



# Perioperative management of cardiac patients undergoing non- cardiac surgery

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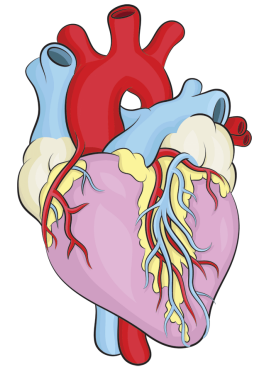
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# Topics



- How to determine the cardiac patient
- Preoperative tests for cardiac patients
- Anesthetic management of cardiac patient
- Management of intraoperative myocardial ischemia





**Perioperative myocardial infarction** is the most feared complication and it has the highest mortality rate.





# Risk Calculation For Perioperative Cardiac Morbidity

(MACE Major Adverse Cardiac Events)



- A validated risk-prediction tool can be useful in predicting the risk of perioperative MACE in patients undergoing noncardiac surgery (Level of Evidence B)
- For patients with a low risk of perioperative MACE, further testing is not recommended before the planned operation (Kanıt B)



# Risk evaluation tools

## ■ Lee Revised Cardiac Risk Index (RCRI)

Type of procedure	1
Ischemic heart disease	1
Heart failure	1
Cerebrovascular disease	1
Insulin dependent DM	1
Perioperative serum creatinine >2.0 mg/dL	1

## ■ ACS NSQIP: American College of Surgeons National Surgical Quality Improvement Program Surgical Risk Calculator

## ■ ACS NSQIP MICA: American College of Surgeons National Surgical Quality Improvement Program Myocardial Infarction or Cardiac Arrest



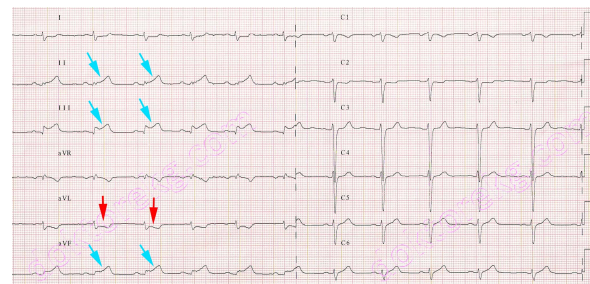
# Clinical Risk Factors

- Coronary artery disease (recent MI occurred within 6 months, age, cerebrovascular disease, percutaneous coronary interventions)
- Preoperative high troponin I levels
- Heart failure
- Cardiomyopathy
- Valvular heart disease
- Arrhythmias and conduction disorders
- Pulmonary vascular disease
- Adult congenital heart disease





# Myocardial Ischemia



- Patient's symptoms (chest, mandibula, upper extremity pain)
- Tachycardia, haemodynamic instability, evidence of pulmonary congestion
- ECG criteria:
  - At least 2 contiguous lead;
    - at least 1 mm elevation at the J point
    - or
    - at least 0.5 mm ST depression and/or T wave inversion of at least 1 mm

# Myocardial Infarction

At least 1 presentation of the followings with elevation of cardiac biomarker levels (troponin I)

- Ischemia
- New ST-segment T wave changes or new left bundle branch block
- New pathological Q waves
- Imaging evidence of new regional wall motion abnormality
- Identification of an intracoronary thrombus by angiography or autopsy



# PERIOPERATIVE CARDIAC TESTING

- **Exercise Capacity and Functional Capacity**
  - Patients with reduced functional status preoperatively are at increased risk of complications.
  - In highly functional asymptomatic patients, it is often appropriate to proceed with planned surgery without further cardiovascular testing.







- Metabolic Equivalent (MET)
- Duke Activity Status Index
- Specific Activity Scale

# Duke Activity Status Index

Activity	Weight
<b>Can you</b>	
1. take care of yourself, that is, eating, dressing, bathing, or using the toilet?	2.75
2. walk indoors, such as around your house?	1.75
3. walk a block or 2 on level ground?	2.75
4. climb a flight of stairs or walk up a hill?	5.50
5. run a short distance?	8.00
6. do light work around the house like dusting or washing dishes?	2.70
7. do moderate work around the house like vacuuming, sweeping floors, or carrying in groceries?	3.50
8. do heavy work around the house like scrubbing floors or lifting or moving heavy furniture?	8.00
9. do yardwork like raking leaves, weeding, or pushing a power mower?	4.50
10. have sexual relations?	5.25
11. participate in moderate recreational activities like golf, bowling, dancing, doubles tennis, or throwing a baseball or football?	6.00
12. participate in strenuous sports like swimming, singles tennis, football, basketball, or skiing?	7.50



