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Role of Physician in Fitness before Surgery

Dr. Raghavi Abhilesh Bembey[1], Dr. Ram Babu[2]

[1,2] Jaipur Golden Hospital, New Delhi

ABSTRACT

A preoperative checkup is necessary for every patient undergoing surgery. A physician's opinion is vital in deciding the suitability of major or minor surgeries by assessing the health status of the patients. Multiple parameters must be monitored and recorded, including a proper history, thorough clinical examination, and an appropriate laboratory checkup. By assessing pre and perioperative risks, the physician can optimize the patient's medical conditions to reduce morbidity and mortality, improving outcomes and quality of life. This review discusses these topics at length and provides recommendations for fellow practitioners.

KEYWORDS: peri-operative, cardiac, noncardiac, hypertension, diabetes, COPD/ asthma, CLD, CKD

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INTRODUCTION

The pre-operative assessment should be seen as an opportunity by every physician to identify co-morbidities that may lead to patient complications during the anesthetic, surgical, or post-operative period. Careful history, laboratory, and other diagnostic tests play an important role in optimizing operative and post-operative outcomes. In this chapter, we shall look at the components of an effective pre-operative history, examination, and routine investigations that can be performed for optimal outcomes.

Pre-Operative History

A detailed history should be taken during pre-operative assessment including:-

History of the Presenting Complaint:- A brief history of why the patient is posted for surgery and the procedure to be done.

Past Medical History:- A detailed past medical history is required including

a) Cardiovascular disease, including hypertension; exercise tolerance is a useful indicator of cardiovascular fitness, particularly for patients undergoing major surgery, it can help predict their risk of postoperative complications and the level of care needed post-operatively. Screening questions may elucidate undiagnosed disease and prompt further investigation, e.g. the presence of exertional chest pain, syncopal episodes, or orthopnoea.

b) Respiratory disease, needs optimization as adequate oxygenation and ventilation are essential in reducing the risk of acute ischemic events in the peri-operative period. Questions include whether the patient can lie flat for a prolonged period or has a chronic cough; also screen for symptoms and signs of obstructive sleep apnoea, if the patient has any risk factors

c) Renal disease, including their baseline renal function and any renal-specific medications.

d)Endocrine disease, specifically diabetes mellitus and thyroid disease.

e) Pregnancy

Drug History:- A detailed drug history is required, as some medications need to be stopped or altered before surgery. Also known allergies, for both drug and non-drug allergies are of utmost importance.

Personal History:- Smoking, alcohol intake, and any recreational drug use.

Pre-operative examination:-

A detailed examination should be performed by the physician especially vitals ((blood pressure [BP], heart rate, respiratory rate, blood sugars, and oxygen saturation); height and weight measurements with body mass index calculation; a detailed physical examination including auscultation of the heart and lungs (especially for irregular rhythms, murmurs, rales, or wheezing), basic neurologic examinations; and an airway assessment. Also to classify patients according to ASA grade for severity assessment and follow up accordingly.

American Society of Anaesthesiologists Grade

ASA grade	Definition
I	Normal healthy patient
II	Mild systemic disease
III	Severe systemic disease
IV	Severe systemic illness that is a constant threat to life
V	Moribund, who is not expected to survive without the operation
E	A suffix is added if an emergency operation

METABOLIC EQUIVALENT OF TASK (MET)

The metabolic equivalent of task (MET) is the ratio of the metabolic rate during exercise to the metabolic rate at rest. One MET corresponds to an energy expenditure of 1 kcal/kg/hour. One MET can also be expressed as oxygen uptake of 3.5 ml/kg/min. METs are used to estimate how many calories are burned during many common physical activities.

FUNCTIONAL CAPACITY is widely recognized to be a major predictor of peri-operative risk. An accepted measure is the metabolic equivalent (MET) (Table 1):

Table 1: Measure of metabolic equivalents (METS)

Number of METs	Equivalent energy expenditure	Functional capacity	Peri-operative Risk
1 MET	Person at rest		
< 4 METs	Walk around the house, dress yourself, light housework	Poor	High
4 - 7 METs	walk 1-2 blocks on level, moderate housework, climb a flight of stairs,	Moderate	Moderate
> 7 METs	Run short distances, sport activities, heavy housework	Good	Low
> 10 METs	Strenuous exercise	Excellent	Low

SURGERY-SPECIFIC RISK

Table2: Surgery specific risk

SURGERY SPECIFIC RISK (30-day cardiac death and myocardial infarction)		
HIGH RISK (>5%)	INTERMEDIATE RISK (1-5%)	LOW RISK (<1%)
#Emergency major surgery #Aortic and major vascular surgery #Peripheral vascular surgery #Upper GI surgery - oesophagectomy, gastrectomy #Surgery with significant fluid shifts and blood loss	#Carotid endarterectomy #Head and neck surgery #Uncomplicated abdominal and thoracic surgery #Peripheral artery angioplasty #EVAR (endovascular aneurysm repair) #Major orthopedic (arthroplasty) # Major urology	#Endoscopic and arthroscopic surgery # Breast surgery #Body surface surgery #Eye surgery #Dental surgery # Minor urology #Gynecology

1) ADVANCED AGE

Older adults have a higher risk for perioperative complications than younger patients, primarily as a result of comorbidities, and need to be assessed for:-

- Patient's cognitive ability and capacity to understand the anticipated surgery/ procedure.
- Depression.
- Risk factors for developing postoperative delirium.
- Use of alcohol and other substance abuse/dependence.

Role of Physician in Fitness before Surgery

- Preoperative cardiac evaluation in patients undergoing noncardiac surgery.
- Risk factors for postoperative pulmonary complications and implement appropriate strategies for prevention.
- Functional status and history of falls.
- Baseline frailty score.
- Nutritional status and consideration of preoperative interventions if the patient is at severe nutritional risk.
- Medication history and evaluation for appropriate perioperative adjustments and monitoring for polypharmacy.

2) CARDIOVASCULAR DISEASE

Table 3: Routine preoperative CARDIAC tests for elective surgery

Test	Indication	Notes
ECHO/Nuclear testing – non-invasive evaluation of LV function	● Dyspnea on exertion ● Chronic heart failure patient with symptoms or asymptomatic with most recent assessment >12 months ago	Routinely not recommended
Stress testing	Symptomatic patients with angina, dyspnea, palpitations, edema, PND like:- ● Unstable angina ● Decompensated CCF ● Severe valvular disease ● Undiagnosed murmurs	● Used to detect myocardial ischemia
Coronary angiography	To be considered in patients with:- ● high cardiac risk based on non-invasive testing ● Angina unresponsive to maximal medical therapy ● Unstable angina ● High/intermediate risk surgery with equivocal non-invasive test results	● Not indicated for patients with stable angina

- **Revised Cardiac Risk Index (RCRI)**

The Revised Cardiac Risk Index (RCRI) is a tool used to estimate a patient's risk of perioperative cardiac complications. The RCRI and similar clinical prediction tools are derived by looking for an association between preoperative variables (e.g., patient's age, type of surgery, comorbid diagnoses, or laboratory data) and the risk for cardiac complications in a cohort of surgical patients (the "derivation cohort")

Table 4: Revised Cardiac Risk Index

Revised Cardiac Risk Index
1. History of ischemic heart disease
2. History of congestive heart failure
3. History of cerebrovascular disease (stroke or transient ischemic attack)
4. History of diabetes requiring preoperative insulin use
5. Chronic kidney disease [creatinine > 2 mg/dL (176.8 μmol/L)]
6. Undergoing suprainguinal vascular, intraperitoneal, or intrathoracic surgery
Risk for cardiac death, nonfatal myocardial infarction, and nonfatal cardiac arrest: 0 predictors = 3.9%, 1 predictor = 6.0%, 2 predictors = 10.1%, ≥3 predictors = 15%

A) HYPERTENSION:

Hypertension increases the risk of perioperative cardiovascular complications and risk, including diastolic and systolic dysfunction, heart failure (HF), renal impairment, cerebrovascular disease, and coronary artery disease (CAD). Sympathetic activation during the induction of anesthesia causes the blood pressure to rise by 20 to 30 mmHg and the heart rate to increase by 15 to 20 beats per minute in normotensive individuals and this response is more pronounced in patients with untreated or poorly controlled

hypertension especially where systolic blood pressure can increase up to 90 mmHg and the heart rate up to 40 beats per minute.

