

Reducing CV Risk In Non-cardiac Surgery

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Many patients who undergo non-cardiac surgery are at high-risk for a possible cardiovascular (CV) complication. Of the estimated 27 million patients expected to have a surgery, approximately 50,000 patients will have a perioperative myocardial infarction (MI), and another one million will have a cardiac complication.¹ Many remember the “Avoid hypotension” recommendation that appeared at the end of a pre-op consultation note. This not-so-helpful advice reflected the state of the art of perioperative cardiac risk reduction at that time. The era in which physicians can only guess at how to reduce risk seems to be ending. This *Heartbeat* will present data to help identify which patients are at intermediate or high-risk, and outline various strategies to minimize risk.

Risk Identification

An **evaluation before non-cardiac surgery may represent the first opportunity to initiate proper cardiac care.** Clinical markers identified during a preoperative history and physical, and review of chest x-ray, labs and electrocardiogram are extremely useful in estimating both preoperative and long-term CV risk (Table 1).

Table 1. Markers for High Cardiac Risk

Known ischemic heart disease (IHD)
Congestive heart failure (HF)
Higher-risk surgery
Diabetes Mellitus (DM)
Renal insufficiency
Poor functional status

Accordingly, for patients with clear evidence of CV disease or risk factors, appropriate evidence-based therapy with beta-blockers, ACE inhibitors, statins and daily use of aspirin, if not contraindicated, should be implemented. An effective, smoking intervention

program, applied 6-8 weeks before surgery, can half the frequency of perioperative complications (mostly wound-related and CV).² Patients with no cardiac markers are generally at very low risk and need no further evaluation or therapy. Obviously, patients who are unstable (e.g. those with unstable angina, recent MI or signs or symptoms of HF) should have their elective surgery delayed until their condition is stabilized.

The effect of these markers is additive, and therefore the likelihood of severe underlying coronary heart disease (CHD) and risk is much higher in those with several or all of the markers identified, especially in the elderly. In patients with known disease—more than one marker (Table 1)—and those with suspected CHD, with one or more coronary risk factors for CHD (hypertension, hypercholesterolemia, family history, tobacco dependence or inactivity) and a history suspicious for the presence of CHD, diagnosis and risk stratification can be aided by non-invasive tests for myocardial ischemia. Diabetics are all high-risk and probably should be studied because many have asymptomatic disease. Appropriate therapy for all risk factors should be started if not already in place.

Non-invasive Testing

The most commonly used tests are exercise (electrocardiography-ECG) treadmill testing—ETT by itself or in conjunction with cardiac imaging (nuclear myocardial perfusion imaging—MPI or stress echocardiography). Selection of what test for which patient depends on baseline ECG, consideration of sensitivity and specificity (Table 2), cost, preference and the patient’s ability to walk. No single test or strategy has been proven superior. Imaging is definitely appropriate for patients with uninterpretable baseline electrocardiograms, i.e. those with LVH, LBBB, pacemaker rhythms, pre-excitation syndromes or baseline non-specific changes.

Table 2. Sensitivity and Specificity of Noninvasive Tests For the Detection of Coronary Artery Disease^{3 4}

Diagnostic Test	Sensitivity (Range)	Specificity (Range)
ETT	68%	78%
SPECT-MPI	88% (73-98)	77% (53-96)
Stress Echo	76% (40-100)	88% (80-95)

In patients with prior events, MI or intervention, ETT MPI is preferred. In those who can't exercise, a pharmacologic agent is the most effective way to provoke ischemia. Medications that blunt or alter the hemodynamic response to exercise should be held for 48 hours preceding the test for best results, even though testing will still be positive in those with the highest risk.

In addition to the ECG and the imaging response to exercise, the patient's clinical response, functional capacity and hemodynamic response (BP and HR) to exercise cannot be over emphasized in assessment of risk. Patients with excellent functional capacity in daily life or on pre-operative ETT have very low rates of perioperative cardiac complications.⁵

Therapies and Interventions

Coronary visualization and appropriate coronary revascularization (percutaneous coronary intervention—PCI or coronary artery bypass surgery—CABG) before non-cardiac surgery should be reserved for patients with unstable myocardial ischemic syndromes or those patients who have been identified as high-risk with non-invasive testing for ischemia. There is no conclusive data showing that coronary intervention reduces risk or complications among patients undergoing elective non-cardiac surgery. **Coronary intervention should be reserved for patients in whom it would be considered appropriate for their long-term care independently of the need for non-cardiac surgery.**

On the other hand, it is thought that beta- blockers, by slowing HR, decreasing BP, and moderating hemodynamic stress responses, reduce complications and the incidence of perioperative ischemia.^{6 7} Beta-blockers are beneficial because they have been shown

to significantly decrease cardiac events in a high-risk population.⁸ On the basis of available evidence, and in the absence of major contraindications, **it is recommended to give therapeutic doses of beta-blockers to patients with an intermediate or high-risk of cardiac complications.**⁹ (Table 3) Beta-blockers would also be preferable for patients with new or inadequately controlled hypertension.

