

Pre-Anaesthetic Fitness for Surgery

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Introduction:

Pre-anaesthetic fitness for surgery requires pre-anaesthetic evaluation of the patient which is one of the essential parts of perioperative care. Several large scales epidemiological confidential study into peri-operative death showed that inadequate preparation of the patients were the major contributory factors for perioperative mortality¹; the mortality rate is 0.01%². The factors include recognition of existing problems of the patient at the earliest opportunity; the process must be designed to allow the problematic patients to be seen by an experienced anaesthesiologist well in advance of proposed surgery³. This can be achieved if proper anaesthetic check up is done as soon as the patient is scheduled for operative procedure. The main purpose is to keep the patients in their best possible physiological condition to undergo anaesthesia and to ensure that the benefit of surgery must not be outweighed by perioperative risks. There should not be any lapse in the routine procedure of pre-anaesthetic formalities. Many a time a small little gap in this practice could

bring severe catastrophe to the patient and to the operative team.

Procedure of Pre-Anaesthetic Assessment

The preoperative visit enables the anaesthesiologist to meet the patient and to make a rapport so that the patient is relieved of imaginary fear and anxiety. The anaesthesiologist should explain about the anaesthetic planning with assurance of adequate perioperative care. Then the anaesthesiologist will proceed to obtain history, perform physical examination and order special investigations as dictated by the findings. The informed consent should be taken and the anaesthetic record sheet should be properly documented.

A. History

A series of questions to be asked. These includes

- i) Presenting condition and concurrent medical history: The preoperative history should clearly establish the patient's present problem which will help to plan the peri-operative anaesthetic management. The indication for surgery may influence anaesthetic management quite dramatically. The systemic effects of disease process must be quantified. There are many diseases which may have a significant impact on anaesthetic 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.
- ii) Family history: There are number of inherited conditions that have a significant influence on different aspects of planned anaesthetic 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.

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- iii) 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 (alcohol, tobacco, opioids and cocaine, etc) taken habitually by some patients that can also have a significant influence on the process of anesthesia.
- iv) Anaesthetic history: Obtaining record of previous admission and previous anaesthesia is very important. This will help to avoid repetitions of complications and planning of anaesthesia. So, details of administration and outcome of any previous anaesthetic exposure are important and mandatory. History of any pre-operative fear, nausea, vomiting, sore throat or headache should be taken into account and the anaesthetist must attempt to clarify their clinical significance. History of any difficult intubation should be evaluated by physical examination.
- i) History of allergy /hypersensitivity: Although severe anaphylactic reactions to anaesthetic drugs are rare 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 anaesthetic. The exact nature of symptoms and signs must be asked for, as the term allergy is not always understood properly by the patient.
- ii) Personal History
 - (a) Smoking: Cigarette smoking is one of the factors involve with adverse peri-operative outcomes. There are several potential

mechanisms by which smoking exerts short term and long term adverse effects on various organs. Short term effects are due to inhalation of cigarette smoke which contains nicotine and carbon monoxide. Nicotine acts on the sympathetic nervous system producing tachycardia, hypertension and increased coronary vascular resistance; all these cause an increase in myocardial oxygen demand. Carbon monoxide binds with haemoglobin to form carboxyhaemoglobin. In a heavy smoker this may result in a significant decrease (as much as 25%) in oxygen delivery to the tissues⁷. The half-life of carboxyhaemoglobin is short and therefore stopping of smoking for about 12 hours lead to an increase in arterial O₂ content⁷. This is very important for the patient suffering from ischaemic heart disease. There is evidence that cessation of smoking improves the symptoms of angina.

Long term problems of smoking include depression of immune function, impaired clearance of secretion from the tracheobronchial tree and chronic airway diseases⁷. It is suggested that stopping of smoking for 6-8 weeks results in reduced bronchoconstriction and mucous secretion in the tracheobronchial tree⁷.

- (b) Alcohol: Patient may 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.

The authors prefer continuation of alcohol rather than withdrawal.

- (c) Vomiting tendency: This may modify the choice of anaesthetics which would reduce the likelihood of post operative nausea and vomiting.
- (d) Menstrual history: Elective surgery should be postponed in early pregnancy, where possible until second trimester⁸ to avoid the potential hazards for the fetus, which include exposure

to teratogenic effect of anaesthetic agents, intraoperative hypoxaemia or asphyxia, risk of spontaneous abortion or preterm delivery.

B. Pre-operative patient questionnaires

1. Do you suffer or have you suffered from any of the following:

Stroke	Yes /No
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	
Liver disease	
Kidney disease	
Anaemia	
Arthritis	

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, how many a 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.

C. 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 preferences are to be given during examination such as airway for difficult intubations.

