Perioperative Cardiovscular Risk Assessment and Management for Noncardiac Surgery

An estimated 17.2 million surgeries are performed each year in the United States. Perioperative major adverse cardiovascular and cerebrovascular events (MACCE) occur in 3% of hospitalizations for noncardiac surgery. That percentage is based on an analysis

of more than 10 million patients from the National Inpatient Sample.**(Ref.1)** However, that is an overall estimate, with specific surgeries associated with greater or lesser risk (**Table**).

Level of Risk for Major Adverse Cardiovascular Events or Death Based on Surgery Type

<1% Risk	≥1% Risk	≥3% Risk	≥5% Risk
Cataract	Orthopedic	General abdominal or intraperitoneal	Suprainguinal and peripheral vascular
Cosmetic or plastic	Otolaryngology	Neurosurgery	Thoracic
	Genitourinary		Transplantation

In general, the more complicated, time-consuming (with more fluid shifts), or delicate the surgery, the greater the cardiac risk.

While it might be encouraging to think of surgical risk today being less than it has been in the past, that is not necessarily accurate. While there have been reductions in recent years in the rates of death and acute myocardial

infarction among patients undergoing major noncardiac surgery, perioperative risk for ischemic stroke has increased over time.**(Ref.1)**

Thus, additional efforts are necessary to improve CV care in the perioperative period of patients undergoing noncardiac surgery.

Using the same huge pool of patients hospitalized for major noncardiac

surgery, Jeffrey Berger, MD, and colleagues specifically looked at the influence of diabetes mellitus on perioperative CV deaths.**(Ref.2)** Over the time period studied, January 2004 to December 2013, DM was present in ≈23% of surgeries and increased over time (p for trend < 0.001).

Patients with DM experienced a MACCE rate of 3.3%, compared with 2.8%

among patients without DM ($p < 0.001$). After multivariable adjustment, the risk got worse over time, with the odds of perioperative MACCEs increasing by 6% for DM patients compared to an 8% *decrease* for patients without DM (p for interaction < 0.001). Trends for individual endpoints were all less favorable for patients with DM compared to those without DM.

Recently, Dr. Berger and Smilowitz, MD, reviewed the evidence regarding risk assessment, testing, and optimal medical therapy to reduce perioperative CV risk before noncardiac surgery.**(Ref.3)** It is an important topic, given that across the last 10 years, patients undergoing noncardiac surgery are an older and sicker population.

It is justified to pointed it out that Because the field is evolving as rapidly as it is, it is really nice to go back and remind everyone where we are today, what do we know, and what's still left for us to figure out over the next few years.

Estimating Perioperative Risk

The incidence of perioperative cardiovascular events is related to the risk for CV events in the individual patient before surgery. Evaluating perioperative risk therefore begins with a focused history and CV physical examination.

History should identify cardiovascular conditions associated with perioperative

MACCE, such as any ischemic heart disease, prior percutaneous coronary intervention, stenting, heart failure, arrhythmias, valvular heart disease, and systemic or pulmonary hypertension. Two big risk factors: chronic kidney disease and diabetes. Fully one-quarter of patents undergoing noncardiac surgery have established CV disease.

Also, consider acute contraindications to noncardiac surgery: acute coronary syndrome, acute decompensated heart failure, tachyarrhythmias or bradyarrhythmias associated with hypotension or requiring urgent medical attention (e.g., ventricular tachycardia or high-grade atrioventricular block), or symptomatic, severe aortic stenosis (mean gradient >40 mm Hg or peak

velocity >4 m/s). In these cases, it may be necessary to delay surgery.

Patients should be asked whether they can perform workloads of ≥4 METs without symptomatic limitation. Such activities include walking up a hill or climbing two or more flights of stairs, riding a bicycle (<10 mph), and doing yard work or gardening, each of which has a 4 METs score. Note: 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.

There are good tools for estimating risk. The 6-component Revised Cardiac Risk Index is relatively simple to use; the 21-component National Surgical Quality Improvement Program universal surgical risk calculator is more complex but may

provide better predictive discrimination. Either approach helps better categorize patients as low, moderate, or high risk for noncardiac surgery.

Routine stress testing is not a good strategy. It is not indicated for low-risk patients or for high-risk patients who are able to walk up a hill or climb up two or more flights of stairs without difficulty. Cardiac stress testing may be considered

for patients with unknown or poor functional capacity who may have high CV risk.

Otherwise, it is easier – and cheaper – to ask the simple question: Are you able to walk up two flights of stairs? If yes, patients can probably proceed to surgery even if they are high risk. The ability to perform at a level of 4 METs

or more is a “great determinant” of how patients will do undergoing surgery.

Put another way, functional testing might be appropriate in patients with poor daily functional capacity (<4 METs) undergoing high-risk surgery, but only if test results would change therapy independent of the planned surgery.

Actively Reducing Risk

Given that established coronary artery disease is already present in a quarter or more of surgical patients, what about active therapy or interventions to reduce risks of noncardiac surgery?

Revascularization before surgery did not improve perioperative outcomes in a randomized trial.**(Ref.4)** Overall, stress testing should be considered only if the

results would change perioperative medical, anesthesia, or surgical approaches.

Specific medical therapies have been evaluated, but without much success. For example, despite observational data suggesting an association of perioperative use of beta-blockers with improved outcomes in high-risk patients, randomized clinical trial results do not

support perioperative prescription of beta-blockers.

Routine preoperative aspirin did not reduce poor outcomes in placebo-controlled trials, but aspirin did significantly increase the rate of major bleeding. What about other antithrombotic or anticoagulant therapy? For patients taking warfarin or a direct oral anticoagulant for prevention of

stroke in atrial fibrillation, perioperative interruption of oral anticoagulation is safe. Bridging with heparin should not be routinely performed.

Who should be considered for bridging?

Patients with mechanical mitral valves and those at increased risk for thrombotic events with mechanical aortic valves should receive bridging

anticoagulation with heparin before noncardiac surgery.

Observational data and small randomized trials suggest that statin use may be associated with lower perioperative CV risk. Current data certainly do not constitute solid level 1 evidence supporting statin therapy to reduce perioperative risk. Having said that so many patients would benefit from

statin therapy overall that putting these patients on statin therapy, in general, would be a good idea *regardless* of whether it will specifically lower perioperative CV risk.

If the patient has already been on beta blocker it could be continued out to the time of surgery, but if needed in high risk patients beta blockers should be

administered at least one to two weeks before the scheduled time of surgery.

The situation is similar regarding the high level of safety of prescribing angiotensin-converting enzyme inhibitors or angiotensin receptor blockers on the day of surgery; as of this moment, whether it is a beneficial approach remains unclear.

The mechanism of MI in a substantial number of these cases is supply demand miss match (type 2 MI) as compared with the plaque rupture (type 1 MI). So the outcome to some extent depends on the experience of anesthesiologist in preventing type 2MI to occur during operation.

Take-home Messages:

- Comprehensive history, physical examination, and a general assessment of functional capacity during daily life should be performed before noncardiac surgery to assess cardiovascular (CV) risk.
- It is important to understand the risk of a specific surgery as well as risk specific to an individual patient.

- Cardiovascular testing is rarely indicated in patients with a low risk of major adverse CV events, and it is often not necessary in patients at high surgical risk based on functional assessment of daily living. Functional testing may be appropriate in patients with poor functional capacity (<4 metabolic equivalent tasks, or METs)

undergoing high-risk surgery *if* test results would change therapy independent of the planned surgery.

References:

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