For the majority of patients, oral antihypertensive medications should be continued up to the time of surgery and can be taken with small sips of water on the day of surgery. With a few exceptions, continuing antihypertensive medications without interruption is safe as discussed in the table:-

Table 5: Perioperative management of cardiovascular agents

Name or class of Drug	Clinical considerations	Recommended strategy for surgery with brief NPO state	Recommended strategy for surgery with prolonged NPO state
Beta-blockers	#Abrupt withdrawal can result in hypertension, tachycardia, and myocardial ischemia. #Perioperative initiation can prevent postoperative myocardial ischemic events in patients with significantly increased cardiac risk but may increase the risk for stroke. #Perioperative initiation of beta blockers are recommended in patients with CAD or ischemia on stress testing who are undergoing vascular surgery; and reasonable in patients with at least one cardiac risk factor who are undergoing vascular surgery, or with CAD or >1 cardiac risk factor undergoing intermediate-risk surgery #Continue therapy up to and including the day of surgery. Substitute IV propranolol, metoprolol, or labetalol during the NPO state. #Perioperative initiation of beta blockers are not recommended in patients with baseline heart rate <60 beats per minute, systolic blood pressure <90 mmHg, or when time is not sufficient for titration. Perioperative initiation of beta-blockers is not recommended in patients with a baseline heart rate <60 beats per minute, systolic blood pressure <90mmHg, or when time is not sufficient for titration.	Therapy is to be continued up to and including the day of surgery.	Therapy is to be continued up to and including the day of surgery and substituted with IV propranolol, metoprolol, or labetalol during prolonged NPO state.
Alpha 2 agonists	Sudden withdrawal can cause extreme hypertension and myocardial ischemia.	Therapy is to be continued up to and including the day of surgery	-
Calcium channel blockers	May be associated with an increased risk of bleeding	Therapy is to be continued up to and including the day of surgery	Therapy can be continued up to and on the day of surgery. IV substitution is not needed unless there is poor hemodynamics (hypertension or arrhythmia).

ACE inhibitors (ACEI) and angiotensin receptor blockers (ARBs)	Continuing the drug is associated with peri and post-operative hypotension risk	Therapy is to be continued up to the day of surgery and the morning dose on the day of surgery to be withheld unless indicated for heart failure or poorly controlled hypertension.	Parenteral enalapril can be used if needed during postoperative period.
Diuretics	Continuation associated with hypovolemia and hypotension	Therapy is to be continued up to the day of surgery but the morning dose on the day of surgery is withheld unless in patients with heart failure whose fluid balance is difficult to manage, diuretics are continued.	Parenteral forms can be used as needed in postoperative period, especially in heart failure patients.
Statins	Associated with elevated risk of myopathy, but provides cardiovascular protection	Continue statins up to and including the day of surgery	
Non-statin lipid-lowering agents	Niacin and fibric acid derivatives associated with rhabdomyolysis. Bile acid sequestrants Interfere with the absorption of other medications.	Discontinue the day before surgery. Resume with oral intake.	

Any patient who experiences a marked rise in blood pressure following surgery (i.e., a sustained increase in systolic pressure greater than 180 mmHg not due to severe pain) should be treated immediately with quickly-titratable intravenous antihypertensive therapy (IV nitroglycerine, nitroprusside, labetalol, hydralazine).

B) HEART FAILURE

HF is a clinical syndrome characterized by the presence of one or more current or prior symptoms (such as dyspnea, fatigue, or edema) caused by cardiac dysfunction. This definition of HF includes patients with American College of Cardiology/American Heart Association stages C and D HF and excludes patients in stages A (at risk for HF but without structural heart disease) or B (at risk for HF with structural heart disease).

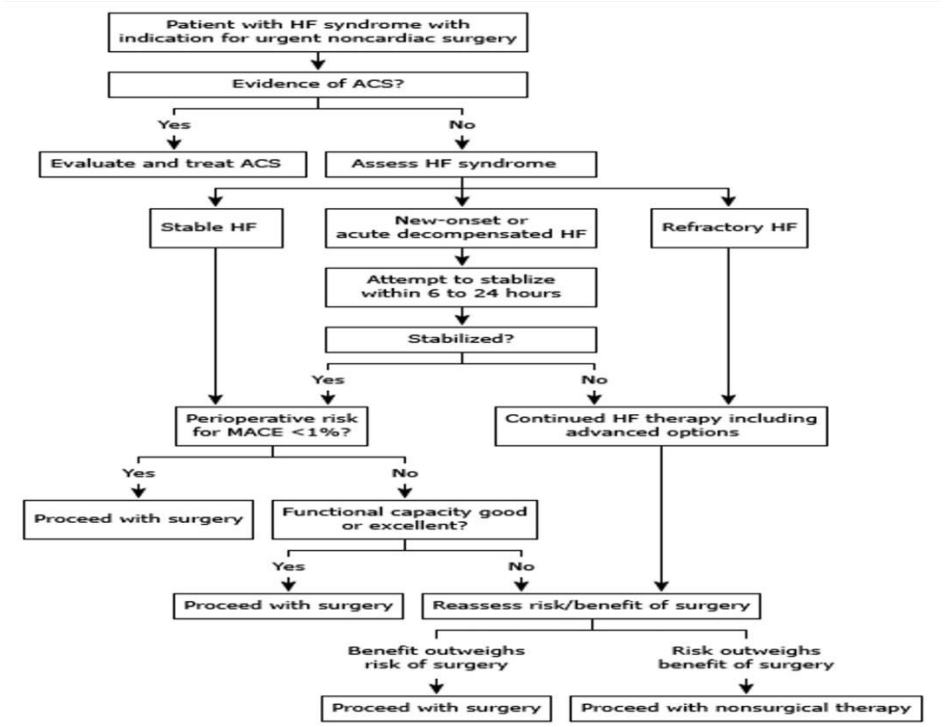

Figure 1:- Algorithm for patients with heart failure syndrome with an indication for urgent noncardiac surgery

