Perioperative Assessment and Management of Hypertensive and Ischemic Heart Disease Patients Undergoing Non-cardiac Surgery

Speaker

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Objectives

A. To understand the scope and magnitude of the problem of HTN & IHD
B. Preoperative evaluation & optimization of the patients
C. Preoperative Cardiac risk identification and modification
D. Smooth un eventful intraoperative period
E. Continuum of care in the post operative period

Anesthesia Management Of Hypertensive Patient

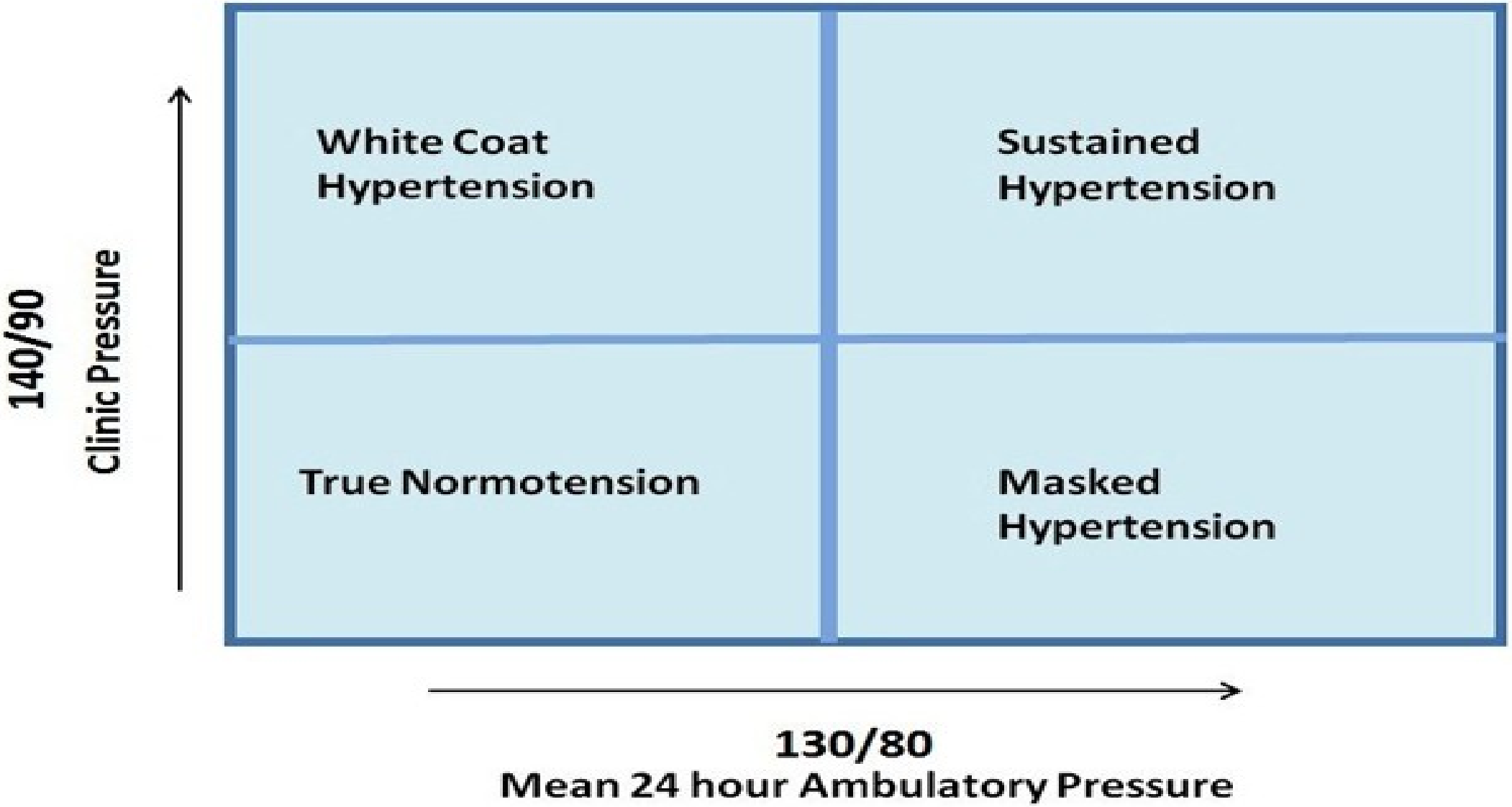
INTRODUCTION

- Hypertension is a very common medical condition world wide.
- It is important to investigate and treat persistent hypertension for a variety of reasons.
- The long term end organ effects are numerous and add significantly to patient morbidity and mortality.
- Ensuring cardiovascular stability and preoperative optimization of blood pressure allows us to manipulate physiology and pharmacology more safely during anaesthesia.

