. It gives an opportunity to consolidate information about the patient and the planned operation.

Investigations:

The pulmonary investigations can grossly be divided into:
Static: Lung volumes.
Dynamic: Peak expiratory flow rate (PEFR), FEV1/ FVC, Flow-volume loop.
Gas exchange: Carbon monoxide transfer.
Cardiopulmonary exercise testing.

But none of the pulmonary function test will be more sensitive as indicators of occult pulmonary disease than information gathered from a careful history and physical examination

<table>
<thead>
<tr>
<th>Lung disease</th>
<th>FVC</th>
<th>FEV1</th>
<th>FEV1 / FVC %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Restrictive</td>
<td>Decrease</td>
<td>Decreased</td>
<td>Normal</td>
</tr>
<tr>
<td>Obstructive</td>
<td>Normal</td>
<td>Decreased</td>
<td>Decreased</td>
</tr>
</tbody>
</table>

In normal healthy subjects, 75 to 80 percent of the FVC exhaled during the first second; the remaining volume in 2 or 3 additional seconds.

FEV1/FVC:
<70 %: mild obstruction
<60%: moderate obstruction
<50%: severe obstruction

Pathological preoperative pulmonary function test results:

FVC < 50% of normal
Forced expiratory volume in first second (FEV1) <1 Litre.
FEV1 / FVC < 50%
PaCO₂ > 6 kPa
Carbon monoxide transfer (DLCO) < 55%

Chest radiography

- Rarely abnormal in patients without risk factors for lung disease
- Rarely reveal anything that might change decision to perform an operation in patients without other risk factors.
- Indicated in a new or changing lung disease and in patients believed to be at high risk for pulmonary complications.

Strategies to improve outcome

- Cessation of smoking
- Treat airflow obstruction with bronchodilators
- Antibiotics: in active infection
• Delay surgery: if surgery is elective and chest/systemic symptoms are still active
• Chest physiotherapy
• Patient education: breathing exercises, continuous positive airway pressure (CPAP) etc.

**Preoperative assessment of diabetic patients**

When considering the diabetic patient for surgery it is essential to determine:

- Type of diabetes (type 1 or 2)
- Stability of the disease
- Diabetic complications
- Surgical procedure (minor, intermediate, major)

**Type of Diabetes**

Type 1 diabetic patients are more difficult to manage in the peri-operative period than Type 2 patients. Stability of the disease in the months before surgery is central to the success.

**Stability of the Disease**

Pre-operative assessment provides an opportunity to assess the general medical condition of the patient. This would normally include assessment of microvascular and macrovascular complications, blood pressure, glycosylated haemoglobin (HbA1c) and cholesterol. It may be possible to obtain such information from the patient’s general practitioner. Good stable control of blood glucose not only makes for easier management prior to surgery, but is also associated with improved wound healing and reduced risk of post-operative wound infection.

Random blood glucose estimation is of not much use in assessing suitability for day surgery and should only be performed on the day of admission to help guide peri-operative management.

HbA1c estimation is a reflection of the integrated blood glucose control over the preceding two to three months. The reference range of HbA1c in non-diabetic subjects is about 4 to 6%.

An HbA1c result of less than about 8% suggests that the patient will be suitable for day surgery. In general, a patient with an HbA1c estimate above 8% will be unsuitable for day surgery because results above this level tend to be associated with a higher fasting blood glucose on the day of surgery, making peri-operative blood glucose control more difficult to manage. An HbA1c result of over 9% suggests that review of diabetic management is needed before any elective surgery is carried out.

**Diabetic Complications**

The complications in a diabetic patient can grossly be classified into

i) Acute metabolic complications e.g. hypo and hyperglycaemia, dehydration, diabetic ketoacidosis, non-ketotic diabetic acidosis, hypokalaemia
Chronic end organ damage due to micro and macrovascular disease e.g. nephropathy, autonomic neuropathy, coronary artery disease, peripheral vascular disease

Recognition of these complications is by history, examination and investigation and management involves multidisciplinary approach involving surgical, medical and anaesthetic team.

Pre-operative management of the diabetic patient

Three key principles for management of the diabetic patient are:
1. Diabetic medication should be omitted on the morning of surgery.
2. The procedure should be scheduled as early as possible on the list, preferably first.
3. Aim to return the patient as soon as possible to usual diet and medication routine.