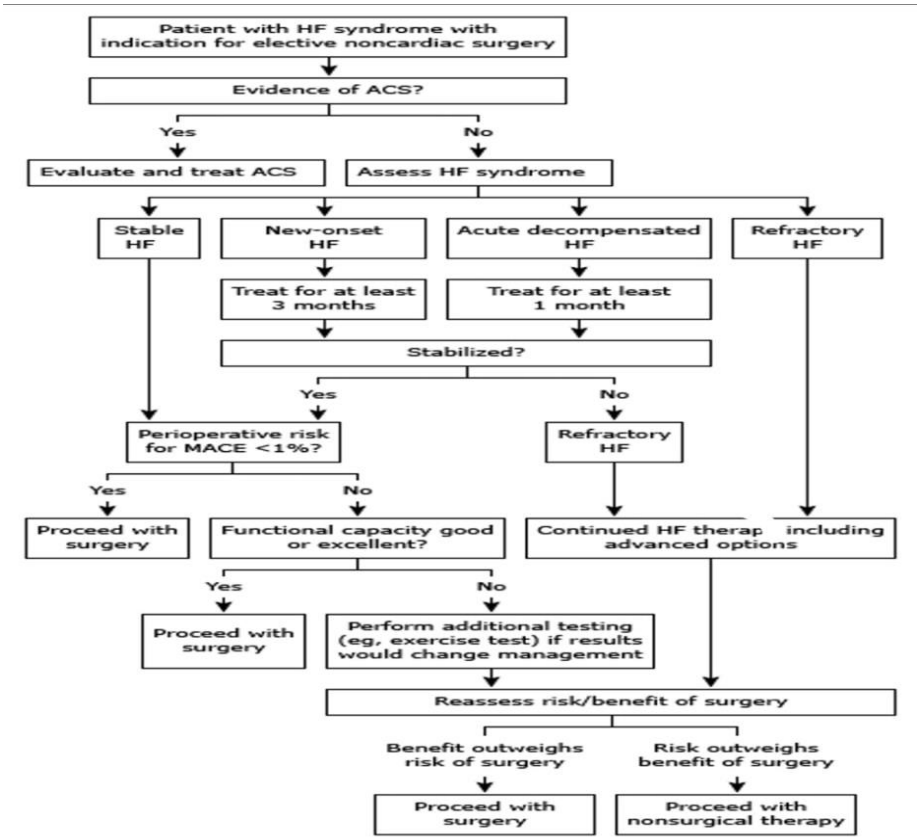

Figure 2:- Algorithm for patients with heart failure syndrome with an indication for elective noncardiac surgery

Preoperative tests are selected based on clinical indications and the likelihood of tests changing the decision to proceed with surgery and perioperative management includes 12 lead electrocardiographs, transthoracic echocardiography (within the last 6 months), stress echocardiography, chest X-ray, natriuretic peptide, hemogram, liver and kidney function test.

Pre-operative optimization with beta-blockers, ACEI/ARBs, mineralocorticoid receptor antagonists, ARNI (angiotensin receptor and neprolysin inhibitor), diuretics, SGLT2 inhibitors, and digoxin.

C) CORONARY ARTERY DISEASE

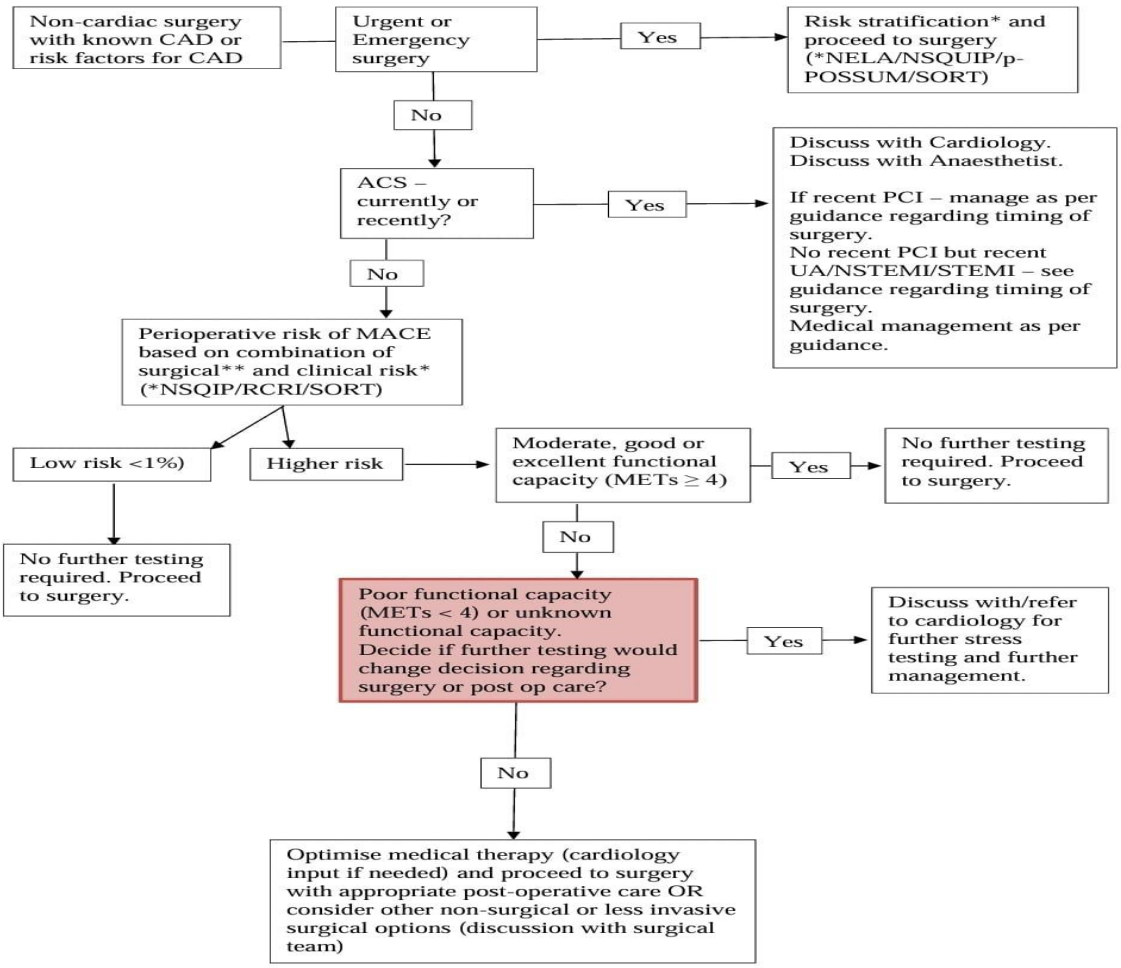

Figure 3:- Stepwise Approach to Perioperative Cardiac Assessment for Coronary Artery Disease (CAD)

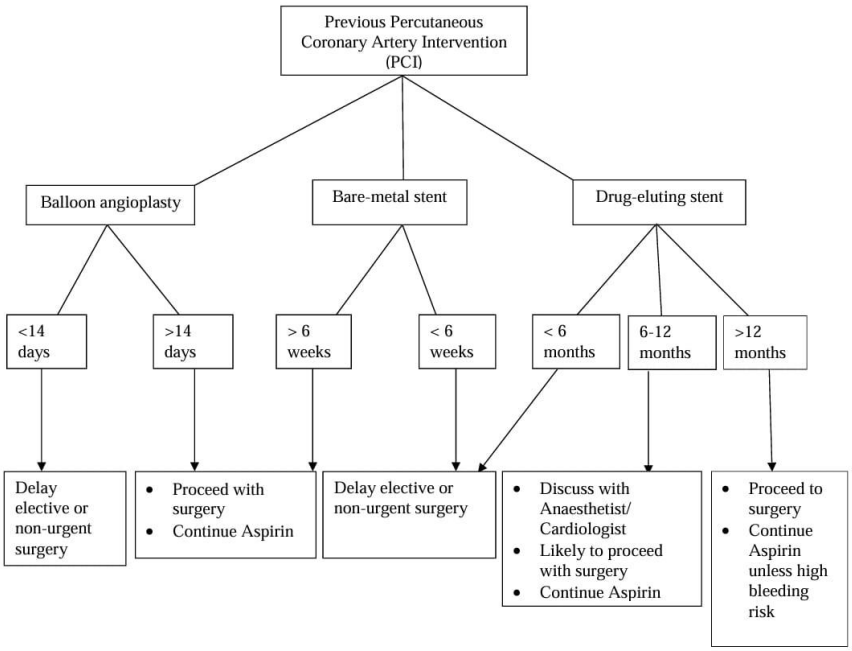

Figure 4:- Perioperative management of patients with coronary artery stents in situ

3) NEUROLOGICAL DISORDERS

a) SEIZURE DISORDER

Causes of seizures in perioperative patients:-

- Epilepsy – breakthrough seizure during perioperative setting is common, the most prominent risk being poor seizure control before surgery: frequency of preoperative seizure and timing of most recent seizure. A lower seizure threshold and increase in risk for perioperative seizure in patients with epilepsy is directly related to subtherapeutic drug levels or sleep deprivation, hence antiepileptics need to be optimized before any surgery
- Anesthesia –many anesthetic sedative-hypnotic drugs have both proconvulsant and anticonvulsant effects, which can depend on the dose and physiologic situation.
- Metabolic and systemic derangements – are a common cause of seizure eg. hyponatremia in the elderly, hyper/hypocalcemia in parathyroid gland pathologies, sepsis, uremic or hepatic encephalopathies, etc., and need to be optimized before surgery clearance.
- Drug and alcohol withdrawal – withdrawal from any sedative-hypnotic medication; alcohol and barbiturates can cause seizures. Thus, a toxicology screen should be performed for patients with a history of addictions. Alcohol withdrawal seizures (characteristically generalized tonic-clonic convulsions that occur within 48 hours after the last drink; they may occur after only two hours of abstinence) are predominantly seen in patients with a long history of chronic alcoholism, need to undergo complete abstinence before surgery with supplementation with thiamine, nutrition, chlordiazepoxide, lorazepam, etc.
- Strokes and other causes.

