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Eric Rosenberg

ACC/AHA Guideline

ACC/AHA 2007 Guidelines on Perioperative Cardiovascular Evaluation and Care for Noncardiac Surgery: Executive Summary

**A Report of the American College of Cardiology/American Heart
Association Task Force on Practice Guidelines (Writing Committee to
Revise the 2002 Guidelines on Perioperative Cardiovascular Evaluation for
Noncardiac Surgery)**

*Developed in Collaboration With the American Society of Echocardiography, American Society of
Nuclear Cardiology, Heart Rhythm Society, Society of Cardiovascular Anesthesiologists, Society
for Cardiovascular Angiography and Interventions, Society for Vascular Medicine and Biology,
and Society for Vascular Surgery*

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A. Purpose of These Guidelines

The tables and algorithms provide quick references for decision making. The overriding theme of this document is that intervention is rarely necessary to simply lower the risk of surgery unless such intervention is indicated irrespective of the preoperative context. The purpose of preoperative evaluation is not to give medical clearance but rather to perform an evaluation of the patient's current medical status; make recommendations concerning the evaluation, management, and risk of cardiac problems over the entire perioperative period; and provide a clinical risk profile that the patient, primary physician and nonphysician caregivers, anesthesiologist, and surgeon can use in making treatment decisions that may influence short- and long-term cardiac outcomes. No test should be performed unless it is likely to influence patient treatment. The goal of the consultation is the optimal care of the patient.

“How risky is surgery?”

Risk Factor/Surgery	Mortality Rate	MI rate
Ruptured AAA repair	42%	
Intact, symptomatic AAA	19%	
Elective, asymptomatic AAA	4%	
Ambulatory surgery	0.003%	0.03%
Hospital surgery	1.4%	
History of CAD		4%
Pancreatic resection (high volume hospital)		3.8%
Pancreatic resection (low volume hospital)		16%
Vascular surgery		8%
Kidney transplant		6%

Table 4. Cardiac Risk* Stratification for Noncardiac Surgical Procedures

Risk Stratification	Procedure Examples
Vascular (reported cardiac risk often more than 5%)	Aortic and other major vascular surgery Peripheral vascular surgery
Intermediate (reported cardiac risk generally 1% to 5%)	Intraperitoneal and intrathoracic surgery Carotid endarterectomy Head and neck surgery Orthopedic surgery Prostate surgery
Low† (reported cardiac risk generally less than 1%)	Endoscopic procedures Superficial procedure Cataract surgery Breast surgery Ambulatory surgery

*Combined incidence of cardiac death and nonfatal myocardial infarction.

†These procedures do not generally require further preoperative cardiac testing.

In the final analysis, 1 of the ultimate objectives of the preoperative cardiac assessment is to exclude the presence of such serious CAD that some form of direct intervention would be warranted even if no noncardiac operation were necessary. In this regard, the presentation for noncardiac surgery may simply represent the first time that a patient with overt or suspected CHD has had an opportunity for cardiovascular assessment.

Physician Documentation for Pre-operative Cardiac Assessment Should Address Two Questions

“Given the type of surgery, what is the likelihood that this specific patient will have an MI or go into pulmonary edema (decompensated heart failure), or go into Vtach/afib with RVR/other significant dysrhythmia, or die?”

“... and what can be done preoperatively to better clarify or lower that risk?”

We want to know, “who needs pre-op...”

- Echocardiogram?
- ECG?
- Stress Testing?
- Revascularization?
- Beta-Blockers?

B. Methodology and Evidence

The ACC/AHA Committee to Revise the 2002 Guidelines on Perioperative Cardiovascular Evaluation for Noncardiac Surgery conducted a comprehensive review of the literature relevant to perioperative cardiac evaluation published since the last publication of these guidelines in 2002. Literature searches were conducted in the following databases: PubMed, MEDLINE, and the Cochrane Library (including the Cochrane Database of Systematic Reviews and the Cochrane Controlled Trials Register). Searches were limited to the English language, the years 2002 through 2007, and human subjects. Related-article searches were conducted in MEDLINE to find additional relevant articles. Finally, committee members recommended applicable articles outside the scope of the formal searches.