Table 3. Indications for the Use of Perioperative Beta-blocker Therapy.

Risk Factor	Peri-operative Beta-blocker Indicated
IHD*	Yes
HF	Yes
High-risk surgery Φ	Uncertain, but probably
DM (especially insulin-requiring)	Yes
Renal insufficiency	Uncertain, but probably if due to DM, HBP or vascular dx
Poor functional status Ω	Yes, if thought to be due to IHD or HF

* IHD includes angina and MI

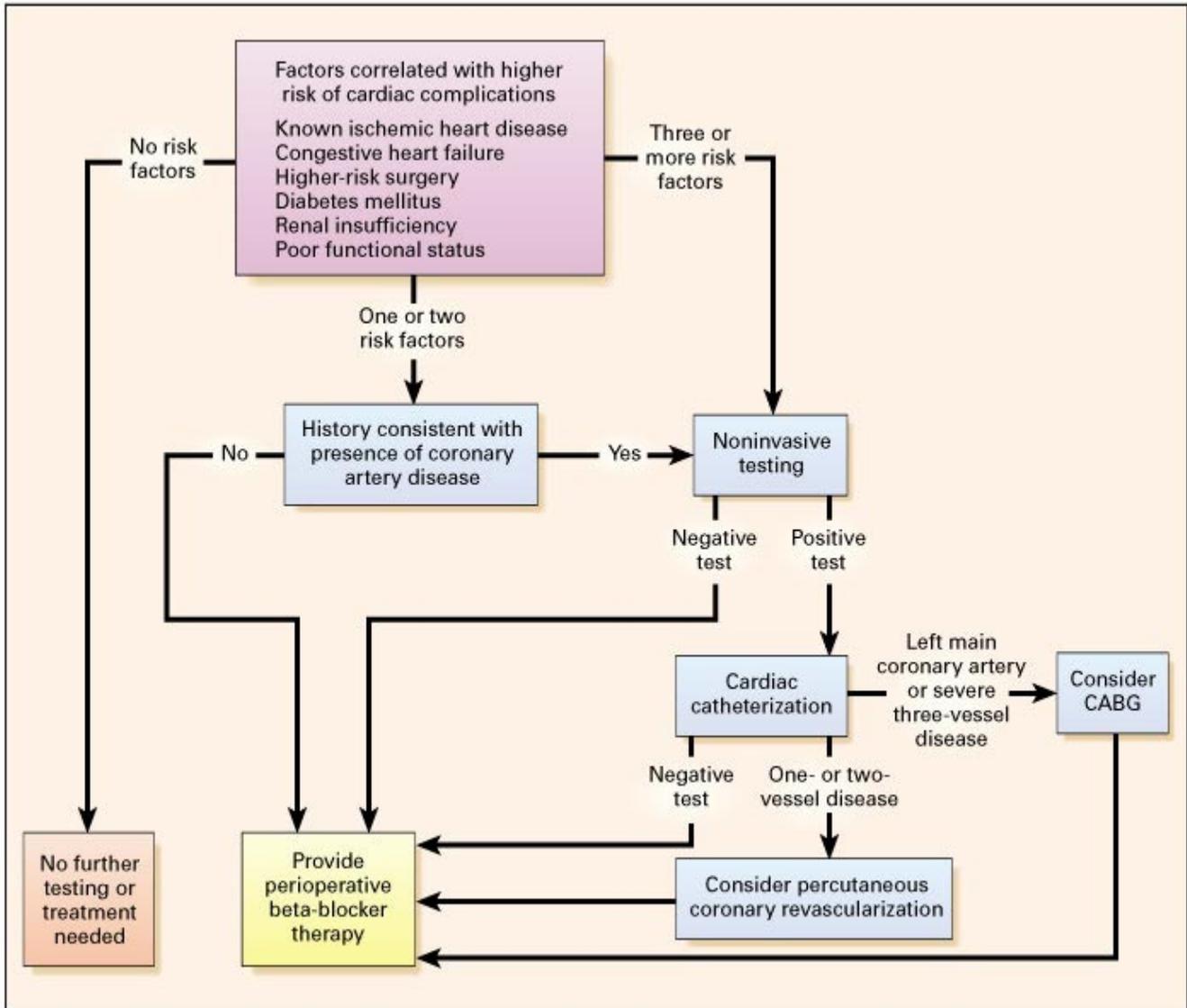
Φ High-risk surgery includes major intraperitoneal, intrathoracic and supra-inguinal vascular procedures.

