

Review Article

PRE-ANAESTHETIC ASSESSMENT: IT'S ROLE IN PREVENTING MORTALITY

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INTRODUCTION:

Pre-operative evaluation is initial and one of the essential part of peri-operative care. Several large scale epidemiological confidential study into peri-operative death (CEPOD) showed that inadequate preparations of the patient were the major contributory factors for peri-operative mortality^{1,2}. These include recognition of existing problems of the patient at the earliest opportunity. For these reasons the process must be designed to allow the patients with coexisting disease to be seen by an anaesthesiologist well in advance of proposed surgery³. This can be achieved if proper anaesthetic check up is done earlier as soon as the patient is scheduled for operative procedure. It is therefore essential that anaesthesiologists visit every patient in the ward before surgery to assess "fitness for anaesthesia".

Procedure of pre anaesthetic assessment

The preoperative visit enables the patient to meet the doctor and discuss possible causes of anxiety. The anaesthetist should explain how the patient would be cared for during operation and in the post operative ward and what measure would be taken for post-operative pain relief. Then the anaesthesiologist will proceed to obtain history, perform physical examination and order special investigations as dictated by the findings.

History :

The preoperative history should clearly established the patients' present problem which will help to plan the peri-operative anaesthetic management.

Presention of condition and concurrent medical history - The indication for surgery may influence anesthetic management quite dramatically. The systemic effects disease process must be quantified. There are many diseases which may have a significant impact on anesthetic management and its outcome, particularly disease of the cardiovascular or respiratory systems. Their presence or absence are usually ascertained by direct questioning and should be recorded carefully.

Family history- There are number of inherited conditions that have a significant influence on different aspects of planned anesthetic management, such as malignant hyperthermia, cholinesterase abnormalities, porphyria, certain hemoglobinopathies and dystrophia myotonica. If such a condition is suspected, a full investigation of relevant family member is beneficial.

Drug history- Many patients requiring surgical procedure might suffer from unrelated disease and about 42% of them receive regular drug therapy^{4,5}. These drugs may have interaction with anesthetic agents or may cause problems related to their sudden withdrawal during preoperative period. There are other substances taken habitually by some patients that can also have a significant influence on the process of anesthesia. These include alcohol, tobacco, opioids and cocaine.

Anaesthetic history - Obtaining record of previous admission and anesthesia is very important. This will help to avoid repetition of complications and planning of anesthesia. So, details of administration and outcome of any previous anesthetic exposure are important and mandatory. History of any pre-operative fear, fight, nausea, sore throat or headache should be taken into account and the anesthetist must attempt to clarify their clinical significance. History of any difficult intubation should be evaluated by physical examination.

History of allergy/hypersensitivity - Although severe anaphylactic reactions to anesthetic drugs are rare but they do represent an important cause of serious morbidity or mortality. Ratio of anaphylactic reaction to population was 1:25000⁶. Common drugs causing anaphylactic reactions are - antibiotics especially co-trimoxazole, penicillin and aspirin. Non-steroidal anti-inflammatory drugs (NSAIDS) are used commonly in the preoperative period may have a risk of cross-sensitivity to the patient. Patients having history of atopy may demonstrate greater sensitivity to release histamine or other vasoactive chemicals with increased reactivity of the

cardiovascular or respiratory system on exposure to noxious stimuli. A small proportion of patients may complain of an allergic reaction to previous anesthetic. The exact nature of symptoms and signs must be asked for, as the term allergy is not always understood properly by the patient.

Smoking- Cigarette smoking is one of the factors involve with adverse peri-operative outcome⁵. There are several potential mechanisms by which smoking is exerting these advance effects. It exerts short term effect as well as long term effects on various organs. Short term effects are due to inhalation of nicotine and carbon monoxide. Nicotine causes an increase in myocardial oxygen demand by its effect on heart rate, blood pressure and peripheral vascular resistance. Carbon monoxide get bind with haemoglobin to form carboxyhaemoglobin resulting in a significant decrease in oxygen delivery to the tissue. Short term effects are reversible if stopped for more than 12 hours. This is very important for the patient,

suffering from ischaemic heart disease. Long term problems of smoking includes - depression of immune function, impaired clearance of secretion from the tracheobronchial tree and chronic airway diseases. These are less amenable to reversal. Stopping of smoking for 6-8 weeks are required to get any beneficial effect

Alcohol - Patient may be present with acute intoxication or sequence of chronic alcohol consumption. Once the diagnosis is established, it must be decided whether to continue alcohol consumption during admission or to run a course of withdrawal during pre-operative period - which has its own risk of morbidity and mortality.