Prevention of seizures — Patients with preexisting seizure disorders need to continue anti-seizure medications till the day of surgery and perioperatively either parentally or with small sips of water.

b) PARKINSON DISEASE

Antiparkinsonian medications — Antiparkinsonian drugs should not be stopped before surgery in most circumstances. Abrupt withdrawal of these drugs can lead to flares of Parkinson's symptoms with motor and bulbar symptoms that may complicate anesthetic management and, rarely, cause neuroleptic malignant syndrome or related withdrawal syndromes. All antiparkinson medication should be continued up to the time of surgery and restarted as soon as possible after surgery.

- Carbidopa-levodopa has a short duration of action. It should be given the night before surgery. The morning dose of levodopa should be given with sips of water for surgery planned in the afternoon or later in the day. It is important to restart taking the medication as soon as possible and levodopa tablets can be crushed and given through the ryles tube if needed.
- Benztropine and diphenhydramine are anticholinergic drugs that are available in parenteral form and can be used in patients who are unable to take oral medication, but they should be used in as low a dose as possible, as they may precipitate an acute confusional state, especially in older adults.
- Monoamine oxidase type B (MAO-B) inhibitors (selegiline, rasagiline) and catechol-O-methyltransferase (COMT) inhibitors (tolcapone and entacapone) should be continued till the day before surgery.

4) PULMONARY DISEASES

General considerations in patients with pulmonary diseases:-

- Smoking cessation: for at least more than eight weeks before surgery. However, briefer periods of cessation also provided nonrespiratory benefits. Pharmacotherapy (eg, nicotine replacement and varenicline) and behavioral interventions for preoperative smoking cessation are beneficial.
- For patients with COPD or asthma, optimize control with inhaled bronchodilators and possibly inhaled glucocorticoids before surgery to achieve their best possible baseline level of function.
- For patients with a flare of COPD or asthma, step-up therapy with systemic glucocorticoids should be prescribed (eg, prednisone 40 mg/day for five days) and delay elective surgery until COPD/asthma is under a good control and has returned to baseline.
- Patients who are currently or have previously received exogenous glucocorticoids should undergo perioperative stress-dose glucocorticoids or testing of the hypothalamic-pituitary-adrenal axis depending on the current glucocorticoid dosing.
- Patients with aspirin-exacerbated respiratory disease (AERD) characterized by asthma, chronic rhinosinusitis with nasal polyposis, and aspirin sensitivity should not receive nonsteroidal anti-inflammatory agents (NSAIDs) for pain control.
- Preoperative antibiotics should only be prescribed for patients with symptoms and signs of lower respiratory infection
- Delay elective surgery for at least 30 days for patients with lower respiratory tract infection and at least six weeks for patients with COVID-19 after consideration of the severity of symptoms at the time of infection, ongoing symptoms, comorbidities, and complexity of surgery

- Counsel patients on preoperative oral care (eg, dental hygienist visit, preoperative chlorhexidine mouthwash)
- Provide preoperative education regarding lung expansion maneuvers and regular incentive spirometry.
- For patients at increased risk of pulmonary complications, initiate chest physical therapy (eg, aerobic exercises, breathing exercises, inspiratory muscle training) at least two weeks before surgery.

- **PULMONARY FUNCTION TEST**
  Pulmonary function tests can be used to determine whether a respiratory disease is obstructive or restrictive. The table below summarises the main findings and gives some example conditions:

Obstructive lung disease	**Restrictive lung disease**
FEV1 - significantly reduced FVC - reduced or normal FEV1% (FEV1/FVC) - reduced	FEV1 - reduced FVC - significantly reduced FEV1% (FEV1/FVC) - normal or increased
Asthma COPD Bronchiectasis Bronchiolitis obliterans	Pulmonary fibrosis Asbestosis Sarcoidosis Acute respiratory distress syndrome Infant respiratory distress syndrome Kyphoscoliosis e.g. ankylosing spondylitis Neuromuscular disorders Severe obesity

- **BEDSIDE PULMONARY FUNCTION TEST**:- Bed-side pulmonary function tests (PFTs) are valuable tools for assessing the cardio-pulmonary status and ventilatory capacity of patients quickly and conveniently.

  ***** Saberazes test or breath-holding test:- Measures the response of the body to the oxygen-carbon dioxide balance in the alveolar air, blood, and tissues under all conditions of health and disease. The patient is asked to take a full breath, but not very deep, and hold it for as long as possible. A normal result is >25 seconds, while a result of <15 seconds indicates poor cardio-pulmonary reserve (CPR) and may be a contraindication for elective surgery, while a result between 15-25 indicates limited CPR.

  Breath Holding Time -Vital Capacity
  -25-30 Seconds - 3500 ml
  -20-25 Seconds - 3000 ml
  -15-20 Seconds- 2500 ml
  -10-15 Seconds- 2000 ml
  -5-10 Seconds- 1500 ml

  *****Single breath count test:- measures how many counts a person can say after holding their breath. Normal is 30-40 counts; used to assess respiratory muscle strength at the bedside, and it is indirectly linked to vital capacity.

  ***** Snider's match-blowing test:- used in determining expiratory capacity and maximum breathing capacity (MBC). The patient is instructed to inhale maximally and then exhale rapidly, attempting to extinguish a burning match held 6 inches (15 cm) from their mouth without using their lips. Having an MBC above 60 liters per minute and a forced expiratory volume in one second (FEV1) above 1.60 liters allows patients to safely extinguish a match, indicating that they can undergo surgery safely. However, if the patient is unable to extinguish the match and has an MBC of less than 60 L/min and a FEV1 of less than 1.6 liters, this indicates diminished respiratory function.

  ***** Modified Snider's test:- In the Sniders match-blowing test, according to the distance of matchstick from the patient's mouth, it is suggestive of MBC>40 L/min at 3 inches; MBC>60 L/min at 6 inches; MBC>150 L/min at 9 inches.

  ***** De Bono's Whistle Blowing Test:- measures peak expiratory flow rate (PEFR). To perform the test, the patient blows down a wide bore tube, at the end of which is a whistle. The test measures their fastest breath speed, which can be as high as 300 liters per minute.

  ***** Greene and Berowitz cough test:- assesses the strength and effectiveness of the respiratory muscles. The patient is instructed to take a deep breath and cough. An effective cough necessitates a vital capacity (VC) equal to three times the tidal volume (TV). If the patient is unable to do so, a Forced Vital Capacity (FVC)< 15 mL/Kg, and PEFR <200L/min should be considered.

  *Tracheal auscultation test:- is another bedside test done during a forced expiration to measure forced expiration time. The patient takes a deep breath while the doctor listens for any abnormal sounds such as wheezing, crackles, stridor, or diminished breath sounds. This test has a normal value of 3 to 5 seconds. Auscultation over the trachea during forced

expiration helps identify potential airway obstructions. Normally the sounds are heard for 3-5 seconds. If < 3 seconds, then a restrictive type of disease may be present, and > 6 seconds, then an obstructive lung disease may be present.