Minor procedures

Though it is not easy to define, in general, a minor surgical procedure is defined as one where the patient is expected to resume oral intake within an hour or so of surgery. The term ‘minor’ therefore includes many short procedures (such as cataract surgeries). At times even longer procedures under regional anaesthesia (such as hand surgeries) can also be regarded as minor because initial recovery from general anaesthesia will usually be bypassed and the patient returned directly to the ward area for refreshments. All of these patients can be managed by simply postponing their usual diabetic treatment (insulin or oral hypoglycaemic drugs) until they take a delayed meal after surgery. Obviously it is important that these patients are treated first on the operating list and that blood glucose is monitored closely. Vigilance is necessary to avoid the risk of hypoglycaemia caused by the delayed action of insulin or oral hypoglycaemic agents taken on the day before surgery or on the morning of surgery in the case of afternoon operations. In cases where hypoglycaemia occurs or seems likely, a simple glucose infusion will suffice until the patient is back to eating post-operatively.

Intermediate procedures

For patients undergoing longer and more complex surgery, more detailed management is required.

Type 2 diabetic patients treated with oral hypoglycaemic drugs
These patients should omit their morning dose of oral hypoglycaemic tablets. Patients with fasting blood glucose of less than 10mmol/l can safely be monitored. Those who arrive with a higher fasting sugar should be managed with a glucose/insulin infusion.

Type 1 and insulin treated type 2 diabetic patients
Management of these patients can be more complicated and more likely to require the help and guidance of anaesthetist. These patients will all need a glucose/insulin infusion until they are ready for a meal after surgery.

Major procedures

Major surgical procedures like laparotomy, vascular surgery, cardiothoracic surgery, major joint replacements etc will require glucose/insulin infusion irrespective of the type of
diabetes. Though insulin is given for perioperative glycaemic control, the role of insulin is more complex and is very important. It is an anabolic hormone that plays an important role in protein and lipid anabolism. Relative insulin deficiency in high risk patients undergoing major surgical procedures involving extensive tissue damage can lead to negative nitrogen balance, poor wound healing and tissue reconstruction, impaired immunity and consequently catastrophic outcome.

The choice of the glucose/insulin infusion regimen and sliding scale is in general guided by local hospital policy.

**Preoperative examination of airway**

Careful airway examination is important to ensure that airway can be safely managed during anaesthesia and sedation. The incidence of failed intubation is approximately 1:2230 in surgical patients and 1:150 to 1:300 in obstetric patients. Detailed history and airway examination may predict the difficulty in managing airway. An effective airway management requires careful planning of primary and secondary plan. Review of previous anaesthetic record and history from the patient may reveal previous problem.

Following clinical examination should be included during airway assessment.

- Any gross craniofacial anomaly and gross abnormality of the neck, previous major operations of the neck may suggest a difficult airway.
- Mouth opening: adequate mouth opening should allow patient’s middle three fingers, held vertically.
- Mallampati’s test: Conducted with the patient is sitting upright, opening the mouth as far as possible and maximally protruding the tongue. Mallampati’s classification involves four classes depending on the structures visible when the mouth when the mouth is fully opened.
  - Class 1: Tonsillar pillars, soft palate and uvula are seen.
  - Class 2: Part of uvula and soft palate are seen. Base of tongue masks tonsillar pillars
  - Class 3: Only soft palate visible
  - Class 4: Even soft palate is not visible.
Structures visible when the mouth is fully opened

- Limitation of neck movement my suggest difficulty in visualising laryngeal structures on laryngoscopy.
- Bucked teeth, presence of any obvious swelling around the neck, orpharyngeal tumours can be associated with difficult intubation.
- Receding mandible, reduced thyromental distance (< 6cm) and reduced sternomental distance (<12 cm) can suggest difficult intubation.

Wilson Risk Sum is a scoring system to predict difficult intubation. It includes following five risk factors.
1. Obesity
2. Restricted head and neck movements
3. Restricted jaw movements
4. Receding mandible and
5. Buck teeth.
Each of the above factors are scored between 0 to 2 to give a maximum score of 10 and a minimum score of 0. A score more than 2 is considered to be significant in predicting difficult intubation. Although the above parameters can give a false alarm of difficult intubation, they play a significant role in assessing the ease of airway management and in predicting possible difficult airway.
Further Reading