Vomiting tendency- This may modify the choice of anesthetics which would reduce the likelihood of post operative nausea and vomiting.

Menstrual history- Elective surgery should be postponed in early pregnancy.

Pre-operative patient questionnaires

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| <ol style="list-style-type: none"> 1. Do you suffer or have you suffered from any of the following:
 Heart disease
 Palpitations
 High blood pressure
 Chest pains
 Swelling of ankles
 Shortness of breath during walking up a single flight of stairs
 Asthma
 Bronchitis
 Diabetes
 Epilepsy
 Ulcer trouble or hiatus hernia ‘ Jaundice or other liver disease
 Kidney disease
 Anaemia
 Arthritis
 Stroke 2. Are you taking any tablets, pills, inhalers or medicines? If yes, please list: 3. Have you any allergies? If yes, please list. 4. Do you smoke? If yes, what or how many a day? /day 5. Do you drink more than a moderate amount of alcohol? (more than 8 pints beer/week or 10 glasses wine/week) 6. Do you bruise easily or bleed excessively? 7. Have you had any operations or general anesthesia before?
 If yes, please list, including approximate dates: 8. Were there any complications?
 If yes, please give details. 9. Have any members of your family had any problems with anesthesia? 10. Is there anything about yourself or your family’s medical history you think we should know?
 If yes, please details. | <p>Yes No</p> |
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Physical examination

Physical examination is a simple, safe and cheap method of providing important pre-operative information. A full clinical examination should be performed on every patient and the findings must be documented. Beside history and routine clinical examination, there are areas where special preference are to be given during examination such as air way for difficulty intubation (Table-I).

Investigation

Laboratory tests are essential tools for appropriate diagnosis and to quantify a disease process. The relevance of investigation of anesthesia can be extended to provide a pre-operative baseline data with which peri-operative change can be compared. In general, results of some investigations can be predicted if a detailed history or examinations is available. Before ordering extensive investigations, the anaesthesiologist should be confirmed that the investigations will alter the management of the

patient. Instead of doing a series of investigations as a matter of routine procedure, a guideline can be followed which will give pertinent information (Table-II).

RISK ASSESSMENT

An attempt has been made to classified or score patients preoperatively in order to identify those at greater risk of adverse outcome:

1. ASA (American society of anesthesiologist) grading

In ASA grading, the patient are classified according to disability related to patients general health, which correlates to some extend with risks of perioperative complications⁷. It predicts poorly when used alone as it does not embrace all aspects of anesthetic risk such as age, severity of the presenting disease or the proposed surgery and it does not identify factors which can be altered pre-operatively to improve outcome. Nevertheless it is useful in average prediction of the risk. (Table –III, IV).

Table - I

Clinical examination before anaesthesia

Systems	Points to examine
General	General well-being, nutritional state, build, colour of skin. hydration state, temperature.
Cardiovascular	Pulse-rate, rythm, volume; Jugular venous pressure and pulsations. Blood pressure, cardiac impulse. Auscultatory heart sound, Carotid pulsations, sacral or ankle oedema.
Respiratory	Observation of dyspnoa Auscultation of lung fields.
Central Nervous System	Function of special senses and other cranial nerves. Peripheral motor and sensory function.
Airway	Mouth opening, neck movements, Dental records.