* Peak flow meter.

a) OBSTRUCTIVE SLEEP APNOEA

Obstructive sleep apnoea (OSA) is a sleep disorder wherein breathing repeatedly stops and starts during sleep and is potentially fatal. Many patients with OSA are undiagnosed when they present for surgery increasing the risk of life during and post-surgery, hence is the physician's responsibility to timely diagnose these patients and initiate treatment for optimal outcomes.

Common comorbidities associated with OSA:-

- Cardiac:- Resistant hypertension, Congestive cardiac failure, Atrial fibrillation, Dysrhythmias
- Respiratory:- Obstructive airway disease, Pulmonary hypertension
- Neurology:- First CVA
- Metabolic/Endocrine:- Type 2 Diabetes, Morbid obesity, Metabolic syndrome, Hypothyroidism
- Other:- Gastro-esophageal reflux disease

Preoperative screening for OSA – any patient with BMI>40 (STOP-BANG)

- S:-Snoring: Do you snore loudly (louder than talking or loud enough to be heard through closed doors)?
- T:-Tired: Do you often feel tired, fatigued, or sleepy during the daytime?
- O:-Observed: Has anyone observed you stop breathing during your sleep?
- P:-Blood pressure: Do you have or are you being treated for high blood pressure?
- B:-BMI: BMI more than 40 kg/m2
- A:-Age: Age over 50 years
- N:-Neck circumference: Neck circumference greater than 40 cm
- G:-Gender: Male

High probability of moderate/severe OSA: - score ≥ 6/8,

Low probability of OSA:- Score < 3/8

Diagnosis:- If STOP-BANG score is ≥6/8, refer patient for:-

- Pulse oximetry, bicarbonate levels, arterial blood gas, and/or
- Respiratory polysomnography (ARES:- Apnea Risk Evaluation System)

Treatment modalities include:-

- Weight loss
- Mandibular advancement splints
- CPAP

5) ENDOCRINE DISORDERS

a) Thyroid disorders

Thyroid disease is very common with the highest prevalence being in women and older age. Thus, a large number of patients who undergo surgery have concomitant thyroid disease and need optimization before surgery.

(i) HYPOTHYROIDISM:-

Hypothyroidism has an effect on multiple bodily systems which influences the perioperative outcome in the following ways:-

- ✓ Systemic hypometabolism results in a decreased cardiac output due to reductions in heart rate and contractility.
- ✓ Hypoventilation occurs because of respiratory muscle weakness and reduced pulmonary responses to hypoxia and hypercapnia.
- ✓ Decreased gut motility results in constipation and ileus.
- ✓ Many metabolic abnormalities can occur in hypothyroidism, including hyponatremia due to a reduction in free water clearance, reversible increases in serum creatinine, and reduced clearance of some drugs (eg, opioids, antiepileptics, hypnotics, anticoagulants, and reduced clearance of vitamin K dependent clotting factors)
- ✓ Hypothyroidism is associated with a decrease in red blood cell mass and normochromic, normocytic anemia.

Defining the severity and management of hypothyroidism —

- ✓ Severe hypothyroidism –patients with myxedema coma; with severe clinical symptoms of chronic hypothyroidism such as altered mentation, pericardial effusion, or heart failure, etc.; or those with very low levels of total thyroxine (T4) (eg, less than 1.0 mcg/dL) or free T4 (eg, less than 0.5 ng/dL).

  – Elective surgery needs to be delayed until hypothyroidism has been corrected. Evaluate for clinical features of myxedema coma (Decreased mental status, hypothermia, bradycardia, hyponatremia, hypoglycemia, hypotension, precipitating illness).

  -In emergency surgery cases in the presence of myxedema coma, patients should be treated with both triiodothyronine (T3) and T4 to rapidly normalize thyroid function with oral formulation. If the injectable form is available, a loading dose of T4 is given at 200 to 300 mcg intravenously followed by 50 mcg daily. T3 should be given simultaneously in a dose of 5 to 20 mcg intravenously followed by 2.5 to 10 mcg every eight hours based on the patient's age and coexistent cardiac risk factors.

- ✓ Moderate hypothyroidism –overt hypothyroidism (elevated thyroid stimulating hormone [TSH], low

free T4) without the features of severe hypothyroidism.

- Elective surgery needs to be postponed until the euthyroid state is restored.
- Urgent surgery should be done without delay, with preparedness for minor perioperative complications that might develop. In preoperatively diagnosed moderate hypothyroidism, thyroid hormone replacement should be initiated immediately. Young patients should be started on full replacement doses of levothyroxine (T4) (1.6 mcg/kg daily), while older patients or patients with cardiopulmonary disease are started at lower doses of 25 to 50 mcg daily with an increase in dose every two to six weeks.

- ✓ Mild hypothyroidism –subclinical hypothyroidism, defined biochemically as a normal serum-free T4 concentration in the presence of an elevated serum TSH concentration. In subclinical hypothyroidism, postponing surgery is not warranted. The degree of thyroid test abnormality that warrants treatment with levothyroxine is controversial and up to the discretion of the physician.

(ii) HYPERTHYROIDISM

Hyperthyroidism can affect many body systems in the following ways:-

- ✓ Increased cardiac output, due both to increased peripheral oxygen needs and increased cardiac contractility. There is an increased heart rate, widened pulse pressure, and decreased peripheral vascular resistance.
- ✓ Atrial fibrillation can occur in patients with hyperthyroidism and is more common in older patients.
- ✓ Subclinical hyperthyroidism is associated with increased rates of atrial ectopy and also threefold increased risk of atrial fibrillation.
- ✓ Dyspnea may occur for a variety of reasons, including increased oxygen consumption and carbon dioxide production, respiratory weakness, and decreased lung volume.
- ✓ Weight loss is primarily due to increased calorigenesis and secondary to increased gut motility, associated with hyper-defecation and malabsorption; these changes cause the patient to be malnourished.

Defining the severity and management of hyperthyroidism —

- ✓ Subclinical hyperthyroidism is defined as a low TSH with normal free T4 and T3. Patients with subclinical hyperthyroidism can undergo elective or urgent surgeries without delay. Unless contraindicated, administration of beta-blockers (eg, atenolol 25 to 50 mg daily) is recommended preoperatively to older patients (>50 years), or younger patients with cardiovascular disease, especially atrial arrhythmias, and taper off after recovery.
- ✓ Overt hyperthyroidism is defined as a suppressed TSH with elevated free T4 and/or T3 concentrations. All elective surgeries in overt hyperthyroidism should be postponed until adequate control of their thyroid condition is achieved (normal free T4 and T3), i.e. at least for three to eight weeks with beta-blockers, thionamides (carbimazole 20-60mg/day, methimazole 5-20mg/day, propylthiouracil (preferred in the first trimester of pregnancy)). In emergency surgery, treat with Intravenous beta blockers, methimazole, and propylthiouracil (100 to 150 mg every six to eight hours) should be given.
- ✓ Thyroid storm needs to be diagnosed and severity determined by BURCH- WARTOFSKY POINT SCALE (BWPS) and treated as a medical emergency with beta-blocker (if not contraindicated) to control the symptoms and signs induced by increased adrenergic tone, glucocorticoids to reduce T4-to-T3 conversion, promote vasomotor stability, possibly reduce the autoimmune process in Graves' disease, and possibly treat associated relative adrenal insufficiency, thionamide to block new hormone synthesis, iodine solution to block the release of thyroid hormone, iodinated radiocontrast agent to inhibit the peripheral conversion of T4 to T3, bile acid sequestrants in severe cases to decrease enterohepatic recycling of thyroid hormones.

b) DIABETES MELLITUS

Diagnosis based on laboratory tests: A fasting plasma glucose ≥ 126 mg/dL, random plasma glucose ≥ 200 mg/Dl, HbA1c >6.5%.