“Size of Treatment Effect”

	Class I <i>Benefit >>> Risk</i> Procedure/Treatment SHOULD be performed/administered	Class IIa <i>Benefit >> Risk</i> <i>Additional studies with focused objectives needed</i> IT IS REASONABLE to perform procedure/administer treatment	Class IIb <i>Benefit ≥ Risk</i> <i>Additional studies with broad objectives needed; Additional registry data would be helpful</i> Procedure/Treatment MAY BE CONSIDERED	Class III <i>Risk ≥ Benefit</i> <i>No additional studies needed</i> Procedure/Treatment should NOT be performed/administered SINCE IT IS NOT HELPFUL AND MAY BE HARMFUL
Level A <i>Multiple (3-5) population risk strata evaluated*</i> <i>General consistency of direction and magnitude of effect</i>	<ul style="list-style-type: none"> • Recommendation that procedure or treatment is useful/effective • Sufficient evidence from multiple randomized trials or meta-analyses 	<ul style="list-style-type: none"> • Recommendation in favor of treatment or procedure being useful/effective • Some conflicting evidence from multiple randomized trials or meta-analyses 	<ul style="list-style-type: none"> • Recommendation’s usefulness/efficacy less well established • Greater conflicting evidence from multiple randomized trials or meta-analyses 	<ul style="list-style-type: none"> • Recommendation that procedure or treatment not useful/effective and may be harmful • Sufficient evidence from multiple randomized trials or meta-analyses
Level B <i>Limited (2-3) population risk strata evaluated*</i>	<ul style="list-style-type: none"> • Recommendation that procedure or treatment is useful/effective • Limited evidence from single randomized trial or non-randomized studies 	<ul style="list-style-type: none"> • Recommendation in favor of treatment or procedure being useful/ effective • Some conflicting evidence from single randomized trial or non-randomized studies 	<ul style="list-style-type: none"> • Recommendation’s usefulness/efficacy less well established • Greater conflicting evidence from single randomized trial or non-randomized studies 	<ul style="list-style-type: none"> • Recommendation that procedure or treatment not useful/effective and may be harmful • Limited evidence from single randomized trial or non-randomized studies
Level C <i>Very limited (1-2) population risk strata evaluated*</i>	<ul style="list-style-type: none"> • Recommendation that procedure or treatment is useful/effective • Only expert opinion, case studies, or standard-of-care 	<ul style="list-style-type: none"> • Recommendation in favor of treatment or procedure being useful/ effective • Only diverging expert opinion, case studies, or standard-of-care 	<ul style="list-style-type: none"> • Recommendation’s usefulness/efficacy less well established • Only diverging expert opinion, case studies, or standard-of-care 	<ul style="list-style-type: none"> • Recommendation that procedure or treatment not useful/effective and may be harmful • Only expert opinion, case studies, or standard-of-care

Suggested phrases for writing recommendations †

<p>should</p> <p>is recommended</p> <p>is indicated</p> <p>is useful/effective/beneficial</p>	<p>is reasonable</p> <p>can be useful/effective/ beneficial</p> <p>is probably recommended or indicated</p>	<p>may/might be considered</p> <p>may/might be reasonable</p> <p>usefulness/effectiveness is unknown /unclear/uncertain or not well established</p>	<p>is not recommended</p> <p>is not indicated</p> <p>should not</p> <p>is not useful/effective/beneficial</p> <p>may be harmful</p>
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*Data available from clinical trials or registries about the usefulness/efficacy in different sub-populations, such as gender, age, history of diabetes, history of prior MI, history of heart failure, and prior aspirin use. A recommendation with Level of Evidence B or C does not imply that the recommendation is weak. Many important clinical questions addressed in the guidelines do not lend themselves to clinical trials. Even though randomized trials are not available, there may be a very clear clinical consensus that a particular test or therapy is useful or effective.