D. Investigations

Laboratory tests are essential tools for appropriate diagnosis and to quantify a disease process. The relevance of investigation for 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 anesthesiologist should confirm 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 relevant 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 patients are classified according to disability related to patient's general health, which correlates to some extent with risks of preoperative complications⁹. It predicts poorly when used alone as it does not embrace all aspects of anaesthetic 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 and perioperative mortality rate. (Table III, IV)

Table-I

<i>Clinical examination before anaesthesia</i>	
Systems	Points to examine
General	General well-being, nutritional state, build, colour of skin, temperature and hydration state.
Cardiovascular	Pulse rate, rhythm, volume, jugular venous pressure and pulsations, cardiac impulse, blood pressure, auscultatory heart sounds, carotid pulsation, sacral oedema.
Respiratory	Auscultation of lung fields, observation for dyspnoea.
Central nervous System	Function of special senses and cranial nerves, peripheral motor and sensory function.
Airway	Mouth opening, neck movement, dental records.

Table II

<i>Guideline for preoperative Investigation</i>	
Investigations	Indication
Urine analysis	This should be performed on every patient. There may be undiagnosed DM or urinary tract infection.
Urea, creatinine	<ul style="list-style-type: none"> All patients over 65 years of age or with a positive result from electrolytes and urine analysis. All patients with cardio-pulmonary disease or taking vaso-cardiovascular active drugs, diuretics or steroids. All patients with a history of liver or renal disease, diabetes or an abnormal nutritional state. Any patient with a history of diarrhea, vomiting or metabolic illness. Patients who have been on i.v. fluid therapy for more than 24 h.
Blood glucose	All patients with history of DM, vascular disease and the patient receiving cortico-steroid.
Liver Function Test	Any history of liver disease, alcoholism, previous hepatitis or unexplained fever, an abnormal nutritional state.
Full blood count	<ul style="list-style-type: none"> All female patients regardless of general health or reason for admission. All male patient > 50 years of age. History of blood loss. History of previous anaemia. History of heamatopoitic disease, cardio-respiratory disease or possibility of significant blood loss during surgery.
Coagulation screen	<ul style="list-style-type: none"> Any patient with a history of coagulation disorder. Significant alcohol consumption, Drug abuse On anticoagulant medication All patient of ethnic group carry risk of sickle gene
Electrocardiogram	<ul style="list-style-type: none"> Smoker > 45 years old Diastolic pressure > 95 mmHg during admission Hypertension or Heart disease Patient on diuretics or cardiovascular active drugs. Patient with symptomatic chronic or acute-on-chronic pulmonary disease.
Chest X-ray	<ul style="list-style-type: none"> Cardiovascular and/or respiratory disease, History suggestive of possible abnormalities e.g trauma. A previously abnormal chest film. Any patient with thyroid enlargement(with a thoracic inlet view)
Pulmonary Function Tests	Patient with severe dyspnoea on mild to moderate exertion should go for Peak expiratory flow rate, FVC and FEV ₁ .
Arterial blood gas analysis	All patients with dyspnoea; patient scheduled for elective thoracotomy.

Table-III*The ASA Physical Status Scale*

Class	Definition
P1 (Class I)	A normal healthy individual
P2 (Class II)	A patient with mild systemic disease
P3 (Class III)	A patient with severe systemic disease that is not incapacitating
P4 (Class IV)	A patient with incapacitating systemic disease that is a constant threat to life.
P5 (Class V)	A moribund patient who is not expected to survive 24h with or without operation.
P6 (Class VI)	A brain-dead patient whose organs are being removed for donor purposes.
Class E	Added as a suffix for emergency operation.

The ASA Classification as amended on October 1984.

Table-IV

Mortality rate of anesthesia 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 survival¹¹. 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-

Table –V*Pre-operative Assessment of Fitness Score (PAFS)*

Score	Preoperative factor
Score 1 for each	Cardiac symptoms controlled by treatment. Dyspnea on climbing stairs. Morning cough. Stroke or myocardial infarction > 6 month age. Hemoglobin <10g.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. 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. Dyspnoea at rest. Myocardial infarction >6months back. Confusion.
Score 4 each	Cytotoxic treatment. Age> 80 years. Palliative operation for surgery. Intestinal obstruction. Perforation, pancreatitis and intraperitoneal abscess. Hemorrhage or anaemia.

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 17000 patients¹⁰. 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.

