



What Surgeons Need to Know About Preoperative Cardiovascular Evaluation for Non-Cardiac Surgery

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Abstract

Perioperative major cardiovascular events can occur in patients undergoing non-cardiac surgery. Preoperative cardiovascular evaluation is performed in order to risk stratify these patients and help minimize potential non-surgical complications. The aim of this article is to summarize the American College of Cardiology and American heart association guidelines for preoperative cardiac evaluation of patients undergoing non-cardiac surgery in a simplified stepwise approach.

Introduction

Perioperative mortality and morbidity due to coronary artery disease (CAD) are known complications of non-cardiac surgery [1]. Therefore, cardiovascular evaluation is frequently performed and non-cardiac surgeons need to be part of this evaluation. Stratifying patients to low, intermediate and high risk profiles allow better planning and management of the proposed surgery and will help minimize unforeseen complications. When Cardiologists or internists get consulted to do a preoperative cardiovascular evaluation, the 5 following points are addressed.

Procedure Urgency

There are four procedure types according to urgency. An emergency procedure is one in which life or limb is threatened if not in the operating room, where there is time for no or very limited clinical evaluation, typically within <6 h. An urgent procedure is one in which there may be time for a limited clinical evaluation, usually when life or limb is threatened if not in the operating room, typically between 6 and 24 h. A time-sensitive procedure is one in which a delay of >1 to 6 weeks to allow for an evaluation and significant changes in management will negatively affect outcome. An elective procedure is one in which the procedure could be delayed for up to 1 year [1].

Procedure Risk

High risk procedure >5% risk and includes; emergent, aortic, peripheral vascular, anticipated prolonged surgical time associated with large fluid shifts. Intermediate risk 1-5% risk and includes carotid end arterectomy, head and neck surgery, intra peritoneal or intra thoracic, orthopedic, and prostate. Low risk <1% risk and includes; endoscopic, superficial, cataract, and breast surgery [1]. It is important to note that open abdominal aortic aneurysm surgery is high risk but, endovascular abdominal aortic aneurysm repair is not high risk.

Patient Risk

Patient risk factors include; CAD, heart failure, cardiomyopathy, valvular heart disease, arrhythmias, pulmonary vascular disease, and adult congenital heart disease. It is important to include clinical predictors of increased perioperative risk;

Major risk

Unstable angina or myocardial infarctions within past 30 days decompensate congestive heart failure, significant arrhythmias, and severe valvular disease.

Intermediate risk

Mild angina (class I/II), prior myocardial infarction, compensated congestive heart failure, diabetes and chronic kidney disease.

Minor risk

Age, abnormal ECG, rhythm other than sinus, decrease in functional status, history of cerebrovascular accident and uncontrolled hypertension.

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Calculation of Risk

There are 3 validated risk-prediction tools that can be useful in predicting the risk of perioperative major cardiovascular events in patients undergoing non-cardiac surgery. Many cardiologists prefer Gupta perioperative risk calculator due to its simplicity [2].

- American College of Surgeons National Surgical Quality Improvement Program Myocardial Infarction Cardiac Arrest (NSQIP MICA). Known as Gupta Perioperative risk calculator [2].
- Revised Cardiac Risk Index (RCRI) [3].
- American College of Surgeons Surgical Risk Calculator National Surgical Quality Improvement Program (NSQIP) [4].

Preoperative Cardiac Testing

It is important to assess functional capacity either by questioning the patient or by performing exercise stress testing.

Exercise and functional capacity

Functional status is a reliable predictor of perioperative and long-term cardiac events. If a patient has not had a recent exercise test before non-cardiac surgery, functional status can usually be estimated from activities of daily living [5]. Functional capacity is often expressed in terms of metabolic equivalents (METs), where 1 MET is the resting or basal oxygen consumption of a 40 year-old, 70-kg male. Functional capacity is classified as excellent (>10 METs), good (7 METs to 10 METs), moderate (4 METs to 6 METs), poor (<4 METs), or unknown. Patients unable to perform 4 METs of work during daily activities are at a higher perioperative cardiac risk. Examples of activities with <4 METs are golfing with a cart, slow ballroom dancing, playing a musical instrument, and walking at approximately 2 mph to 3 mph. Examples of activities with >4 METs are climbing one flight of stairs or walking up a hill, walking on level ground at 4 mph, and performing heavy work around the house. The DASI (Duke Activity Status Index) is another method to assess functional status [6].

Stepwise approach to perioperative cardiac assessment

The American College of Cardiology and American heart association endorses the following treatment algorithm [1];

- Step 1: Patient scheduled for surgery with known risk factors for CAD. Is the surgery Emergency? If yes then perform clinical risk stratification and proceed with surgery without delay. If no then proceed to step 2.
- Step 2: Does the patient have acute coronary syndrome (ACS)? If yes then evaluate and treat according to guidelines directed medical treatment and perform surgery when patient is stable from an ACS point of view. If no then proceed to step 3.
- Step 3: Estimate perioperative risk of major cardiovascular events based on combined clinical and surgical risk calculators mentioned before then proceeds to step 4.
- Step 4: If low risk surgery <1% then no further cardiac testing (class III to perform testing). Proceed with surgery.
- Step 5: If intermediate (1-5%) or high risk (>5%) surgery then assesses functional capacity. If ≥ 4 METs then proceed with surgery without further cardiac testing. If <4 METs or functional

capacity is unknown or cannot be determined proceed to step 6.

- Step 6: Will further testing impact decision making or perioperative care? If yes then perform pharmacological stress testing (class IIa). If the stress test is normal then proceed with surgery. If abnormal then postpone the surgery and proceed with coronary revascularization (class I). If further testing will not impact decision making or perioperative care proceed to step 7.
- Step 7: Proceed with surgery according to guideline directed medical treatment or consider alternative strategies such as non-invasive treatment or palliation [1].

It is important to individualize patient evaluation. For example, not every positive stress test needs further risk stratification with coronary angiography. Stable asymptomatic patients with low and intermediate risk positive stress testing, may proceed with their planned surgery without further testing. This is due to the fact that there is no evidence in such patients that coronary intervention before non-cardiac surgery will improve their outcome and that Antiplatelet interruption can lead to major cardiovascular events in the perioperative period. Moreover, if the patient had coronary revascularization in past 5 years and has no change in symptoms, the patient can proceed to surgery without further testing. Also, if the patient has history of CAD with a normal stress test in past 2 years without new symptoms, the patient can proceed to surgery without further testing.

Conclusion

Preoperative cardiovascular before non-cardiac surgery can be simple and clear if the above 7 step algorithm is followed. Preoperative evaluation should be individualized according to patient risk profile and should be a team approach that includes the patients' cardiologist, internist, anesthetist and surgeon performing the non-cardiac surgery. This team approach will minimize patient risk of complications.

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