Definition Of Hypertension

Category of Blood Pressure	Systolic Pressure (mm Hg)	Diastolic Pressure (mm Hg)
Normal	<130	<85
High normal	130–139	85–89
Hypertension		
Stage 1/mild	140–159	90–99
Stage 2/moderate	160–179	100–109
Stage 3/severe	180–209	110–119
Stage 4/very severe	>210	>120

Patterns of Blood pressure



GENERAL CONSIDERATIONS

- When assessing patients for anesthesia who have elevated blood pressure, a number of questions must be answered.
  1. Is the patient known to be hypertensive on a previous occasion?
  2. Are they on antihypertensive medication?
  3. Does the patient have a treatable cause for their hypertension?
  4. Does the patient have “white coat” hypertension?
  5. Does the blood pressure control need alteration before surgery?
- Untreated, severe hypertension can lead to serious post operative complications like:
  - Myocardial ischemia and infarction,
  - Cerebral hemorrhage, infarction
  - and Renal failure.

Preoperative assessment & Investigation

- Patients with hypertension are often asymptomatic, and preoperative assessment is often the first manifestation of any potential problem
- 90% of patients have idiopathic hypertension, but any treatable causes such as endocrine tumours, renal disease and PIH should be excluded .
- Detailed history about duration of hypertension & related illnesses such as ischemic heart disease, renal failure and cerebrovascular disease.
- Assess the extent of hypertensive end organ damage.
- Initial investigations:
  1. Electrocardiography changes to look for:

     Left ventricular hypertrophy,

     Bundle branch block & evidence of ischemia or old MI such as Q waves.

  2 KFT, Na+, K+, urinalysis, lipid profile, blood sugar
- In breathless patients a chest radiograph should be performed, and if significant cardiac disease is suspected an exercise tolerance test.
- Echocardiography in selected patients to evaluate left ventricular function

Drug Treatment & Management Of Hypertension

- Drugs may be divided into those used for long term management of blood pressure, and those used for emergency reduction of hypertension.
- Drugs can act locally on the vessel wall e.g. nitrates acting to increase local nitric oxide production, increase receptor activity e.g. alpha blockers reducing constriction of vessel musculature and beta blockers reducing force of contraction of cardiac muscle.
- In long term control monotherapy will usually be started and the effect determined before starting further therapy.
- In the primary care setting, hypertension in the elderly is usually managed initially with a thiazide diuretic or beta blocker.
- ACE inhibitors are also considered in younger individuals for first line treatment.
- Subsequent anti hypertensives may be added according to initial response.

Drug Class	Agents of Choice	Comments
Diuretics	HCTZ 12.5-50mg, chlorthalidone 12.5-25mg, indapamide 1.25-2.5mg triamterene 100mg *K+ sparing* – spironolactone 25-50mg, amiloride 5-10mg, triamterene 100mg furosemide 20-80mg twice daily, torsemide 10-40mg	Monitor for hypokalemia Most SE are metabolic in nature Most effective when combined w/ ACEI Stronger clinical evidence w/chlorthalidone Spironolactone - gynecomastia and hyperkalemia Loop diuretics may be needed when GFR <40mL/min
ACEI/ARB	*ACEI:* lisinopril, benazapril, fosinopril and quinapril 10-40mg, ramipril 5-10mg, trandolapril 2-8mg *ARB*: candesartan 8-32mg, valsartan 80-320mg, losartan 50-100mg, olmesartan 20-40mg, telmisartan 20-80mg	SE: Cough (ACEI only), angioedema (more with ACEI), hyperkalemia Losartan lowers uric acid levels; candesartan may prevent migraine headaches
Beta-Blockers	metoprolol succinate 50-100mg and tartrate 50-100mg twice daily, nebivolol 5-10mg, propranolol 40-120mg twice daily, carvedilol 6.25-25mg twice daily, bisoprolol 5-10mg, labetalol 100-300mg twice daily,	Not first line agents – reserve for post-MI/CHF Cause fatigue and decreased heart rate Adversely affect glucose; mask hypoglycemic awareness
Calcium channel blockers	*Dihydropyridines*: amlodipine 5-10mg, nifedipine ER 30-90mg, *Non-dihydropyridines*: diltiazem ER 180-360 mg, verapamil 80-120mg 3 times daily or ER 240-480mg	Cause edema; dihydropyridines may be safely combined w/ B-blocker Non-dihydropyridines reduce heart rate and proteinuria
Vasodilators	hydralazine 25-100mg twice daily, minoxidil 5-10mg terazosin 1-5mg, doxazosin 1-4mg given at bedtime	Hydralazine and minoxidil may cause reflex tachycardia and fluid retention – usually require diuretic + B-blocker Alpha-blockers may cause orthostatic hypotension
Centrally-acting Agents	clonidine 0.1-0.2mg twice daily, methyldopa 250-500mg twice daily guanfacine 1-3mg	Clonidine available in weekly patch formulation for resistant hypertension