†In 2003, the ACC/AHA Task Force on Practice Guidelines developed a list of suggested phrases to use when writing recommendations. All recommendations in this guideline have been written in full sentences that express a complete thought, such that a recommendation, even if separated and presented apart from the rest of the document (including headings above sets of recommendations), would still convey the full intent of the recommendation. It is hoped that this will increase readers’ comprehension of the guidelines and will allow queries at the individual recommendation level.

Table 1. Clinical Predictors of Increased Perioperative Cardiovascular Risk (Myocardial Infarction, Heart Failure, Death)

Major

Unstable coronary syndromes

- Acute or recent myocardial infarction* with evidence of important ischemic risk by clinical symptoms or noninvasive study
- Unstable or severe† angina (Canadian class III or IV)‡

Decompensated heart failure

Significant arrhythmias

- High-grade atrioventricular block
- Symptomatic ventricular arrhythmias in the presence of underlying heart disease
- Supraventricular arrhythmias with uncontrolled ventricular rate

Severe valvular disease

Intermediate

Mild angina pectoris (Canadian class I or II)

Previous myocardial infarction by history or pathological Q waves

Compensated or prior heart failure

Diabetes mellitus (particularly insulin-dependent)

Renal insufficiency

Minor

Advanced age

Abnormal ECG (left ventricular hypertrophy, left bundle-branch block, ST-T abnormalities)

Rhythm other than sinus (e.g., atrial fibrillation)

Low functional capacity (e.g., inability to climb one flight of stairs with a bag of groceries)

History of stroke

Uncontrolled systemic hypertension

ECG indicates electrocardiogram.

*The American College of Cardiology National Database Library defines *recent MI* as greater than 7 days but less than or equal to 1 month (30 days); acute MI is within 7 days.

†May include “stable” angina in patients who are unusually sedentary.

‡Campeau L. Grading of angina pectoris. *Circulation*. 1976;54:522–523.