Table-II
Guideline for pre-operative investigation

Investigations	Indication
Urine analysis	This should be performed on every patient. There might have occasional undiagnosed diabetic or urinary tract infection. Beware of false positive: if it is not confirmed by other evidence of pathology.
Urea, creatinine	All patients over 65 years of age or with a positive result from electrolytes and urinalysis. All patients with cardiopulmonary disease or taking cardiovascular active drugs, diuretics or steroids. All patient with a history of renal or liver disease, diabetes or an abnormal nutritional state. Any patient with a history of diarrhoea, vomiting or metabolic illness. Patients who have been on intravenous fluid therapy for more than 24 hours.
Blood glucose	All patient with history of DM, vascular disease and the patient receiving cortico-steroid.
Liver function tests	Any history of liver disease, alcoholism, previous hepatitis or unexplained fever following a recent general anesthetic. Any patient with an abnormal nutritional state.
Full blood count	All female adults, regardless of general health or reason for admission. All male patients over 50 years of age, and all other with history of blood loss, previous anaemia or haematopoitetic disease, cardio-respiratory disease or significant blood loss during surgery.
Coagulation screen	Any patient with a history of coagulation disorder, significant chronic alcohol consumption, drug abuse or taking anticoagulant medication. All patients belonging to an ethnic group at risk of carying the sickle gene with previous unrecorded status (predominantly Afro-Caribbeans, but also includes Indians, those of mixed race and some southern Mediterranean countries).
Electrocardiogram	Male smoker>45 years old; all others>50 years old Any patient with a diastolic blood pressure greater than 95 mmHg during admission All patients with a history of heart disease (proven or suspected) or hypertension All patients on diuretics or cardiovascular active drugs Patients with symptomatic chronic or acute-on-chronic pulmonary disease.
Chest X-ray	History suggestive of possible abnormality, e.g. trauma, cardiovascular disease, pulmonary disease with localizing chest signs, A previously abnormal chest film. Any patients with thyroid enlargement (along with a thoracic inlet view) This investigation will not be necessary if a chest X-ray from the previous 6 months is available, and the patient's medical condition is unaltered.
Pulmonary Function Tests -	Patient with severe dyspnoea on mild to moderate exertion should ordered for – peak expiratory flow rate, forced vital capacity (FVC) and FEV ₁ .
Arterial blood gas analysis-	- All patients with dyspnoea, patients scheduled for elective thoracotomy.

Table-III*The ASA Physical Status Scale*

Class I	A normal healthy individual
Class II	A patient with mild systemic disease
Class III	A patient with severe systemic disease that is not incapacitating
Class IV	A Patient with incapacitating systemic disease that is a constant threat to life.
Class V	A moribund patient who is not expected to survive 24 h with or without operation.
Class E	Added as a suffix for emergency operation.

Table-IV*Mortality rate after anaesthesia and surgery for each ASA physical status*

ASA rating	Mortality rate %
I	0.1
II	0.2
III	1.8
IV	7.8
V	9.4

2. PAFS (Pre-operative assessment of fitness score)

This classification is based on physiological information, demographic feature and basic laboratory test for the assessment of peri-operative survival⁹. The specificity is 80%. It includes various scoring (Table-V) for the assessment of post-operative complication such as pneumonia, sepsis, non-infective organ failure within 30 days of surgery. Prospective identification of independent predictors of severe peri-operative adverse outcome is of utmost importance. Forrest and co-workers have undertaken a large-scale study, analyzing independent predictors of severe peri-operative adverse outcome over 17,000 patients⁸. A history of some cardiovascular disease, the needing abdominal or cardio thoracic surgery, specific demographic factors were found to be the most important predictors of severe cardiovascular or respiratory events.

Table-V*Pre-operative assessment of fitness score (PAFS)*

Preoperative factor	
Score 1 for each	Cardiac symptoms controlled by treatment Dyspnoea on climbing stairs, Morning cough Stroke or myocardial infarction > 6 month age Hemoglobin <10 g.dl ⁻¹ Serum albumin 30-35 g.litre ⁻¹ Plasma urea 10-19mmol.litre ⁻¹ Steroid treatment Controlled diabetes
Score 2 for each	Age 70-79 years Cardiac symptoms poorly controlled by treatment, Dyspnoea on walking and Persistent cough with sputum
Score 3 for each	Clinical Jaundice Serum albumin <9g.litre ⁻¹ Loss of 10% body weight in 01 month Plasma urea >20mmol ¹ , Dyspnoea at rest Myocardial infarction <6 month ago, Confusion Cytotoxic treatment
Score 4 each	Age >80 years Palliative operation for surgery Intestinal obstruction Perforation, pancreatitis and intraperitoneal abscess. Hemorrhage or anaemia.