Anaesthesia Management

- Focusing on the Cardiovascular stability is important during anaesthesia and the perioperative period.
- Risk of greater swings of blood pressure than the normal population and it has been shown that blood pressure lability can be associated with increased cardiovascular morbidity and mortality postoperatively, particularly in patients with severe uncontrolled hypertension.
- Optimization of such patients with investigation and drug treatment can improve long term outcome and prevent such complications.
- Require a higher blood pressure for adequate organ perfusion than normotensive patients – this is particularly in the elderly.
- Avoidance of hypotension (and apparent normotension), may prevent complications of under-perfusion.
- Patients with uncontrolled hypertension requiring urgent surgery may benefit from regional anaesthetic techniques to avoid the risks of general anaesthesia, for example an ankle block for toe amputation.

Conduct of Anaesthesia

Induction

1. Standard NIBP monitoring with ECG SPO2, ETCO2 is mandatory for anaesthesia.
2. High risk patients undergoing major surgery should have intra-arterial BP monitoring to improve control and allow early intervention.
3. Premedication and smooth induction for blunting hypertensive response to laryngoscopy and intubation is a must.

Maintenance

1. Patients with underlying organ dysfunction need careful consideration of anesthetic agents
2. Effective opioid analgesia, regional anesthetic techniques and avoiding hypoxia, hypercarbia and light anaesthesia all aid to reduce episodes of hypertension intraoperatively.
3. Vasopressor agents and intravenous fluids may be required if hypotension results from cardiac depression.
4. Extubation should be smooth as emergence from anaesthesia may produce hypertension, and deep extubation may improve this

Recovery

1. Monitoring should include ECG, blood pressure and SpO_2.
2. Patients may develop hypertension due to pain, bladder distension or anxiety.
3. Postoperative cognitive dysfunction especially in elderly may worsen blood pressure values.
4. After reversible causes have been treated (pain, urine retention) treatment of continuing hypertension may be required.

Postoperative care

1. Patients must be followed up after anaesthesia & alternative routes of administration of drugs are considered for NPO patients.
2. Patients with severe hypertension must be closely monitored in PACU
3. High risk patients may benefit from supplementary oxygen.
4. The continuation of prevention of hypertensive triggers on the ward must also be highlighted.

Anesthesia management in patients with Ischemic heart diseases

Magnitude of the Problem

- *CAD is the most frequent cause of perioperative cardiac mortality and morbidity after noncardiac surgery*
- Worldwide >200,000,000 major noncardiac surgical procedures annually
- 1:20 suffer myocardial injury/infarction or cardiac arrest/death within 30 days
- Perioperative cardiac complications account for 1/3 of perioperative deaths

Steps of intervention

1. Evaluate patient’s current medical status
2. Preoperative cardiac risk assessment
3. Perioperative cardiac risk modification
4. Provide and communicate clinical risk profile
5. Monitoring for perioperative cardiac events
6. Management of perioperative cardiac complications

Approach to the patient

Team Work

- *Patient*
- *Primary care physician*
- *Anesthesiologist*
- *Surgeon*
- *Medical consultant*