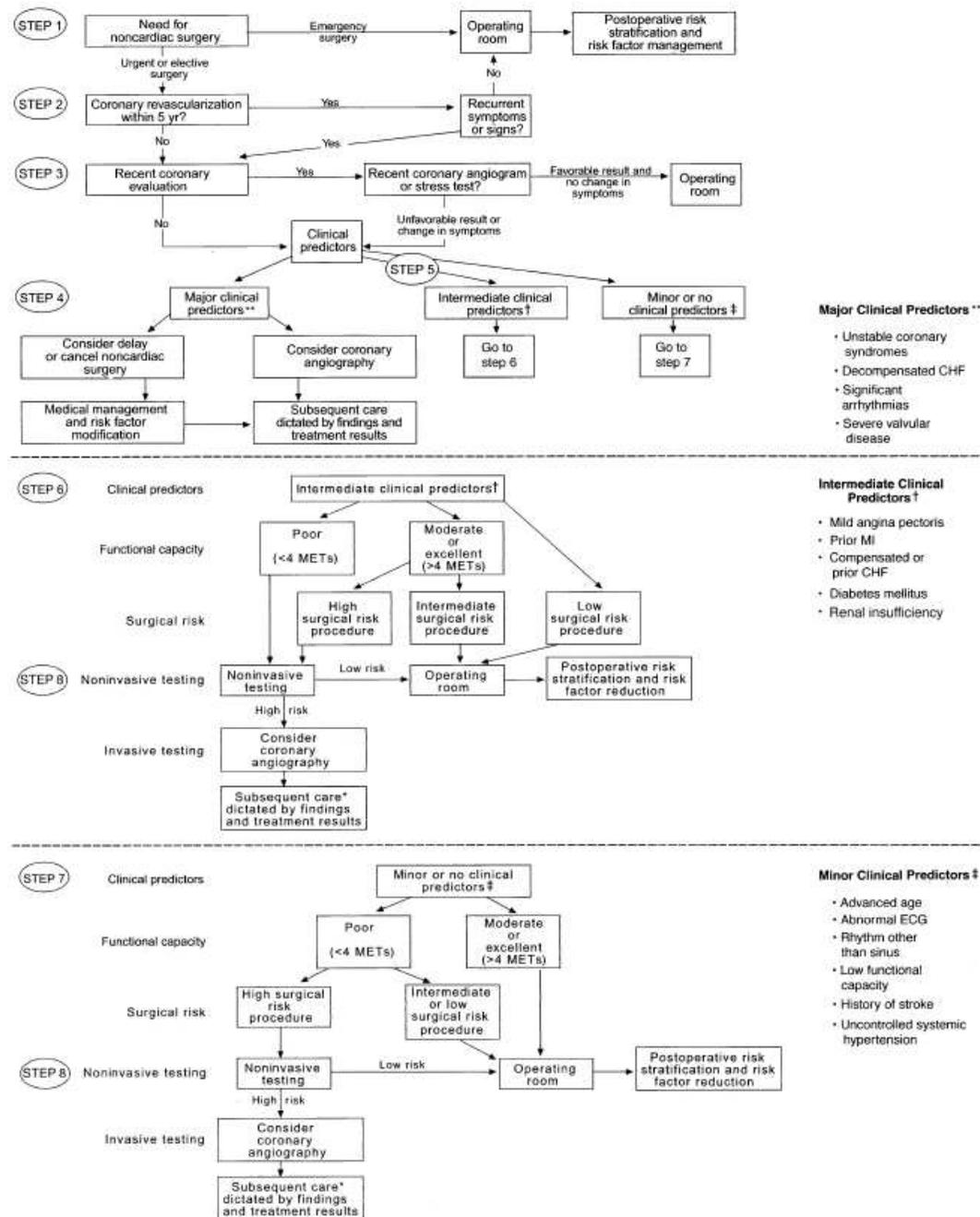


Figure 1. Stepwise approach to preoperative cardiac assessment. Steps are discussed in text. *Subsequent care may include cancellation or delay of surgery, coronary revascularization followed by noncardiac surgery, or intensified care.

Table 2. Active Cardiac Conditions for Which the Patient Should Undergo Evaluation and Treatment Before Noncardiac Surgery (Class I, Level of Evidence: B)

Condition	Examples
Unstable coronary syndromes	Unstable or severe angina* (CCS class III or IV)† Recent MI‡
Decompensated HF (NYHA functional class IV; worsening or new-onset HF)	
Significant arrhythmias	High-grade atrioventricular block Mobitz II atrioventricular block Third-degree atrioventricular heart block Symptomatic ventricular arrhythmias Supraventricular arrhythmias (including atrial fibrillation) with uncontrolled ventricular rate (HR greater than 100 beats per minute at rest) Symptomatic bradycardia Newly recognized ventricular tachycardia
Severe valvular disease	Severe aortic stenosis (mean pressure gradient greater than 40 mm Hg, aortic valve area less than 1.0 cm ² , or symptomatic) Symptomatic mitral stenosis (progressive dyspnea on exertion, exertional presyncope, or HF)

*According to Campeau.⁹

†May include "stable" angina in patients who are unusually sedentary.

‡The American College of Cardiology National Database Library defines recent MI as more than 7 days but less than or equal to 1 month (within 30 days).

CCS indicates Canadian Cardiovascular Society; HF, heart failure; HR, heart rate; MI, myocardial infarction; NYHA, New York Heart Association.

Given the increasing use of the Revised Cardiac Risk Index, the committee chose to replace the intermediate-risk category with the clinical risk factors from the index, with the exclusion of the type of surgery, which is incorporated elsewhere in the approach to the patient. Clinical risk factors include

- history of ischemic heart disease,
- history of compensated or prior HF,
- history of cerebrovascular disease,
- diabetes mellitus, and
- renal insufficiency.⁴

A history of MI or abnormal Q waves by ECG is listed as a clinical risk factor, whereas an acute MI (defined as at least 1 documented MI 7 days or less before the examination) or recent MI (more than 7 days but less than or equal to 1 month before the examination) with evidence of important ischemic risk by clinical symptoms or noninvasive study is an active cardiac condition. This definition reflects the consensus of the ACC Cardiovascular Database Committee. In this way, the separation of MI into the traditional 3- and 6-month intervals has been avoided.^{17,48} Current management of MI provides for risk stratification during convalescence.⁴⁹ If a recent stress test does not indicate residual myocardium at risk, the likelihood of reinfarction after noncardiac surgery is low. Although there are no adequate clinical trials on which to base firm recommendations, it appears reasonable to wait 4 to 6 weeks after MI to perform elective surgery.