Ω Poor functional status is defined as the inability to walk 4 blocks or climb 2 flights of stairs.

Optimally, beta-blockers should be initiated a week prior to surgery so that the dose can be adjusted to achieve a resting heart rate of no more than 60 beats per minute. Shorter-acting beta-selective agents such as metoprolol (25-50mg twice daily) are preferred for titration so the dose can be adjusted over a period of several days. On the day of surgery, a long-acting preparation (metoprolol XL) is practical because most patients won't be taking oral preparations for at least 24 hours post-op. Intravenous therapy can be used as necessary to maintain levels. Beta-blocker treatment should be continued for at least 6-12 weeks post operatively, and indefinitely if the patient had a prior indication, but was not taking them.

A flow chart (endnote 9), which outlines a definitive strategy, to evaluate risk and reduce the incidence of perioperative cardiac complications (summarizing guidelines from the American College of Physicians¹⁰ and the American College of Cardiology/American Heart Association¹¹) is presented in Figure 1.

Figure 1: Strategy for Assessing the Risk of Perioperative Coronary Complications in Patients Scheduled to Undergo Non-Cardiac Surgery



The decision whether to perform non-invasive testing is based on the presence of clinical risk factors, the patient’s functional status, and the type of surgery scheduled. If the non-invasive test is abnormal, the decision to proceed to coronary visualization is based on several factors. The likelihood of high-risk (left main [$>50\%$] or severe two or three-vessel coronary artery disease [$>70\%$ stenosis]) is much higher if there is severe ECG ST segment depression, changes are provoked by a low level of stress, and persist for a long period or if large or multiple areas of myocardium appear at risk on the imaging component. Ischemia demonstrated in a patient with resting left ventricular dysfunction (LVEF $< 40\%$) is also high-risk and all these patients should be considered for coronary visualization. PCI and CABG should be performed where indicated only if justified independently of the need for non-cardiac surgery. Data are from Boersma et al.¹² and Eagle et al.¹³

Conclusion

There is a large opportunity to improve the quality of care of patients undergoing major non-cardiac surgery with appropriate evaluation, risk stratification and increasing the use of beta-blockers in the perioperative period. Implementing the flow-chart along with other risk reduction therapies, including smoking intervention programs, and the initiation of long-term, preventative medical treatment with beta-blockers, ACE-inhibitors, statins and aspirin, where indicated, will decrease both short and long-term CV risk.

The ACC/AHA have just issued updated guidelines, which are on the ACC/ AHA websites (58 pages). An executive summary of the guidelines will be published in the February 6, 2002 issue of *Journal of American College of Cardiology* and the April 2, 2002 issue of *Circulation*. The flow chart (page 3) is reflective of the new guidelines, encouraging the wider use of beta-blockers. The new guidelines call for caution in performing surgery in patients who have undergone coronary stenting within the last month and expand on treatment and risk factors for patients with arrhythmias (not covered in this *Heartbeat*). Dr Kim Eagle (University of Michigan, Ann Arbor, MI), who chaired the 12-member guidelines panel, said, “ Take all of the knowledge we’ve gained in CV medicine and therapeutics in the last 5 years and apply it to the perioperative moment – that’s essentially what we’re trying to do with these guidelines. With effective medical therapy, a significant number of complications could be avoided.”

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⁹ Fleisher LA, Eagle KA. Lowering cardiac risk in non-cardiac surgery. *N Engl J Med* December 6,2001; 345: 1677-82.

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¹¹ Eagle KA et al. Guidelines for perioperative cardiovascular evaluation for noncardiac surgery. Report of the American College of Cardiology/ American Heart Association Task Force on Practice Guidelines (Committee on Perioperative Cardiovascular Evaluation for Noncardiac Surgery). *Circulation* 1996; 93: 1278-317.

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