Evaluation of the score according to phyforth, et al¹⁰

- A total score of less than 6: indicates low risk (10%)
- A score of 6-10: high risk (84.4%) of postoperative death or major complication within 30 days of surgery

The major complications are defined as pneumonitis, sepsis or non infective organ failure

PREDICTION OF SPECIFIC ADVERSE EVENTS

These are-

- A. The difficult airway**
- B. Adverse cardiac events**
- C. Respiratory complications**

A. Prediction of difficult airway:

Physical features related with difficult intubation includes

1. General appearance of the neck, face, maxilla and mandible
2. Jaw movement, mouth opening
3. Head extension and neck movement
4. The teeth and oropharynx
5. The Soft tissues of neck
6. Recent chest and cervical spine X-ray
7. Previous anesthetic records,

Unfortunately, difficult intubations still unexpectedly occur, causing more anaesthetic morbidity and mortality^{1,10}. Mallampati and colleagues devised a classification based on visible pharyngeal structures when the patient opens the mouth maximally and protrudes the tongue¹¹. This was subsequently modified by Samson & Young (Table-VI)¹². This is a simple bedside test but sometimes related with a high incidence of false positive. To improve upon the observers variability, Wilson and colleagues described a five point features which includes weight; movement of head, neck and jaw; presence of mandibular recession or absence of buckteeth. These also produce a significant number of false positive^{13,14}. When Mallapati test is combine with Thyromental Distance (TD) the false positivity is reduced. Now it is suggested that any patient with thyromental distance of less than 7 cm and Mallampati grade III or IV; patient may present with intubation problem¹⁵. Cormack and Lehane described a standard method of grading depending on laryngoscopic view (Table-VII)¹⁶.

Table- VI

Mallampati's modified classification

Grade	Description
I	Pharyngeal pillars, soft palate and uvula visible
II	Only soft palate and uvula visible
III	Only the soft palate visible
IV	Soft palate not visible

Table-VII

Cormack & Lehane's grading depending on laryngoscopic view

Grade	Structures visible at laryngoscopy
I	Vocal cord visible
II	Arytenoid cartilages and posterior part of the vocal cords visible
III	Epiglottis visible
IV	No exposure of the glottis, or of the corniculate cartilages

Evaluation of Cornack & Lahane grading

I	No difficulty
II	Slight difficulty
III	Severe difficulty
IV	Intubation impossible without special method.

B. Adverse cardiac events

Opinions are conflicting regarding prediction of serious perioperative cardiac events. Goldman and colleagues are renowned for their retrospective study on cardiac event in patient undergoing non cardiac surgery^{17,18}. Their risk indices (Table-VIII & IX) gives a guide to major cardiac complications.

Similar risk indices have described more recently (Table-X), although controversy persists about the most accurate predictors of serious pre operative cardiac events¹². One of the most sensitive factor is the presence of pre-operative hypertension. Gross hypertensive responses, with ECG evidence of ischaemia on some occasions are likely to occur due to noxious stimuli during anesthesia in hypertensive patients. Whether treated or not, if the pre-operative diastolic pressure exceeds 110 mm Hg, there is a chance of ST changes with an

increased incidence of postoperative myocardial infarction. So the patients should be prepared for surgery in such a way that these changes are less likely to occur. Thus patients, who are presented with a diastolic arterial pressure more than 110 mmHg, should receive antihypertensive treatment. Several days or weeks may be required to stabilize the cardiovascular system. Controlled or uncontrolled hypertension is usually associated with increased cardiac peri-operative morbidity^{19,20}. On the other hand over aggressive treatment of hypertension, that is diastolic pressure less than 85 mmHg may itself increase morbidity or mortality in those with ischaemic heart disease, perhaps due to inadequate coronary artery perfusion pressure²¹. Hypertensive patients with left ventricular hypertrophy is associated with an increased risk of peri-operative myocardial ischaemia due to imbalance of myocardial oxygen supply and demand, even in the absence of coronary artery disease²².