Minor predictors

are recognized markers for cardiovascular disease that have not been proven to independently increase perioperative risk, for example, advanced age (greater than 70 years), abnormal ECG (LV hypertrophy, left bundle-branch block, ST-T abnormalities), rhythm other than sinus, and uncontrolled systemic hypertension. The presence of multiple minor predictors might lead to a higher suspicion of CAD but is not incorporated into the recommendations for treatment.

Table 3. Estimated Energy Requirements for Various Activities

	Can you . . .		Can you . . .
1 MET	Take care of yourself? Eat, dress, or use the toilet?	4 METs	Climb a flight of stairs or walk up a hill? Walk on level ground at 4 mph (6.4 kph)?
	Walk indoors around the house?		Run a short distance?
	Walk a block or 2 on level ground at 2 to 3 mph (3.2 to 4.8 kph)?		Do heavy work around the house like scrubbing floors or lifting or moving heavy furniture?
4 METs	Do light work around the house like dusting or washing dishes?		Participate in moderate recreational activities like golf, bowling, dancing, doubles tennis, or throwing a baseball or football?
		Greater than 10 METs	Participate in strenuous sports like swimming, singles tennis, football, basketball, or skiing?

kph indicates kilometers per hour; MET, metabolic equivalent; and mph, miles per hour.

*Modified from Hlatky et al,¹⁰ copyright 1989, with permission from Elsevier, and adapted from Fletcher et al.¹¹