- **Step-wise Bayesian strategy**

  Clinical markers

  Prior coronary evaluation and treatment

  Functional capacity

  Surgery-specific risk factors

Goals of History taking and clinical evaluation

1. Identification of serious cardiac disorder CAD, CHF, Arrhythmias
2. Initial history, Physical examination, ECG.
3. Define disease severity, stability, and prior treatment
4. Functional capacity assessment
5. Comorbid conditions(DM, peripheral vascular disease, renal dysfunction, copd)
6. Type and nature of surgery
   - Emergency surgery like an acute life or limb threatening condition
   - Urgent surgery. e.g., surgery for an acute bowel obstruction, hip fracture
   - Semi-urgent surgery, e.g., surgery for cancer that has potential to metastasize
   - Elective surgery
   - Consider higher risk nature of surgeries like
     - vascular procedures
     - prolonged complicated thoracic, abdominal and head and neck procedures

Broad indications of Cardiac risk assessment before noncardiac surgery

1. ≥45 years of age, or
2. 18-44 years of age with known significant cardiovascular disease
   - coronary artery disease,
   - cerebral vascular disease,
   - peripheral arterial disease,
   - congestive heart failure,
   - severe pulmonary hypertension, or
   - severe obstructive intra-cardiac abnormality
     - e.g., aortic stenosis, mitral stenosis, hypertrophic obstructive cardiomyopathy

Clinical Predictors of Increased Perioperative Cardiovascular Risk

(Myocardial Infarction, Congestive Heart Failure, Death)

Major

- Unstable coronary syndromes
- Decompensated CHF
- Significant Arrhythmias

Intermediate

- Mild angina pectoris
- Prior MI
- Compensated or prior HF
- Diabetes Mellitus (particularly taking insulin)
- Renal insufficiency

Minor

- **Advanced Age.**
- **Abnormal ECG.**
- **Rhythm other than sinus.**
- **Low functional capacity.**
- **History of stroke.**
- **Uncontrolled systemic hypertension**

Cardiac risk Stratification for Noncardiac Surgical Procedures

- **High *(reported cardiac risk often >5%)***
  - *Emergent major operations, particularly in the elderly*
  - *Aortic and other major vascular surgeries*
  - *Peripheral vascular*
  - *Anticipated prolonged surgical procedures associated with large fluid shifts and/or blood loss*
- **Intermediate *(Reported cardiac risk generally <5%)***
  - *Carotid endarterectomy*
  - *Head and neck*
  - *Intraperitoneal and intrathoracic*
  - *Orthopedic and Prostatic*
- **Low *(reported cardiac risk generally <1%)***
  - *Endoscopic procedures*
  - *Superficial procedures*
  - *Cataract*
  - *Breast*