PRE-OPERATIVE ASSESSMENT includes- duration of diabetes, current medication, previous blood glucose control, known complications of diabetes (ischemic heart disease, nephropathy, retinopathy, hypertension, neuropathy),

Investigations should include fasting and post-prandial blood sugars, HbA1C, lipid profile, liver and kidney function test, fundus examination, urine routine and microscopy, urine for ketones and microalbuminuria, and ECG.

Table 6:- Fasting guidelines for diabetes medications (short starvation period – no more than one missed meal)

MEDICATION TYPE	COMMONLY USED MEDICATIONS	DAY OF FASTING
Biguanide	Metformin	Can be taken as normal, but may cause GI upset
Sulphonylurea	Gliclazide, Glimpeiride etc.	• Omit morning dose • If taken twice daily give the evening dose if the patient is eating an evening meal, otherwise, omit.
Thiazolidinedione	Pioglitazone	Taken as normal
DPP-4 Inhibitors	Sitagliptin, Vildagliptin, Linagliptin, Teneligliptin	Taken as normal
GLP-1 Analogues (Non-insulin injectables)	Exenatide, Liraglutide, Semaglutide	Taken as normal
SGLT-2 Inhibitors	Dapagliflozin, Canagliflozin, Empagliflozin	Omit when fasting

Table 7:- Fasting guidelines for insulin (short starvation period – no more than ONE missed meal)

<table>
<tr><th>INSULIN REGIME</th><th colspan="2">DAY OF FASTING</th></tr>
<tr><td>ONCE DAILY BASAL OR INTERMEDIATE-ACTING</td><td colspan="2">• To be continued at the usual timing and dose
• Variable rate IV insulin is to be continued if needed with regular glucose monitoring</td></tr>
<tr><td>TWICE DAILY (Biphasic insulins)</td><td colspan="2">• Half of the usual morning dose given
• Evening dose as usual if patient having an evening meal
• Variable rate IV insulin is to be commenced instead of the regular dose if the evening meal is being missed</td></tr>
<tr><td rowspan="2">THREE TIMES DAILY (Biphasic insulins)</td><td>MORNING or ACUTE LIST
• Half the usual morning dose
• If still fasting state continues afternoon dose is to be omitted</td><td>EVENING LIST
• Take the usual morning dose
• Lunch time dose to be missed.</td></tr>
<tr><td colspan="2">• If an evening meal is taken, then no change in the evening dose is to be made.
• If the fasting state continues till evening, commence variable rate IV insulin</td></tr>
<tr><td rowspan="2">FOUR OR MORE DAILY (Basal bolus regime)</td><td>MORNING or ACUTE LIST
• Omit the morning short-acting insulin</td><td>EVENING LIST
• Usual morning dose of short-acting insulin to be taken</td></tr>
<tr><td colspan="2">• No change to basal/background insulin.
• Omit short-acting dose till fasting state.
• If the patient is eating the evening meal –the evening dose does not need to be changed. Commence variable rate IV insulin if the evening meal is also being skipped. Basal insulins are to be continued alongside IV insulin.</td></tr>
</table>

Table 8: PERI-OPERATIVE MANAGEMENT OF DIABETIC PATIENTS:- Aim to maintain blood glucose between 80 and 180 mg/dL peri-operatively:

Regimen 1 Observation only Diet-controlled diabetes requires 4-hourly glucose measurements peri-operatively. If consistently >180 mg/dl, consider changing to regimen 4.	*Regimen 2* Omission of oral hypoglycaemic drugs Stop drugs 6-12 hours pre-op and monitor glucose 4- hourly peri-operatively
Regimen 3 Proportion of usual insulin morning cases: Omit breakfast and insulin evening cases: Light breakfast and half usual insulin All cases: Monitor blood glucose 2-hourly	*Regimen 4* Variable rate intravenous insulin infusion– standard regimen If 4 readings are out of the target range, change to gentle or aggressive regimen

Restarting usual treatment:-

- ✓ Insulin-treated patients: Restart s/c insulin before the second full meal. Discontinue infusions one hour after the first s/c dose.
- ✓ Tablet-treated patients: Restart the usual treatment before the second full meal. If once-daily treatment, then restart treatment with an evening meal and half the usual morning dose.

MANAGEMENT OF HYPOGLYCAEMIA AND HYPOGLYCAEMIA RISK

Patients admitted pre-operatively should have a capillary blood glucose (CBG) measured

- ✓ If admission CBG is <108mg/dL:- consider the potential risk of hypoglycemia in the perioperative period
- ✓ If CBG is 70-108mg/dL and no symptoms of hypoglycemia:- Consider giving 50-100mls of 10% dextrose as a stat iv bolus, repeat CBG after 15 minutes
- ✓ If CBG <70mg/dL:- Give 80-100mls of 20% glucose, repeat CBG after 15 minutes

6) HEMATOLOGICAL DISORDERS

a) Anemia

Preoperative anemia needs a detailed evaluation with a workup for the cause of anemia.

- ✓ Nutritional:- iron, vitamin B12, or folate deficiency:- replete deficiency with oral or intravenous supplements of iron, vitamin B12, and folate at least 6 to 8 weeks before surgery.
- ✓ Chronic inherited, acquired anemia:- eg. Sickle cell, hemoglobinopathies, MDS, AIHA, etc.
- ✓ Anemia due to blood loss:- occult or frank gastrointestinal, genitourinary losses need to be identified and corrected.
- ✓ Parasitic intestinal infestation:- needing deworming
- ✓ Anemia of chronic disease:- determine the cause and optimize before surgery. Use of erythropoietin where indicated.

Indications and guidelines for blood transfusions:-

- ✓ Emergency surgeries
- ✓ Patients should not normally be transfused if the hemoglobin concentration is > 10g/dL
- ✓ A strong indication for transfusion is a hemoglobin concentration < 7g/dL
- ✓ Transfusion will become essential when the hemoglobin concentration decreases to 5g/dL
- ✓ A hemoglobin concentration of 8-10g/dL is a safe level even for those patients with significant cardiorespiratory disease.
- ✓ The exception to the rule is patients presenting with hip fractures for surgery – in the presence of ischaemic heart disease, transfuse if Hb < 10g/dL, otherwise in other cases consider transfusion if Hb < 9g/dL.
- ✓ Symptomatic patients should be transfused

b) Anticoagulation and antiplatelet drugs

- ✓ Aspirin, Clopidogrel, and Prasugrel are to be stopped 7 days pre-operatively, Ticagrelor for 5 days pre-operatively, and Dipyridamole 2 days pre-operatively.
- ✓ However, it is recommended to continue aspirin 75mg peri-operatively in the following cases:-
  -till 12 months after post-PCI: Coronary artery stent with Bare-metal stent (BMS) or Drug-eluting stent (DES)
  -till 3 months after for secondary prevention of ischemic TIA/CVA
  -till 1 month after a carotid artery stenting
  - Post-carotid endarterectomy (CEA)

- ✓ Anticoagulation:- In the peri-operative period risks and consequences of thrombosis need to be weighed against risk and consequences of excess perioperative and postoperative bleeding.

There are 3 options for the peri-operative management of anti-coagulants:-

- ✓ Continue warfarin (with INR monitoring pre-procedure) or other novel oral anticoagulants – this

is for minor superficial procedures like cataract surgery, minor superficial dermatological procedures, minor dental procedures, low-risk endoscopic (diagnostic +/- biopsies, biliary or pancreatic stenting, diagnostic EUS)

- ✓ Temporary cessation of anticoagulation for a period pre- and post-operatively with post-operative prophylactic anticoagulation only.
- ✓ Temporarily withhold warfarin or other novel oral anticoagulants pre-operatively with bridging anticoagulation therapy with LMWH or IV Heparin

And option to be chosen from above is determined by:- primary indication for anticoagulation and risk assessment of thromboembolism, type of procedure or surgery, and risk of perioperative bleeding

Anticoagulation can be continued in dental surgery-single or multiple simple extractions, cataract surgery, minor dermatological surgery e.g. skin biopsy, joint and soft tissue injections/aspirations, coronary angiography and pacemaker insertion, diagnostic endoscopy +/- biopsy, etc. INR must be checked within 5 days before the procedure or on the day of the procedure to ensure it is not elevated. For patients on DOAC treatment, the dose on the day of the procedure is missed– although if the patient has taken then consider performing the procedure after the peak effect of anticoagulation is over that is 2-3 hours following ingestion.