Evaluation of PAFS score according to phyforth et al¹²:

*A total score of less than 6 indicates low risk (10%)

*A score of 6-10: high risk 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 intubations 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. Mallampati and colleagues devised a classification based on visible pharyngeal structures when the patient opens the mouth maximally and protrudes the tongue¹³. This was subsequently modified by Samson & Young (Table VI¹⁴). 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^{15, 16}. When Mallapati test is combined with thyromental distance (TD) the false positive is reduced. Now it is suggested that any patient with thyromental distance of less than 7cm and Mallampati grade III or IV may present with intubation problem¹⁷. Cormack and Lehane described a standard method of grading depending on laryngoscopic view (Table VII)¹⁸.

Table-VI

Mallampatis 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

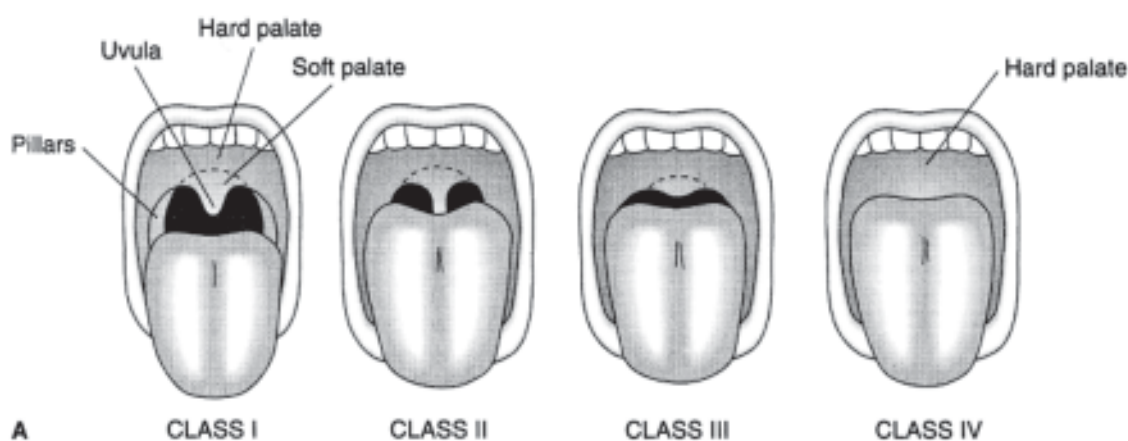
Cormack & Lehane's grading on laryngoscope view:

Grade	Structures visible
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.

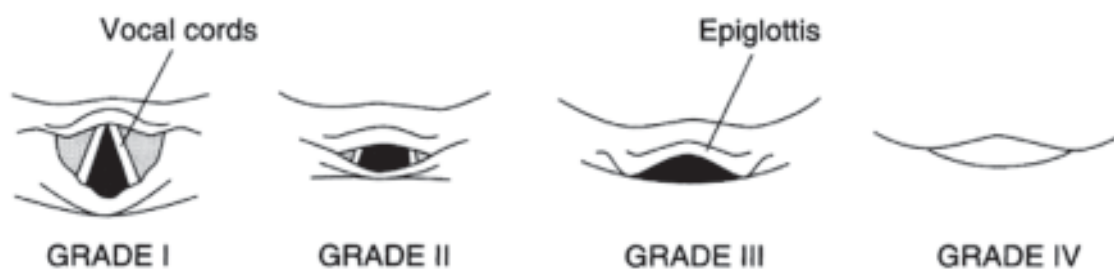
Evaluation of Cormack & Lahane grading

Grade I	No difficulty
Grade II	Slight difficulty
Grade III	Severe difficulty
Grade IV	Intubations impossible without special method

Mallampati classification of oral opening



Cormack and Lehane's grading on laryngoscope view:



(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^{19, 20}. Their risk indices (Table-VIII and IX) give 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 factors 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^{21, 22}. 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 pressure²³. Hypertensive patients with left ventricular hypertrophy are 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 disease²⁴.

Table-VIII*Goldman's multifactorial Cardiac Risk Index (CRI)*

A patient's score is totaled and used to calculate the risk of major complications associated with surgery

Risk factor	Points
1. History	
Age > 70 years	5
Myocardial infarction in preceeding 6 months	10
2. Physical examination	
Third heart sound or gallop rhythm	11
Aortic stenosis	3
3. ECG	
Rhythm other than sinus or atrial ectopic beats on ECG	7
More than 5 ventricular ectopics per minutes	7
4. General status	
PO ₂ <8kPa (<60mmHg) or PCO ₂ > 6.7kPa (>50 mmHg)	3 each
K ⁺ <3mmol/L or bicarbonate < 20 mmol/L	
Blood urea nitrogen (BUN) > 8.3mmol/l or creatinine >270 mmol/L	
Abnormal liver enzyme or signs of chronic liver disease	
Patient bedridden from non-cardiac causes	
5. Operation	
Intraperitoneal, intrathoracic, or aortic operation	3
Emergency operation	4
Total possible score	53

Table-IX*Computation of cardiac risk (Goldman et al.¹⁸)*

Risk of major complications associated with surgery

Class (number of points)	Cardiac death	Life-threatening complications
I (0 – 5)	0.2%	0.7%
II (6 – 12)	2%	5%
III (13 – 25)	2%	11%
IV (> 26)	56%	22%

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

Interval since last 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*

- - 0.4 % 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

Table-XII

Incidence of Perioperative Re-infarction in relation to duration of operation and site of operation.

