

ACCF/AHA 2009 Perioperative Focused Update & Guideline

Based on the 2009 ACCF/AHA Focused Update on Perioperative Beta Blockade Incorporated Into the ACC/AHA 2007 Guidelines on Perioperative Cardiovascular Evaluation and Care for Noncardiac Surgery:

A Report of the ACC/AHA Task Force on Practice Guidelines developed in collaboration with the Amer. Society of Echocardiography, Amer. Society of Nuclear Cardiology, Heart Rhythm Society, Society of Cardiovascular Anesthesiologists, Society for Cardiovascular Angiography and Interventions, Society for Vascular Medicine, and Society for Vascular Surgery



AMERICAN
COLLEGE of
CARDIOLOGY
FOUNDATION



ACCF/AHA 2009 Guidelines on Perioperative Cardiovascular Evaluation and Care for Noncardiac Surgery

This slide set was adapted from the 2009 ACCF/AHA Focused Update on Perioperative Beta Blockade Incorporated Into the ACC/AHA 2007 Guidelines on Perioperative Cardiovascular Evaluation and Care for Noncardiac Surgery (*Journal of the American College of Cardiology* published ahead of print on November 2, 2009, available at <http://content.onlinejacc.org/cgi/content/full/j.jacc.2009.07.010>)

The full-text guidelines are also available on the Web sites:
ACC (www.acc.org) and,
AHA (www.americanheart.org)

Special Thanks to

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Applying Classification of Recommendations and Level of Evidence

Class I	Class IIa	Class IIb	Class III
<i>Benefit >>> Risk</i>	<i>Benefit >> Risk Additional studies with focused objectives needed</i>	<i>Benefit ≥ Risk Additional studies with broad objectives needed; Additional registry data would be helpful</i>	<i>Risk ≥ Benefit No additional studies needed</i>
Procedure/ Treatment SHOULD be performed/ administered	IT IS REASONABLE to perform procedure/ administer treatment	Procedure/Treatment MAY BE CONSIDERED	Procedure/Treatment should NOT be performed/administered SINCE IT IS NOT HELPFUL AND MAY BE HARMFUL

Alternative Phrasing:

should is recommended is indicated is useful/effective/ beneficial	is reasonable can be useful/effective/ beneficial is probably recommended or indicated	may/might be considered may/might be reasonable usefulness/effectiveness is unknown /unclear/uncertain or not well established	is not recommended is not indicated should not is not useful/effective/ beneficial may be harmful
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Applying Classification of Recommendations and Level of Evidence

Class I	Class IIa	Class IIb	Class III
<i>Benefit >>> Risk</i>	<i>Benefit >> Risk Additional studies with focused objectives needed</i>	<i>Benefit ≥ Risk Additional studies with broad objectives needed; Additional registry data would be helpful</i>	<i>Risk ≥ Benefit No additional studies needed</i>
Procedure/ Treatment SHOULD be performed/ administered	IT IS REASONABLE to perform procedure/ administer treatment	Procedure/Treatment MAY BE CONSIDERED	Procedure/Treatment should NOT be performed/administered SINCE IT IS NOT HELPFUL AND MAY BE HARMFUL

Level of Evidence:

Level A:	Data derived from multiple randomized clinical trials or meta-analyses Multiple populations evaluated
Level B:	Data derived from a single randomized trial or nonrandomized studies Limited populations evaluated
Level C:	Only consensus of experts opinion, case studies, or standard of care Very limited populations evaluated

Active Cardiac Conditions for Which the Patient Should Undergo Evaluation and Treatment Before Noncardiac Surgery (Class 1, LOE: B)

Condition	Examples
Unstable coronary syndromes	<ul style="list-style-type: none"> Unstable or severe angina* (CCS class III or IV)[†] Recent MI[‡]
Decompensated HF (NYHA functional class IV; worsening or new-onset HF)	
Significant arrhythmias	<ul style="list-style-type: none"> 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 > 100 bpm at rest) Symptomatic bradycardia Newly recognized ventricular tachycardia
Severe valvular disease	<ul style="list-style-type: none"> Severe aortic stenosis (mean pressure gradient > 40 mm Hg, aortic valve area < 1.0 cm², or symptomatic) Symptomatic mitral stenosis (progressive dyspnea on exertion, exertional presyncope, or HF) or MVA < 1.5 cm²