Vitamin K antagonist:- for intermediate and high-risk surgeries.

Warfarin should be stopped 5 days before surgery, Phenindione and acenocoumarol have shorter half-life and hence should be stopped 4 days before surgery.

Check INR on the day of surgery to ensure < 1.5. If INR is >1.5 adminster Inj. Vitamin K and fresh frozen plasma if required.

Table 9: Pre-operative management of warfarin

D -6	D -5	D-4	D -3	D -2	D -1	D0 – Surgery
Last dose warfarin	No indication of pre-operative bridging					Commence LMWH Prophylaxis 6-12 hours post-op

INDICATIONS FOR BRIDGING THERAPY WITH WARFARIN:

- ✓ Venothromboembolisim (VTE):- if VTE has occurred in the past 3 months, a very high-risk patient on therapeutic anticoagulation who now has a target INR of 3.5.
- ✓ Atrial fibrillation (AF):- Patients with a previous stroke/TIA and 3 or more of the following risk factors: Congestive cardiac failure, hypertension (>140/90 mmHg or on medication), age >75 years, diabetes mellitus.
- ✓ Mechanical Heart Valve(MHV):- All MHV patients EXCEPT bi-leaflet aortic valves and none of the risk factors of chronic AF, left ventricular dysfunction, age > 75 years, hypertension, diabetes, prior stroke/TIA

Stop VKA as advised with daily INR monitoring during bridging therapy with a dose of LMWH depending on this result. As described in the table below (Table 10):-

Table 10: T:- therapeutic dose; P:- prophylactic dose; *:- oral vitamin K and repeat INR next day

D-6	D-5		D-4		D-3	
	INR	Dose of LMWH	**INR**	Dose of LMWH	**INR**	Dose of **LMWH**
LAST dose of warfarin	<2	T	<2	T	<2	T
	2-3	T	2-3	T	2-3	P
	3-4	T	3-4	P	3-4	*
	> 4	Repeat on D3	>4	*	>4	*

NOACs (non-vitamin K antagonist oral anticoagulants):

Table 11: Pre-operative indications for NOACs

NOAC	Creatinine Clearance (ml/min)	High risk of bleeding/major surgery/ neuraxial block	Standard risk of bleeding/no neuraxial block	Investigation on the day of surgery
DABIGATRAN	≥80 50 – 79 30 -49	2 days pre-operatively 3 days pre-operatively	1 day pre-operatively 2 days pre-operatively	Clotting screen and Thrombin time

		4 days pre-operatively	3 days pre-operatively	
RIVAROXABAN, EDOXABAN, APIXABAN	≥30 <30	2 days pre-operatively 3 days pre-operatively	1 day pre-operatively 2 days pre-operatively	Clotting screen

7) CHRONIC LIVER DISEASE (CLD)

Patients with liver disease frequently require surgery and are at a higher risk of intraoperative complications and postoperative morbidity and mortality.

a) Screening for liver disease before surgery:- a detailed history of prior blood transfusions, tattoos, illicit drug use, history of multiple sex partners and/or sexually transmitted infections, a family history of jaundice or liver disease, a history of jaundice or fever following anesthesia, alcohol use (current, prior and quantity), and a review of current medications. Assess patient for clinical features suggestive of liver disease like fatigue, pruritus, increased abdominal girth, jaundice, palmar erythema, spider telangiectasias, splenomegaly, and gynecomastia and testicular atrophy in males.

✓ A routine liver biochemical profile and ultrasound for liver size and parenchyma in suspected patients.

✓ USE OF SCORES:-

-APRI (AST to platelet ratio index):- The APRI is calculated using the AST elevation (which is the AST level divided by the upper limit of normal [ULN] for the lab) and the platelet count per mm3 divided by 100. APRI SCORE OF 0.7 is predictive of fibrosis F2/F3, whereas a score of 1 is predictive of F4.

-AST/ALT ratio — The AST/ALT ratio is approximately 0.8 in normal subjects. A ratio

>1 suggests the presence of cirrhosis, but is a inconsistent marker.

-FIB-4 index – The FIB-4 index combines biochemical values (platelet count, ALT, and

AST) and age. It had good predictive accuracy for advanced fibrosis and

hepatocellular carcinoma in alcoholic liver disease

FIB-4: Age ([yr] x AST [U/L]) / ((PLT [10(9)/L]) x (ALT [U/L])(1/2)).

Interpretation of FIB-4:-

>Low risk: FIB-4 below 1.30

>Intermediate risk: FIB-4 between 1.30 and 2.67

>High risk: FIB-4 over 2.67

-NAFLD fibrosis score – It takes into account the patient's age, body mass index (BMI),

Blood glucose levels, aminotransferase levels, platelet count, and albumin. An

Intermediate or high NFS score (greater than minus 1.455) suggests advanced

liver fibrosis

-many other scores like the PGA index, Fibroindex, FORNS index, BARD index, etc can also be used. Few direct markers of fibrogenesis and fibrinolysis can be used like Matrix deposition markers (Procollagen I peptide, Procollagen III peptide, Type I collagen, Type IV collagen), Matrix degradation markers (MMP-2, TIMP-1, -2), Cytokines (TGF-beta, TGF-alpha, PDGF)

b) In patients with known liver disease:-

✓ Absolute contraindications to elective surgery in patients with liver disease include- Acute alcoholic hepatitis, acute liver failure, acute viral hepatitis, child-Pugh class C cirrhosis, severe chronic hepatitis, severe coagulopathy (prolongation of the prothrombin time >3 seconds despite vitamin K administration; platelet count <50,000/mm3), severe extrahepatic complications, acute renal failure, cardiomyopathy or heart failure, hypoxemia.

✓ Risk scores for patients with cirrhosis:-

--The Child-Pugh classification assigns one to three points to each of five parameters (encephalopathy, ascites, bilirubin, albumin, and prothrombin time [PT] or international normalized ratio [INR]). Patients with a score of 5 or 6 have Child-Pugh class A cirrhosis (well-compensated cirrhosis), those with a score of 7 to 9 have Child-Pugh class B cirrhosis (significant functional compromise), and those with a score of 10 to 15 have Child-Pugh class C cirrhosis (decompensated cirrhosis).

-The Model for End-stage Liver Disease (MELD) score is a continuous scale (with higher values representing more severe liver disease) based on a formula that assigns weights to the patient's serum bilirubin, creatinine, and INR. It is used to predict short-term survival in patients awaiting liver transplants but is also useful in predicting postoperative morbidity and mortality in patients with cirrhosis. A MELD score of 10 to 15 confers increased perioperative risk, and patients with MELD scores >15 should not undergo elective surgery.

--The Mayo Risk Score is used to predict postoperative mortality in patients with cirrhosis, using the MELD parameters, age, ASA physical status classification, and etiology of liver disease.

c) Complications of chronic liver disease to be dealt with:-

✓ Encephalopathy – Hepatic encephalopathy can be precipitated by gastrointestinal bleeding, constipation, infection (including spontaneous bacterial peritonitis and urinary tract infections), hypoxia, hypovolemia, alkalemia, hypoglycemia, hypokalemia, hyponatremia,

sedatives (particularly benzodiazepines) and should be prevented. Diagnosis is based on clinical evaluation and grading of HE along with supportive high serum ammonia and lactate levels. Treat with oral lactulose syrups, high bowel washes, and lactulose enemas.