Table-VIII

Goldman's multifactorial Cardiac Risk Index (CRI)

Risk factor	Points
Heart failure	11
Myocardial infarction<6 month	10
Cardiac rhythm other than sinus	7
Ventricular ectopics>5 Min	7
Age>70	5
Aortic stenosis	3
Thoracic or abdominal surgery	3
Poor general medical condition	3
Emergency operation	4

Table-IX

Evaluation of Goldman's Cardiac Risk Index (CRI)

Points	Major cardiac complications
0-5	0.3 -3%
6-12	1-10%
13-26	3-30%
26-53	19-75%

The total score relates to cardiac mortality or morbidity. With patients scoring >25, found to be significantly related with higher risk of life threatening peri-operative cardiac event (myocardial infarction, cardiac failure or ventricular tachycardia).

Table-X

Incidence of perioperative re-infarction in relation to interval between first MI and Surgery

Interval since MI	Re infarction risk
Under 3 months	up to 30%
3-6 months	up to 15%
Over 6 months	up to 6%

Table-XI

Incidence of perioperative MI : Retrospective studies

- 0.1 - 0.4 % MI, in previous healthy patient
- 3.2 - 7.7 % MI, in patient with previous MI
- 50% are Silent
- Occurrence - majority after 3rd day of surgery
- Mortality - 40% - 60% in preoperative MI

C. Respiratory complication

Although the post-operative pulmonary complications are very frequent, pre-operative respiratory functional tests are not necessarily helpful in their prediction. One retrospective study by Nunn and colleagues examined patients undergoing elective surgery who had a severely limited forced expiratory volume (FFV₁ < 1) on pre-operative assessment²³. They found the only useful predictors of the need for postoperative ventilation to be the combination of a pre-operative arterial oxygen tension of less than 9kpa and the presence of dyspnoea at rest.

Guideline for preoperative therapy

Disease	Therapy
Respiratory disease	<ul style="list-style-type: none"> * Chest physiotherapy * Sputum for bacteriological test and culture * Appropriate antibiotic therapy * Bronchodilators - Where applicable * Avoidance of drug associated with the release of histamine & SRS substances.
Cardiovascular disease	
Hypertension	* Antihypertensive drugs (Diastolic blood pressure should be <110 mm Hg).
Myocardial Ischaemia	* Interval between first MI and surgery >6 months.
Valvular heart disease	* Antibiotic prophylaxis against infective endocarditis.
Arrhythmias	* Drug therapy
Conduction defect	* Insertion of pacemaker pre-operatively if necessary
Renal Disease	<ul style="list-style-type: none"> * Up to date blood urea, serum electrolytes and creatinine estimation. * Correction of uremia and potassium imbalance. Hepatic diseases
Obstructive jaundice	* Mannitol at or just before induction
Hepatorenal syndrome	* IV fluid should be started night before Surgery
Bleeding problems	* Inj vit K 10mg-3 days before surgery
Smoking habit	* Stop smoking 12 hours for reversal of short-term effects 6-8 weeks for reversal of longer-term effects.
Alcohol consumption	* Better allow to continue than to have withdrawal syndromes.
Endocrine disease:	* Control by direct suppression of endocrine over activity or its effect on target organ.
Diabetes Mellitus	* Close control of blood glucose concentration
Steroid	* Additional steroid cover is required during preoperative period.
Contraceptive pill	
Progesterone containing pill	* Medication need not be stopped
Oestrogen containing pill	<ul style="list-style-type: none"> * Stop 4 weeks pre-operatively and recommence at the first menstrual cycle post-operatively. If early post-operative or Heparin prophylaxis is not indicated. mobilization
If pill is not stopped and /or early post-operative mobilization is not possible	* Prophylactic subcutaneous low dose heparin is indicated.
Hormone replacement therapy (HRT)	* No special precaution is required
Dental condition	* May be removed before anesthesia to prevent
Loose teeth	chance of dislodgement and aspiration .
Poor oral hygiene	* Referral to an oral surgeon.

CONCLUSION

Discussion between surgeon and anesthetist is essential for optimum prediction of risk. The responsibility of anesthesiologists is to recognize the risk factors and to ensure that those should be corrected before surgery. It is therefore essential to visit the concerned patient before surgery to assess the fitness for anesthesia. This can be done in the anesthetic outpatient clinic, to which a patient is referred before admission. Thus the anesthetist can make a rapport with the patient, explain the procedure regarding anesthetic and surgical management and an informed consent for the proposed procedure can be taken from the patient or patient's guardian.

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