Duration of operation (h)	Upper abdominal intrathoracic operation %	Other operative site%
<3	5.9	3.6
>3	15.9	3.8

*P <0.05 compared with other site

(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 ($FEV_1 < 1$) on pre-operative assessment²⁵. 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.

Preoperative therapy guideline

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 which releases histamine and SRS
Cardiovascular disease-	Antihypertensive drug. Diastolic pressure
• Hypertension	should be < 110 mmHg
• MI	Interval between the attack of MI and surgery should be > 06 months
• Valvular Heart Disease	Antibiotic therapy against bacterial endocarditis
• Arrhythmias	Drug therapy
• Conduction Defect	Insertion of pace-maker before operation, if necessary.
Renal disease	Up-to-date blood urea, electrolytes, serum creatinine estimation. Correction of uremia and potassium imbalances
Liver disease-	Obstructive jaundice Mannitol at or just before induction.
• Hepato-renal syndrome	• IV fluid should be started night before surgery.
• Bleeding problems	• Inj. Vit K 10mg iv for 3 days before surgery.
Smoking habit	Stop smoking 12 hrs for reversal of short term effect and 6 – 8 weeks for reversal of long term effects
Alcohol consumption	Better allow than to have withdrawal syndrome
Endocrine disease	Control by direct suppression of endocrine over activity or its effect on target organs.
Diabetes mellitus	Close control of blood glucose concentration.
Steroid	Additional steroid cover is required before induction and start of operation.
Contraceptive pill	
• For-progesterone containing pill	Medication need not be stopped.
• For oestrogen containing pill:	• Stop 4 weeks pre-operatively and recommence at the start of first menstrual cycle post operative.
If early mobilization post operatively	• Heparin prophylaxis is not required.
If pill not stopped &/or-early mobilization is not possible postoperatively.	• Low-dose S/C heparin is indicated.
Hormone replacement therapy(HRT)	• No special precaution is required.
Dental condition	•
• Loose teeth-	• May be removed before anaesthesia to prevent dislodgement and aspiration.
• Poor hygiene	• Referral to an oral surgeon before operation.

Preoperative fasting

American Society of Anaesthesiology Fasting Guideline.

Ingested material	Minimum fasting ^a
Clear liquid ^b	2 hours
Breast milk	4 hours
Infant formula	6 hours
Non-human milk	6 hours
Light meal ^c	6 hours

- Fasting times apply to all ages.
- Example: water, fruit juice without pulp, carbonated beverages, clear tea, black coffee.
- Example: dry toast and clear liquid. Fried or fatty foods may prolong gastric emptying time. Both amount and type of food must be considered.

The guidelines recommend no routine use of gastrointestinal stimulants, gastric acid secretion blockers or oral antacids.

Providing information to the patient and obtaining consent:

- All patients should be told of common complications.
- All patients should be told what they may experience.
- All patients should be given the opportunity to ask questions.

Consent

- The patient must have the capacity to consent to the treatment offered.
- The patient must have sufficient information to enable him/her to make a balanced decision to consent.
- The consent must be voluntary.
- If in doubt - Consent should be sought from a person with parental responsibility. Capacity may also be invalidated by a patient's confusion, pain, shock, or fatigue, and administration of some drugs such as opioid, analgesics or benzodiazepine premedication.
- Appropriate advice should be sought if there is any concern.

Conclusion:

It is strongly recommended that the anaesthesiologist should be careful enough in preanaesthetic evaluation to recognize the risk factors. Necessary treatment of the co-existing diseases should be arranged to bring the patient in his/her best possible physiological state prior to operation. This can be done in the anesthetic clinic, where the patient prior to surgery be referred. Discussion between anaesthesiologist and surgeon is essential for optimum prediction of risk. This will reduce the perioperative morbidity and mortality. Prevention is always better than treating the catastrophe, which may fall due to the lack of proper pre-anaesthetic evaluation.

Moreover, informed consent of the patient and proper documentation of anaesthetic record sheet are emphasized. These will allow the anaesthesiologist involved to stand on a solid foundation for patient's perioperative care and medico-legal question, if any.

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