**cardiology
consultation**

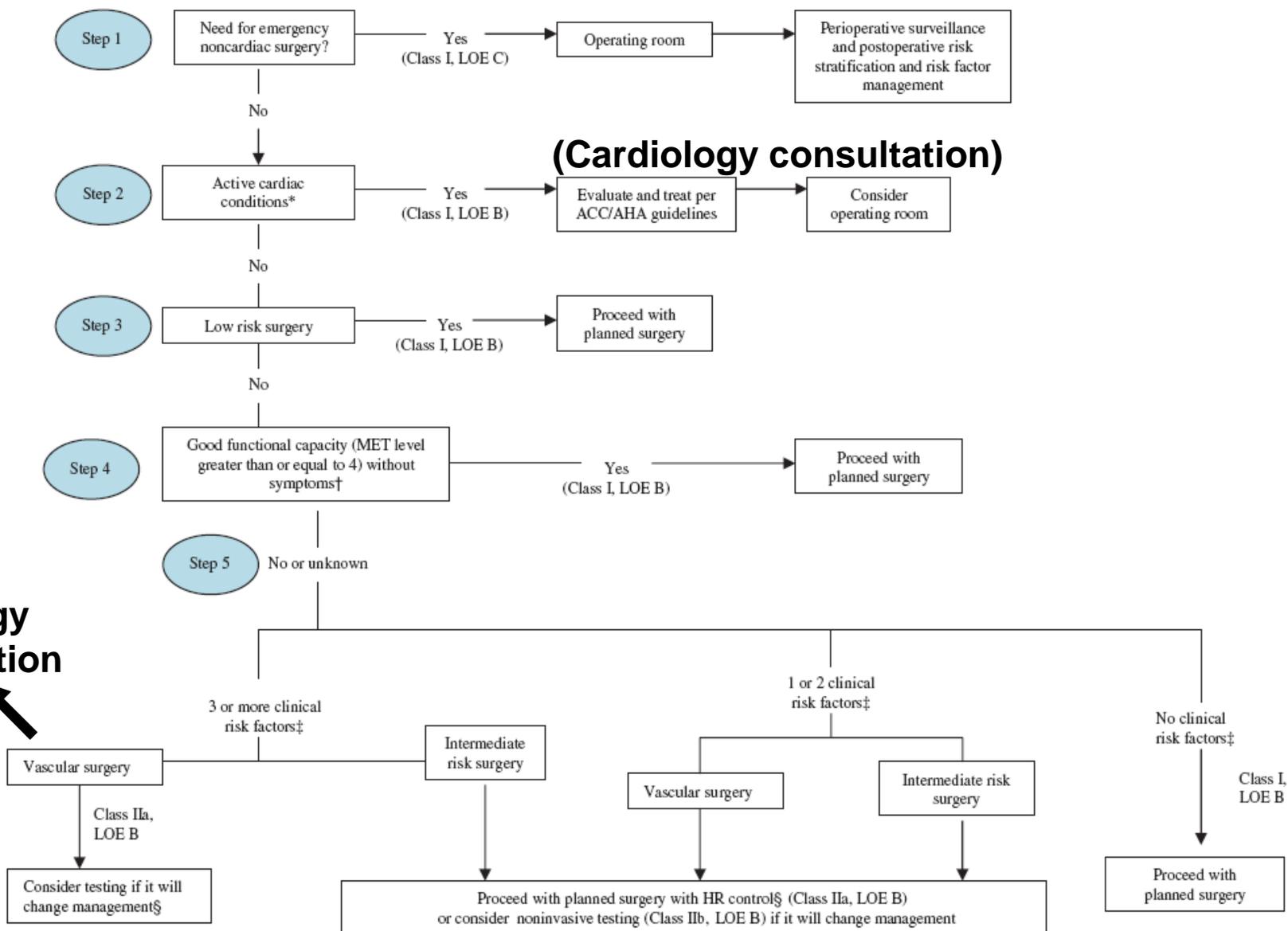


Figure 1. Cardiac evaluation and care algorithm for noncardiac surgery based on active clinical conditions, known cardiovascular disease, or cardiac risk factors for patients 50 years of age or greater. *See Table 2 for active clinical conditions. †See Table 3 for estimated MET level equivalent. ‡Clinical risk factors include ischemic heart disease, compensated or prior HF, diabetes mellitus, renal insufficiency, and cerebrovascular disease. §Consider perioperative beta blockade (see Table 11) for populations in which this has been shown to reduce cardiac morbidity/mortality. ACC/AHA indicates American College of Cardiology/American Heart Association; HR, heart rate; LOE, level of evidence; and MET, metabolic equivalent.

“Who should get pre-op...”

- Echocardiogram?
- ECG?
- Stress Testing?
- Revascularization?
- Beta-Blockers?

7.2. Perioperative Medical Therapy

7.2.1. Perioperative Beta-Blocker Therapy

Recommendations for Beta-Blocker Medical Therapy

Class I

- 1. Beta blockers should be continued in patients undergoing surgery who are receiving beta blockers to treat angina, symptomatic arrhythmias, hypertension, or other ACC/AHA class I guideline indications. (*Level of Evidence: C*)**
- 2. Beta blockers should be given to patients undergoing vascular surgery who are at high cardiac risk owing to the finding of ischemia on preoperative testing. (*Level of Evidence: B*)**

Class IIa

- 1. Beta blockers are probably recommended for patients undergoing vascular surgery in whom preoperative assessment identifies CHD. (*Level of Evidence: B*)**
- 2. Beta blockers are probably recommended for patients in whom preoperative assessment for vascular surgery identifies high cardiac risk, as defined by the presence of more than 1 clinical risk factor.* (*Level of Evidence: B*)**
- 3. Beta blockers are probably recommended for patients in whom preoperative assessment identifies CHD or high cardiac risk, as defined by the presence of more than 1 clinical risk factor,* who are undergoing intermediate-risk or vascular surgery. (*Level of Evidence: B*)**