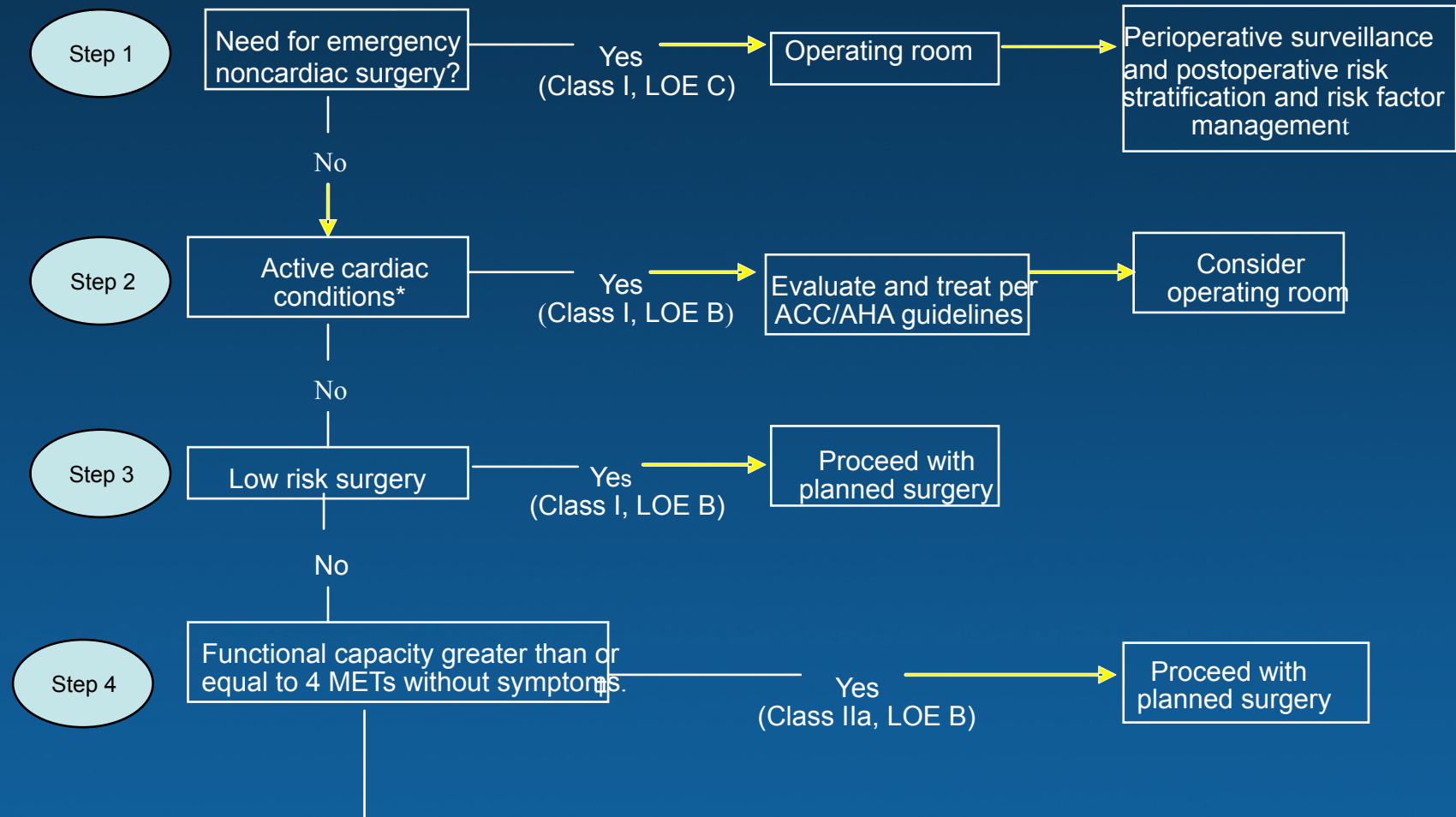
CCS indicates Canadian Cardiovascular Society; HF, heart failure; HR, heart rate; MI, myocardial infarction; NYHA, New York Heart Association. *According to Campeau.¹⁰ [†]May include stable angina in patients who are unusually sedentary. [‡]The ACC National Database Library defines recent MI as more than 7 days but within 30 days)