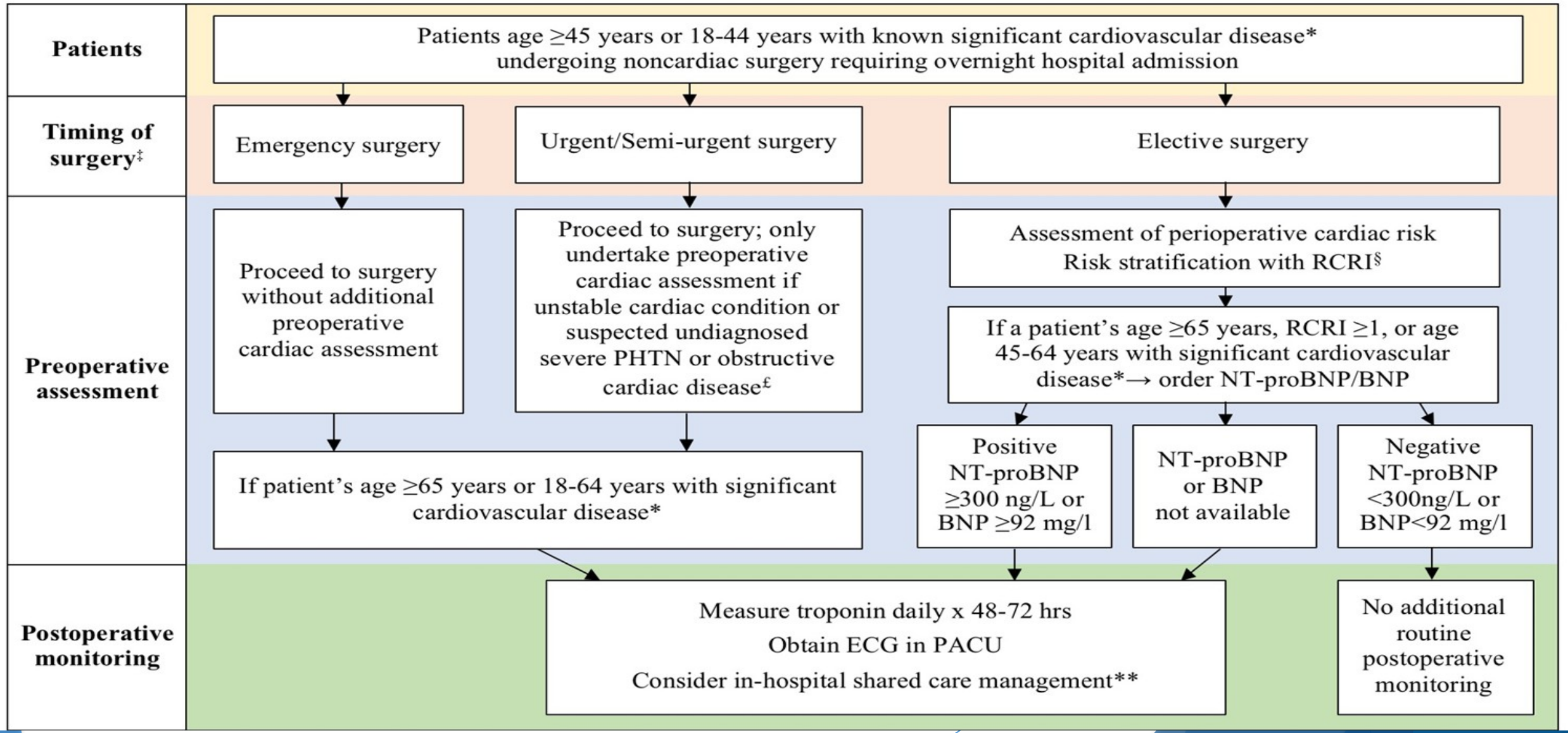
Method of Assessing Cardiac Risk

- Resting Left Ventricular Function
  - Risk of complications greatest with EF<35%.
- Exercise Stress Testing
- Pharmacological Stress Testing
- Ambulatory ECG monitoring
- Coronary Angiography
- Clinical risk indices
  - Revised Cardiac Risk Index (RCRI)

Preoperative resting echocardiography

- Routine preoperative resting echocardiography to enhance perioperative cardiac risk estimation is not recommended
- If patient requires urgent/semi-urgent or elective surgery and clinical exam suggests undiagnosed severe obstructive intra-cardiac abnormality or severe pulmonary HTN, obtain urgent echocardiography before surgery to inform anesthesiologist, surgeon, and medical team of type and degree of disease
- If clinical assessment suggests patient may have undiagnosed cardiomyopathy then echocardiogram should be obtained to facilitate optimization of perioperative outcome and long-term cardiac health

Stepwise approach to preoperative cardiac workup in a patient for non cardiac surgery



Risk Communication

- Ethical requirement to accurately apprise patients about benefits and risks of surgery
- Patients have more accurate perception of risk presented as numbers rather than subjective words (low, moderate, or high-risk), probabilities, or effect measures (e.g., RRR)
- Explicit communication of perioperative cardiac risk based on expected event rate among 100 patients or range of risk consistent with 95% confidence interval of risk estimate

Anesthetic Considerations and Intraoperative Management

1. Choice of anesthetic and intraoperative monitoring best left to discretion of anesthesia care team
2. No study clearly demonstrated improved outcome from use of:
    - Regional versus general anesthesia
    - Pulmonary artery catheter
    - Intraoperative Nitroglycerin
    - ST-Segment Monitoring
    - Transesophageal echocardiography
    - Prophylactic placement of intra-aortic balloon counter pulsation device

Recommendations: Medical Therapy

- β-blocker initiation within 24 hours before noncardiac surgery is strongly not recommended
- Among patients taking β-blocker chronically, continue β-blocker during the perioperative period
- Discontinue ASA **at least** 3 days before noncardiac surgery to reduce risk of major bleeding
- In patients with indication for chronic ASA, restart ASA when bleeding risk related to surgery has passed
- It is recommend discussing and facilitating smoking cessation before noncardiac surgery
- ACEI/ARB continuation associated with increase intraoperative hypotension
- It is recommend withholding ACEI/ARB starting 24 hours before noncardiac surgery in patients treated chronically with ACEI/ARB
- Continue statin therapy perioperatively in patients who are on chronic statin therapy

Monitoring for perioperative cardiac events

- ST-segment analysis in patients with known CAD or undergoing vascular surgery may provide increased sensitivity to detect myocardial ischemia during the perioperative period and may identify patients who would benefit from further postoperative and long-term interventions.
- Using pulmonary artery catheters in patients undergoing noncardiac surgery is not recommended
- Use of invasive blood pressure monitoring using arterial line and central venous line is recommended in high risk case and should be based on a case to case approach.
- Based on scant evidence, preoperative preparation in intensive care unit may benefit certain high risk patients, particularly those with decompensated HF.