# SUPPLEMENTAL PREOPERATIVE EVALUATION-1

## ECG

- Preoperative resting 12-lead electrocardiogram (ECG) is reasonable for patients with known coronary heart disease, significant arrhythmia, peripheral arterial disease, cerebrovascular disease, or other significant structural heart disease, except for those undergoing low-risk surgery (Level of Evidence B)
- Routine preoperative resting 12-lead ECG is not useful for asymptomatic patients undergoing low-risk surgical procedures (Level of Evidence B)
- The implications of abnormalities on the preoperative 12-lead ECG, increase with patient age and with risk factors for coronary heart disease the optimal time interval between obtaining a 12-lead ECG and elective surgery is unknown.
- General consensus suggests that an interval of 1 to 3 months is adequate for stable patients.





# SUPPLEMENTAL PREOPERATIVE EVALUATION-2

## Assessment of LV function

- It is reasonable for patients with dyspnea of unknown origin to undergo preoperative evaluation of LV function (Level of Evidence C)
- Reassessment of LV function in clinically stable patients may be considered if there has been no assessment within a year. (Level of Evidence C)
- Routine preoperative evaluation of LV function is not recommended (Level of Evidence B)



# SUPPLEMENTAL PREOPERATIVE EVALUATION-3

## Exercise Stress Testing

- For patients with elevated risk and excellent ( $>10$  METs) functional capacity, it is reasonable to forgo further exercise testing with cardiac imaging and proceed to surgery (Level of Evidence B).
- For patients with elevated risk and poor ( $<4$  METs) or unknown functional capacity, it may be reasonable to perform exercise testing with cardiac imaging to assess for myocardial ischemia if it will change management (Level of Evidence C).
- Routine screening with noninvasive stress testing is not useful for patients at low risk for noncardiac surgery (Level of Evidence B).



# SUPPLEMENTAL PREOPERATIVE EVALUATION-4

- It is reasonable for patients who are at an elevated risk for noncardiac surgery and have poor functional capacity(<4 METs) to undergo noninvasive pharmacological stress testing (either dobutamine stress echocardiogram [DSE] or pharmacological stress MPI) if it will change management (Level of Evidence B).
- Routine screening with noninvasive stress testing is not useful for patients undergoing low-risk noncardiac surgery (Level of Evidence B).





# SUPPLEMENTAL PREOPERATIVE EVALUATION-5

- Routine preoperative coronary angiography is not recommended. (Level of Evidence C)



Patient scheduled for surgery with known or risk factors for CAD\* (Step 1)

Emergency

Yes

Clinical risk stratification and proceed to surgery

No

ACS† (Step 2)

Yes

Evaluate and treat according to GDMT†

No

Estimated perioperative risk of MACE based on combined clinical/surgical risk (Step 3)

Low risk (<1%) (Step 4)

Elevated risk (Step 5)

No further testing (Class III:NB)

Proceed to surgery

Moderate or greater (≥4 METs) functional capacity

Excellent (>10 METs)

No further testing (Class IIa)

Moderate/Good (≥4–10 METs)

No further testing (Class IIb)

Proceed to surgery

No or unknown

Poor OR unknown functional capacity (<4 METs): Will further testing impact decision making OR perioperative care? (Step 6)

Yes

Pharmacologic stress testing (Class IIa)

If normal

If abnormal

Coronary revascularization according to existing CPGs (Class I)

No

Proceed to surgery according to GDMT OR alternate strategies (noninvasive treatment, palliation) (Step 7)

\*See Sections 2.2, 2.4, and 2.5 in the full-text CPG for recommendations for patients with symptomatic HF, VHD, or arrhythmias.

†See UA/NSTEMI and STEMI CPGs (Table 2).



# Timing of Elective Noncardiac Surgery in Patients With Previous PCI

- Revascularization before noncardiac surgery is recommended in circumstances in which revascularization is indicated. (Level of Evidence C)