Estimated Energy Requirements for Various Activities

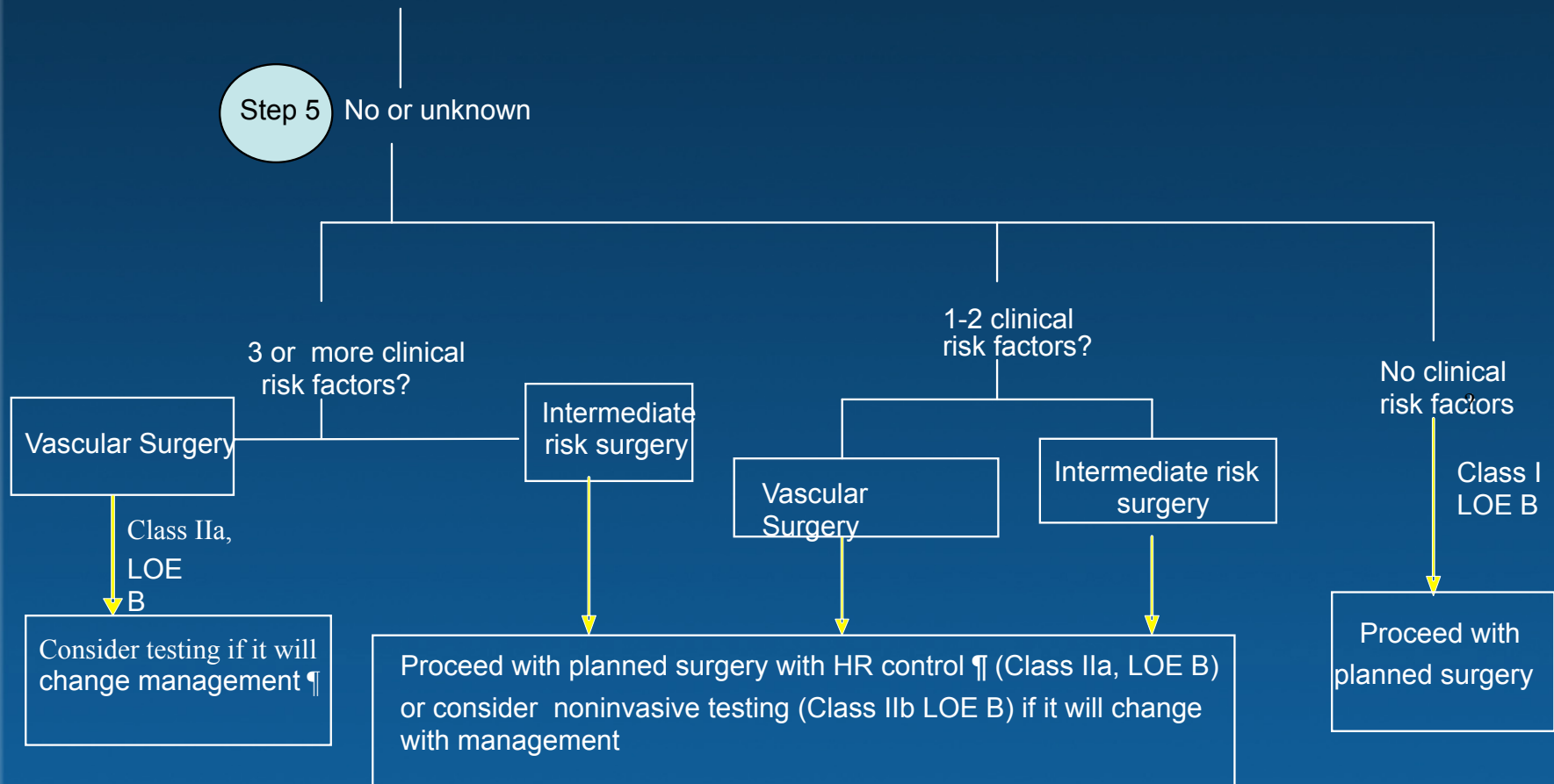
<div>1 Met</div> <div><div></div></div>	Can You...	<div>4 Mets</div> <div><div></div></div>	Can You...
	Take care of yourself?		Climb a flight of stairs or walk up a hill?
	Eat, dress, or use the toilet?		Walk on level ground at 4 mph (6.4 kph)?
	Walk indoors around the house?		Do heavy work around the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