Perioperative Arrhythmia/Conduction Disturbances

- Often due to remedial noncardiac problems:
  - Infection
  - Hypotension
  - Metabolic derangements
  - Hypoxia
- Cardioversion not recommended in patients without hemodynamic compromise until precipitating causes corrected or modified
- Electrical cardioversion for supraventricular or ventricular arrhythmias causing hemodynamic compromise

Post operative myocardial ischemia:

- Strongest predictor of perioperative cardiac morbidity.
- May go untreated until overt symptoms of cardiac failure develop.
- Diagnosis of perioperative MI has short and long-term prognostic value.
- 30% to 50% perioperative mortality and reduced long-term survival.

- Patients without evidence of CAD:
  - Surveillance restricted to those who develop perioperative signs of cardiovascular dysfunction
- Patients with known or suspected CAD, and undergoing high or intermediate risk procedure:
  - ECGs at baseline, immediately after procedure, and daily x 2 days
  - Cardiac troponin measurements 24 hours postoperatively and on day 4 or hospital discharge (whichever comes first)

Management of perioperative cardiac complications & follow up

- Treatment of Perioperative MI
  - ACC/AHA guidelines for ACS and AMI, with consideration of post-op conditions
  - Coronary reperfusion for ST elevation MI
  - Treat risk factors for secondary prevention
  - Initiation of long-term ASA and statin in patients who suffer myocardial injury or infarction after noncardiac surgery is recommend
- Assessment and management of future risk factors for:
  - CAD
  - Heart failure
  - Hypertension
  - Stroke
  - Peripheral vascular disease
  - Other cardiovascular disease

Summary & Conclusions

- Perioperative evaluation and management results from good communication between surgeon, anesthesiologist, primary care physician, and consultant
- Further cardiac testing and treatments same as in nonoperative setting, considering:
  - The urgency of the noncardiac surgery
  - Patient-specific risk factors
  - Surgery-specific considerations
- Use Preoperative Tests When:
  - Clinical assessment suggests intermediate risk and surgical risk not low
  - Surgical risk is high
  - Results will affect patient management
  - Postoperative period is the most vulnerable and needs care vigilance and multi disciplinary management

TAKE HOME MESSAGE

- Balanced anesthesia technique and multi model approach to minimize physiological disturbance in cardiovascular system keeping values as close to pre anesthesia levels as possible.
- Formulation of national clinical practice guidelines regarding anesthesia management of HTN & IHD
- Optimize the patient preoperatively for elective surgery for smooth & stress free peri operative period

ASA Status	Definition	Examples
ASA I	A normal healthy patient	Healthy, non-smoking, **Normotensive** or **Pre-hypertensive** patient
ASA II	A patient with mild systemic disease without substantive functional limitations	**Well-controlled Hypertension**, Current smoker, social alcohol drinker,
ASA III	A patient with severe systemic disease with Substantive functional limitations; One or more moderate to severe diseases.	**Poorly controlled Hypertension** or DM, COPD, morbid obesity (BMI ≥40), ESRD undergoing regularly scheduled dialysis,
ASA IV	A patient with severe systemic disease that is a constant threat to life	**Hypertension** with (< 3 months) MI, CVA, TIA, or CAD/stents, ongoing cardiac ischemia or severe valve dysfunction, ESRD not undergoing regularly scheduled dialysis
ASA V	A moribund patient who is not expected to survive without the operation	**Hypertensive emergency** with ruptured abdominal/thoracic aneurysm, massive trauma, intracranial bleed with mass effect, ischemic bowel in the face of significant cardiac pathology or multiple organ/system dysfunction
ASA VI	A declared brain-dead patient whose organs are being removed	**Hypertensive patient** with neuro-trauma declared brain-dead and taken for organ donation

Just a note to say...