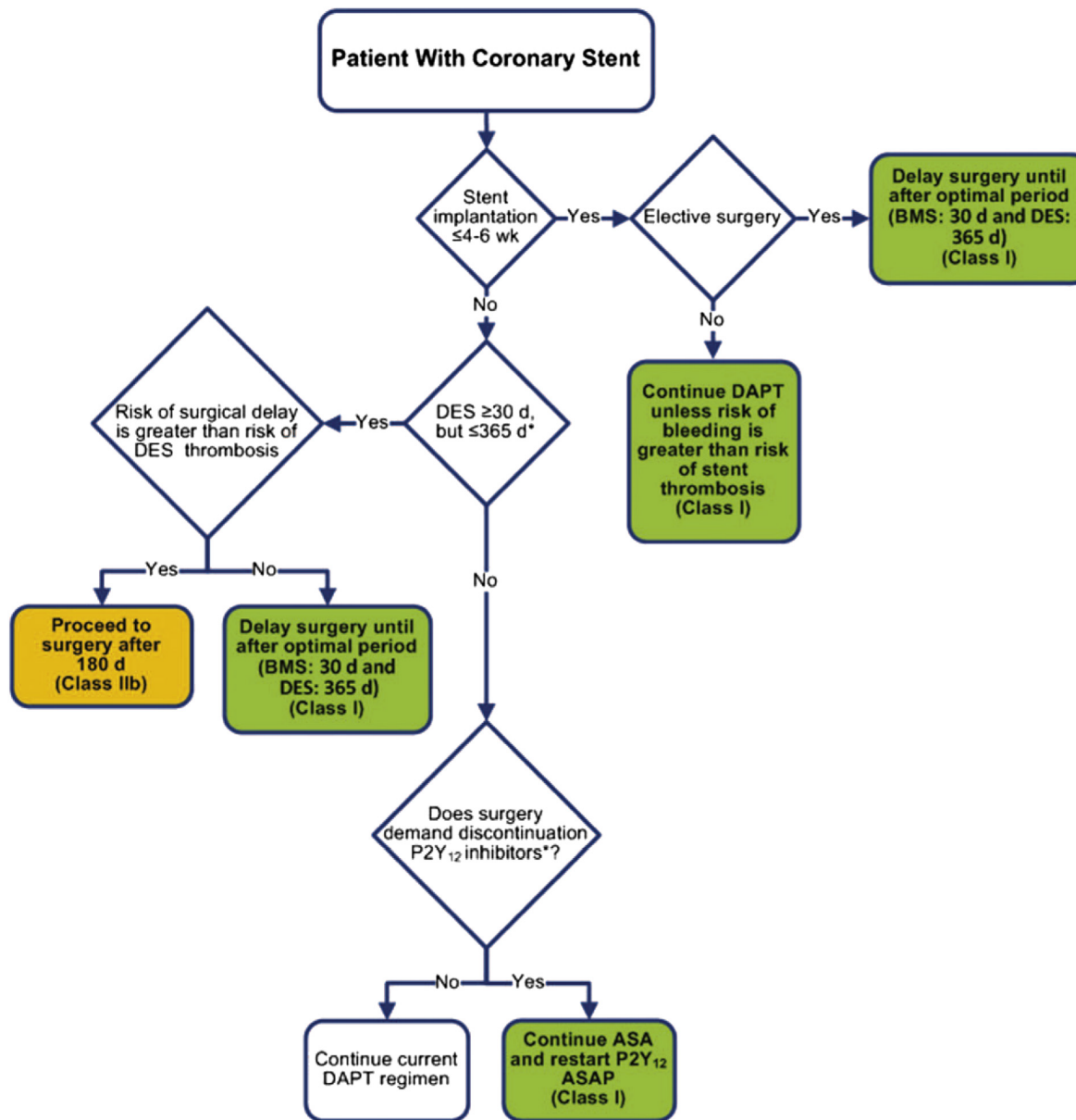
Delay times;

- Balloon angioplasty: 14 days
- Bare Metal Stent: 30 days
- Drug Eluting Stent: 365 days
- In patients in whom noncardiac surgery is required, a consensus decision among treating clinicians as to the relative risks of surgery and discontinuation or continuation of antiplatelet therapy can be useful. (Level of Evidence C)



- Elective noncardiac surgery should not be performed within 30 days after BMS implantation or within 12 months after DES implantation in patients in whom dual antiplatelet therapy (DAPT) will need to be discontinued perioperatively. (Level of Evidence B)
- Initiation or continuation of aspirin is not beneficial in patients undergoing elective noncardiac noncarotid surgery who have not had previous coronary stenting. (Level of Evidence B)





# Perioperative beta-blocker therapy



- Continue beta-blockers in patients who are on beta-blockers chronically
- In patients with intermediate- or high-risk preoperative tests or  $\geq 3$  RCRI factors it may be reasonable to begin beta blockers
- Beta-blocker therapy should not be started on the day of surgery






# Perioperative statin therapy

- Continue statins in patients currently taking statins
- Perioperative initiation of statin use is reasonable in patients undergoing vascular surgery at least 2 weeks before the surgery



- Alpha-2 agonists are not recommended for prevention of cardiac events
- Continuation of ACE inhibitors or ARBs is reasonable perioperatively
- If ACE inhibitors or ARBs are held before surgery, it is reasonable to restart as soon as clinically feasible postoperatively





Patients with ICDs should be on a cardiac monitor continuously during the entire period of inactivation, and external defibrillation equipment should be available. Ensure that ICDs are reprogrammed to active therapy. (Level of Evidence C)



# Intraoperative Monitoring

- Precordial leads should be added to the standard 3-lead ECG
- V5 (%75) and V4 (%61) are most sensitive

V5+V4                      %90

DII+V5                      %80

DII+V5+V4              %96



- Automated ST-segment analysis can alert the anesthesiologist, while not as good at detecting ischaemia!!!