- ✓ Hematologic abnormalities – Diminished hepatic function causes procoagulant and anticoagulant effects. Abnormalities in routine laboratory tests of coagulation, including prolongations of the PT, INR, and activated partial thromboplastin time (aPTT) commonly seen. Mild thrombocytopenia and elevated D-dimer are seen with portal hypertension and hypersplenism. In patients with liver disease and abnormal hemostatic laboratory tests planned for surgery, prophylactic vitamin K is administered where deficiency is suspected eg. poor nutrition, cirrhosis, cholestatic disease, antibiotic use, etc. In suspected microvascular bleeding, or risk of bleeding due to percutaneous procedures platelet transfusion to achieve a platelet count ≥50,000/microL, and cryoprecipitate to maintain fibrinogen levels ≥200 mg/dL is done. However, transfusion of fresh frozen plasma to correct the INR is not routinely recommended.
- ✓ Portal hypertension – results in the formation of varices, circulatory, functional, and biochemical abnormalities, splenomegaly, and ascites. Can be treated preoperatively with beta-blockers. PHTN can also cause portopulmonary hypertension (PPHTN) leading to complications.
- ✓ Pulmonary complications – Patients with ascites may develop shortness of breath, ventilation/perfusion mismatch, pleural effusion, decreased lung capacity, and not tolerate lying supine. Patients with encephalopathy are at increased risk for pulmonary aspiration. Hepatopulmonary syndrome (HPS) can induce intrapulmonary vascular dilatations (IPVDs) causing hypoxemia.
- ✓ Renal dysfunction —liver disease causes a progressive decline in renal function, characterized by retention of sodium and free water, renal hypoperfusion, and decreased glomerular filtration, which can lead to hepatorenal syndrome (HRS) increasing risk of parenchymal renal disease, sepsis, nephrotoxicity, and hypovolemia. HRS can be corrected with intravenous albumin and terlipressin.
- ✓ There is an increased risk of electrolyte imbalance like hyponatremia, hypokalemia and needs optimization before surgery. Also, there is increased cardiovascular risk in patients with CLD.

8) CHRONIC KIDNEY DISEASE

Chronic kidney disease is associated with cardiovascular disease and increases the risk of postoperative morbidity and mortality.

- ✓ Preoperative Assessment Patients with kidney disease includes

i)Patients with chronic renal failure in whom dialysis has not yet been initiated.

ii) Patients with acute renal failure who are or are not undergoing dialysis.

iii) Stable patients with renal failure who are undergoing hemodialysis or peritoneal dialysis.

iv) Patients who have undergone kidney transplantation but have impaired renal function.

- ✓ Laboratory test before surgery:- Serum electrolytes, glucose, blood urea nitrogen, creatinine, calcium, magnesium, phosphorus, albumin, complete blood count, and arterial blood gas. Coagulation tests, including prothrombin time, activated partial thromboplastin time, and international normalized ratio,
- ✓ Assessment and optimization of comorbidities in CKD like cardiovascular disease, hypertension, anemia, diabetes, and malnutrition.
- ✓ Hyperkalemia:- Although there are no recommendations for safe preoperative potassium values, it is better to avoid general anesthesia in patients with chronic kidney disease who have a serum potassium level above 5.5 mEq/L(5.5 mmol/L). Treatment options include polystyrene binding resins (eg, patiromer or sodium zirconium cyclosilicate), insulin in combination with intravenously administered dextrose, beta 2 adrenergic receptor agonist nebulization, intravenously administered bicarbonate, and, if all else fails, dialysis. In the case of NPO status, polystyrene binding resins cannot be given orally before surgery, it can be administered as retention enemas (30 to 60 g rectally every six hours).
- ✓ Acid-base disorders:-Chronic metabolic acidosis in patients with CKD has not been associated with increased perioperative risk. However, acidosis in patients with CKD should be managed with IV bicarbonate in severe cases and oral bicarbonate tablets to maintain an S. bicarbonate level of 22meq/l.
- ✓ Bleeding:- Uraemia can cause platelet dysfunction causing increased perioperative bleeding. Bleeding time is the most sensitive indicator of the extent of platelet dysfunction, bleeding times of greater than 10 to 15 minutes are associated with a high risk of hemorrhage. Antiplatelet agents should be withheld within 72 hours before surgery in patients with CKD. Other drugs that can increase the risk of intraoperative bleeding like diphenhydramine, nonsteroidal anti-inflammatory drugs, chlordiazepoxide, cimetidine, etc. should also be withheld before surgery. Options for correcting elevated bleeding times in patients with renal failure include:- hemodialysis (low heparin or heparin free), desmopressin (DDAVP) at 0.3 mcg/kg IV 1 hour before surgery, cryoprecipitate, conjugated estrogens at 0.6 mg per kg per day IV or orally for 5 days, transfusion of packed red blood cells to raise the hematocrit to at least

30 percent, which increases platelet interaction with vessel walls.

- ✓ Antibiotic prophylaxis:-prophylactic antibiotics for surgical procedures, particularly dialysis graft procedures are recommended in CKD patients. Vancomycin or a first-generation cephalosporin in a dosage appropriate for renal function is best for empirical therapy.
- ✓ Surgery should be deferred in cases of volume overload not responsive to diuretics, resistant hyperkalemia with ECG changes, severe metabolic acidosis, uremic encephalopathy, uremic pericarditis, uremic gastritis, etc. In such cases dialysis should be initiated immediately for optimization.

9) OTHERS

a) Obesity

Obese patients are at risk of multiple pre and peri-operative complications and have a high incidence of co-existing diseases, including

- ✓ Diabetes
- ✓ hypertension, cardiac disease, metabolic syndrome
- ✓ respiratory disease
- ✓ OSA (obstructive sleep apnoea) and obesity hypoventilation syndrome
- ✓ venous thromboembolic disease
- ✓ Regurgitation, reflux, and aspiration.

Classifying obesity based on BMI as given below and initiating pre-operative corrective measures like diet, exercise, and anti-obesity drugs in patients for effective weight management. Also, optimization of above mentioned co-existing complications is of utmost importance.

Table 12: Classification of BMI. (BMI = weight/height2 (kg/m2))

Classification	BMI
Acceptable	20 - 24.9
Overweight	25 - 29.9
Obese	30 – 40
Morbidly obese	> 40
Super morbid obesity	>45

b) Patients on chronic steroid therapy

Patients on chronic steroid therapy need to continue pre-operative doses of steroids on the day of surgery.

Patients should be classified on hypothalamic-pituitary-adrenal axis suppression (HPAA) basis for proper guidance for the need of peri-operative stress dose of steroids:-

- High risk of HPAA suppression – needs stress-dose of steroids peri-operatively
  -primary adrenal insufficiency (Addison's disease)
  -high dose of Prednisolone ≥ 20mg/d for ≥ 3 weeks, or with features of Cushing's syndrome
  -known diagnosis of secondary adrenal insufficiency
- Low risk of HPAA suppression – peri-operative steroids not required regularly
  -any dose of steroids for < 3 weeks
  -Prednisolone 5mg daily
  -Prednisolone 10mg alternate days.
- Intermediate risk of HPAA suppression:- history of chronic steroid therapy not in one of the above categories – needs clinical judgment based on patient's pre-operative status and the stress/type of surgery.
- High-dose steroids for immunosuppression – need continuous steroid administration peri-operatively.

CONCLUSION

Assessment of a patient undergoing surgery is very important to avoid perioperative complications and the role of a physician is very crucial here. It's a very vast topic and multiple parameters and conditions to be considered and discussing all of them is out of the scope of this review. These are some crucial and common recommendations to be considered in preoperative assessment and should be followed to decrease the morbidity and mortality of patients in significant amounts.

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