Class IIb

- 1. The usefulness of beta blockers is uncertain for patients who are undergoing either intermediate-risk procedures or vascular surgery, in whom pre-operative assessment identifies a single clinical risk factor.* (*Level of Evidence: C*)**
- 2. The usefulness of beta blockers is uncertain in patients undergoing vascular surgery with no clinical risk factors who are not currently taking beta blockers. (*Level of Evidence: B*)**

Class III

- 1. Beta blockers should not be given to patients undergoing surgery who have absolute contraindications to beta blockade. (*Level of Evidence: C*)**

Table 11. Recommendations for Perioperative Beta-Blocker Therapy Based on Published Randomized Clinical Trials

Surgery	No Clinical Risk Factors	1 or More Clinical Risk Factors	CHD or High Cardiac Risk	Patients Currently Taking Beta Blockers
Vascular	Class IIb, Level of Evidence: B	Class IIa, Level of Evidence: B	Patients found to have myocardial ischemia on preoperative testing: Class I, Level of Evidence: B* Patients without ischemia or no previous test: Class IIa, Level of Evidence: B	Class I, Level of Evidence: B
Intermediate risk	...	Class IIb, Level of Evidence: C	Class IIa, Level of Evidence: B	Class I, Level of Evidence: C
Low risk	Class I, Level of Evidence: C

See Table 4 for definition of procedures. Ellipses (...) indicate that data were insufficient to determine a class of recommendation or level of evidence. See text for further discussion. CHD indicates coronary heart disease.

*Applies to patients found to have coronary ischemia on preoperative testing.

†Applies to patients found to have coronary heart disease.

AHA: Surgery with Beta-Blockers Onboard May Be Risky

By Crystal Phend, Staff Writer, MedPage Today

Reviewed by Zalman S. Agus, MD; Emeritus Professor at the University of Pennsylvania School of Medicine.
November 07, 2007

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ORLANDO, Nov. 7 -- Beta-blockers given before noncardiac surgery to prevent cardiovascular events in at-risk patients may be counterproductive, researchers found.

Perioperative metoprolol (Lopressor, Toprol-XL) started two to four hours before surgery prevented 15 MIs, three revascularizations, and seven atrial fibrillation events per 1,000 treated patients compared with placebo, according to a large prospective trial presented here at the American Heart Association meeting.

But this came at the expense of eight deaths, five severe strokes, 42 cases of significant bradycardia, and 53 significant hypotension events per 1,000 patients, reported P.J. Devereaux, M.D., of McMaster University in Hamilton, Ontario, and colleagues.

The "disturbing" increase in death and stroke recommends against routine use, commented Gordon F. Tomaselli, M.D., of Johns Hopkins University, who moderated a press conference at which the results were presented.

Action Points

- Caution interested patients that although the study did not support the use of beta-blockade for prevention of perioperative events, it did not suggest that patients should stop taking the drug prescribed for other indications.
- Note that this study was published as an abstract and presented orally at a conference. The data and conclusions should be considered to be preliminary until published in a peer-reviewed publication.

POISE trial (presented at AHA October 2007 but not yet published)

- N=8,351; age \geq 45
- Noncardiac surgery
- 82% had CAD or PVD; the rest had risk factors
- Metoprolol vs. placebo started 2 – 4 hours preop and continued 30 days

Metoprolol reduces risk of MI, but reduced survival in this population...

- 1.1% absolute risk reduction (ARR) for death/nonfatal MI/nonfatal cardiac arrest at 30 days
- 1.5% ARR for nonfatal MI (3.6% vs. 5.1%; NNT 67)
- 0.5% absolute risk increase (ARI) for stroke (1% vs. 0.5%; NNH 200; RR 2.2)
- 0.8% ARI for total mortality (3.1% vs. 2.3%; “NNK” 125; RR 1.3)
- 8% ARI for hypotension
- 3.2% ARI for “significant” bradycardia

Devereaux, et al. AHA 2007. (unpublished)

“How long should surgery be delayed after PTCA?”