- Emergency use of perioperative TEE in patients with hemodynamic instability is reasonable in patients undergoing noncardiac surgery if expertise is readily available. (Level of Evidence C)
- Routine use of intraoperative TEE during noncardiac surgery is not recommended. (Level of Evidence C)



- Routine use of pulmonary artery catheterization in patients, even those with elevated risk, is not recommended. (Level of Evidence A)
- The use of pulmonary artery catheterization may be considered when underlying medical conditions that significantly affect hemodynamics (i.e., HF, severe valvular disease, combined shock states) cannot be corrected before surgery. (Level of Evidence C)





# Neuraxial Versus General Anesthesia

In patients who are eligible for an intraoperative neuraxial anesthetic, there is no evidence to suggest a cardioprotective benefit from the use or addition of neuraxial anesthesia for intraoperative anesthetic management!!!





# Volatile anesthetic versus TIVA

Use of either a volatile anesthetic agent or total intravenous anesthesia is reasonable for patients undergoing noncardiac surgery, and the choice is determined by factors other than the prevention of myocardial ischemia and MI (Evidence level A)

# **Monitored anesthesia care versus general anesthesia**

There are no randomized controlled trials to suggest a preference for monitored anesthesia care over general anesthesia for reducing myocardial ischemia and MI.



# Perioperative Anemia Management

- Anemia can contribute to myocardial ischemia
- There were no specific recommendations for hemodynamically stable patients with acute coronary syndrome because of the lack of high-quality evidence for either a liberal or a restrictive transfusion strategy in these patients.



# Physiological Goals

## Increasing the oxygen supply of myocardium

- Low/Normal heart rate (increasing diastolic time)
- High coronary blood flow
- High oxygen content of blood ( $\text{SaO}_2$  ve Hb)
- Normal/high aortic pressure
- Reduced coronary vascular resistance
- Low left ventricular end diastolic pressure

## Decreasing the oxygen demand of myocardium

- Low/Normal heart rate
- Low myocardial wall tension or afterload
- Avoid increased myocardial contractility



# Management of Perioperative Myocardial Infarction

- Obtaining an ECG is recommended in the setting of signs or symptoms suggestive of myocardial ischemia, MI, or arrhythmia. (Level of Evidence B)
- Measurement of troponin levels is recommended in the setting of signs or symptoms suggestive of myocardial ischemia or MI. (Level of Evidence A)
- The usefulness of postoperative screening with troponin levels in patients at high risk for perioperative MI, but without signs or symptoms suggestive of myocardial ischemia or MI, is uncertain in the absence of established risks and benefits of a defined management strategy. (Level of Evidence B)
- Routine postoperative screening with troponin levels in unselected patients without signs or symptoms suggestive of myocardial ischemia or MI is not useful for guiding perioperative management. (Level of Evidence B)



# What Should We Do?

## Confirm diagnosis

- Obtain 12 lead ECG
- Consider transoesophageal echocardiogram if haemodynamic instability is detected.
- Obtain baseline and 4-hour troponin levels.



# Optimise Myocardial Oxygen Supply and Demand Balance

- Pause surgery
- Achieve physiological goals:
  - Low/Normal heart rate
  - Normal blood pressure
  - Normal oxygen saturations with the least  $\text{FiO}_2$
  - Avoid hypothermia
  - Avoid excessive fluid
- Administer beta-blockers
- Consider giving aspirin via nasogastric tube
- Consider infusion of Gliseril trinitrat

\* Prophylactic intravenous nitroglycerin is not effective in reducing myocardial ischemia in patients undergoing noncardiac surgery (Evidence B).

- Consider intra-aortic balloon pump
- Consultate with a cardiologist for percutaneous coronary intervention





# Postoperative Considerations

- Consider intensive care unit
- Obtain serial ECG ve troponin levels
- Ensure cardiology follow up
- Pain management
- Achieve normovolaemia
- Prevent tachycardia (additional beta-blockers)
- Maintain normal oxygen saturation
- Consider aspirin ve antiplatelet therapy as guided by the cardiologist





# Thanks For Your Attention...