MET indicates metabolic equivalent; mph, miles per hour; kph, kilometers per hour. *Modified from Hlatky et al, copyright 1989, with permission from Elsevier, and adapted from Fletcher et al.

Cardiac Evaluation and Care Algorithm for Noncardiac Surgery (1)



Cardiac Evaluation and Care Algorithm for Noncardiac Surgery (2)



Cardiac Risk Stratification for Noncardiac Surgical Procedures

Risk Stratification

Vascular (reported cardiac risk often > 5%)

Intermediate (reported cardiac risk generally 1%-5%)

Low† (reported cardiac risk generally <1%)

Procedure Examples

Aortic and other major vascular surgery
Peripheral vascular surgery

Intraperitoneal and intrathoracic surgery
Carotid endarterectomy
Head and neck surgery
Orthopedic surgery
Prostate surgery

Endoscopic procedures
Superficial procedure /Breast surgery
Cataract surgery
Ambulatory surgery

Prognostic Gradient of Ischemic Responses During an ECG-Monitored Exercise Test in Patients With Suspected or Proven CAD

High Risk Ischemic Response

Ischemia induced by low-level exercise* (less than 4 METs or heart rate < 100 bpm or < 70% of age-predicted heart rate) manifested by 1 or more of the following:

- Horizontal or downsloping ST depression > 0.1 mV
- ST-segment elevation > 0.1 mV in noninfarct lead
- Five or more abnormal leads
- Persistent ischemic response >3 minutes after exertion
- Typical angina
- Exercise-induced decrease in systolic BP by 10 mm Hg

Prognostic Gradient of Ischemic Responses During an ECG-Monitored Exercise Test in Patients With Suspected or Proven CAD

Intermediate:

Ischemia induced by moderate-level exercise (4 to 6 METs or HR 100 to 130 bpm (70% to 85% of age-predicted heart rate)) manifested by ≥ 1 of the following:

- Horizontal or downsloping ST depression > 0.1 mV
- Persistent ischemic response greater than 1 to 3 minutes after exertion
- 3- 4 abnormal leads

Low

No ischemia or ischemia induced at high-level exercise (> 7 METs or HR > 130 bpm ($> 85\%$ of age-predicted heart rate)) manifested by:

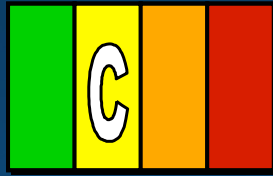
- Horizontal or downsloping ST depression > 0.1 mV
- 1- 2 abnormal leads

Inadequate test

Inability to reach adequate target workload or heart rate response for age without an ischemic response. For patients undergoing noncardiac surgery, the inability to exercise to at least the intermediate-risk level without ischemia should be considered an inadequate test.

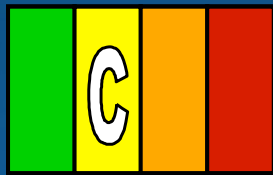
Recommendations for Preoperative Noninvasive Evaluation of LV Function

I IIa IIb III



It is reasonable for patients with dyspnea of unknown origin to undergo preoperative evaluation of LV function.

I IIa IIb III

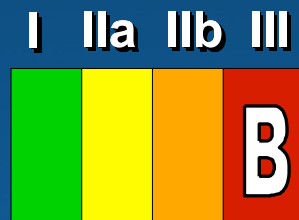


It is reasonable for patients with current or prior HF with worsening dyspnea or other change in clinical status to undergo preoperative evaluation of LV function if not performed within 12 months.