“When is it safe to stop antiplatelet therapy after PTCA?”

Don't allow antiplatelet therapy to be interrupted without patient-MD cardiology consultation

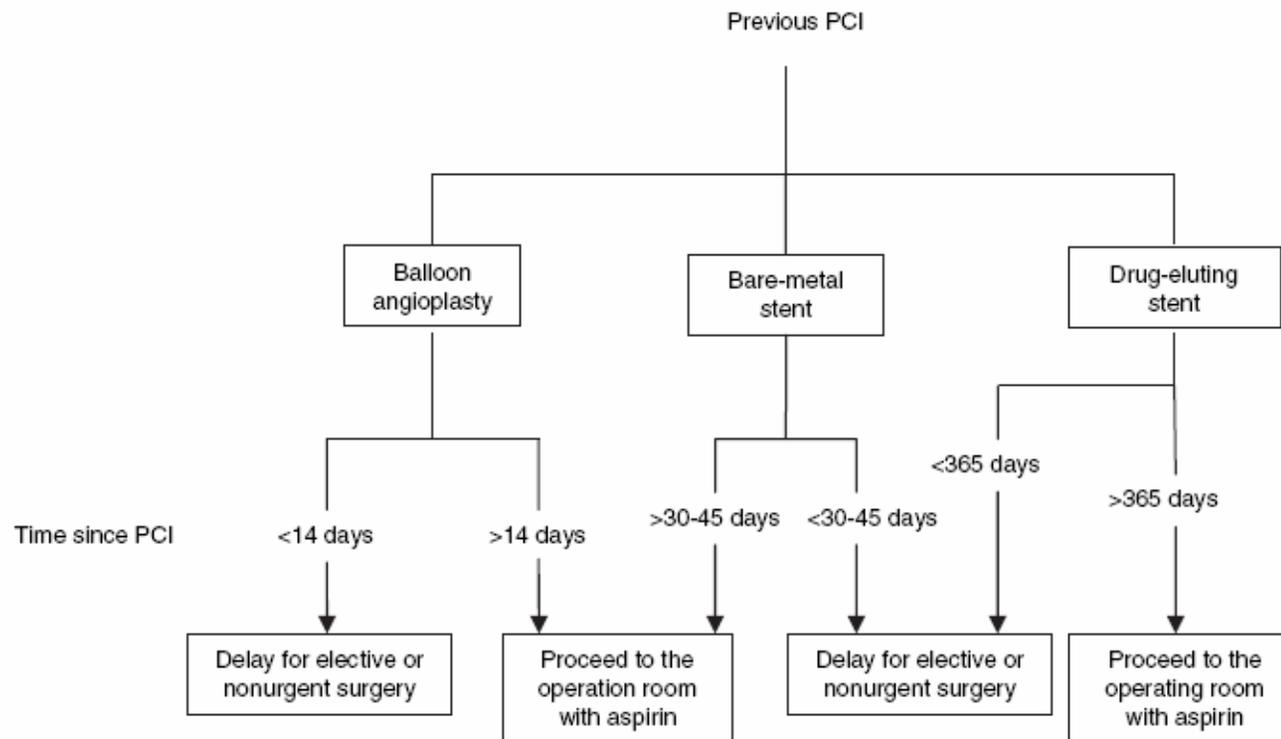


Figure 2. Proposed approach to the management of patients with previous percutaneous coronary intervention (PCI) who require non-cardiac surgery, based on expert opinion.

One final thought about elective PTCA and surgery...

- If surgery can't be performed safely with patient taking aspirin/clopidogrel...
- And if surgery must be delayed because clopidogrel must not be stopped after new stent...
- And if there's questionable benefit to preoperative revascularization before high risk surgery vs. medical management...
- And if we can predict with reasonable certainty someone's risk for perioperative MI based upon risk profile...
- Why order preoperative stress tests?
- (personal suggestion: *"would you order a stress test even if the patient *weren't* going to have surgery?"*... if yes, then you should probably go ahead and do it. If NO, then re-think whether it's really necessary.)