Recommendations for Preoperative Noninvasive Evaluation of LV Function



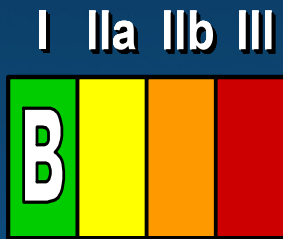
Reassessment of LV function in clinically stable patients with previously documented cardiomyopathy is not well established.



Routine perioperative evaluation of LV function in patients is not recommended.

Recommendations for Preoperative Resting 12-Lead ECG

Preoperative resting 12-lead ECG is recommended for patients with:



- At least 1 clinical risk factor* who are undergoing vascular surgical procedures.

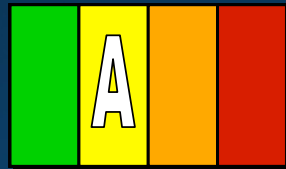


- Known CHD, peripheral arterial disease, or cerebrovascular disease who are undergoing intermediate-risk surgical procedures.

* Clinical risk factors include history of ischemic heart disease, history of compensated or prior HF, history of cerebrovascular disease, diabetes mellitus, and renal insufficiency.

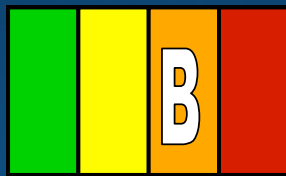
Recommendations for Preoperative Resting 12-Lead ECG

I IIa IIb III



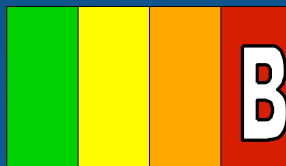
Preoperative resting 12-lead ECG is reasonable in persons with no clinical risk factors who are undergoing vascular surgical procedures.

I IIa IIb III



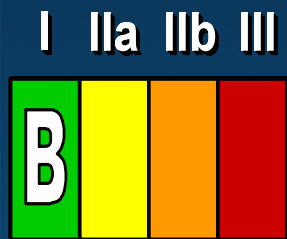
Preoperative resting 12-lead ECG may be reasonable in patients with at least 1 clinical risk factor who are undergoing intermediate-risk operative procedures.

I IIa IIb III

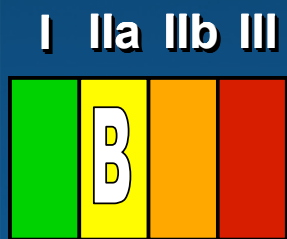


Preoperative and postoperative resting 12-lead ECGs are not indicated in asymptomatic persons undergoing low-risk surgical procedures.

Recommendations for Noninvasive Stress Testing Before Noncardiac Surgery



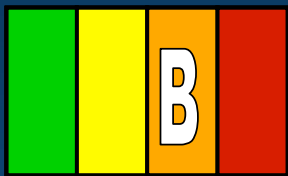
Patients with active cardiac conditions in whom noncardiac surgery is planned should be evaluated and treated per ACC/AHA guidelines before noncardiac surgery.



Noninvasive stress testing of patients with 3 or more clinical risk factors and poor functional capacity (< 4 METs) who require vascular surgery is reasonable if it will change management.

Recommendations for Noninvasive Stress Testing Before Noncardiac Surgery

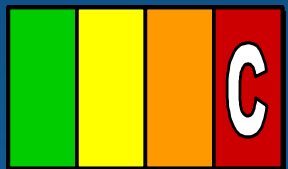
I IIa IIb III



Noninvasive stress testing may be considered for patients:

- With at least 1 to 2 clinical risk factors and poor functional capacity (less than 4 METs) who require intermediate-risk or vascular surgery if it will change management.

I IIa IIb III



Noninvasive testing is not useful for patients:

- With no clinical risk factors undergoing intermediate-risk noncardiac surgery.
- Undergoing low-risk noncardiac surgery.

Preoperative Coronary Revascularization With CABG or Percutaneous Coronary Intervention

Coronary revascularization before noncardiac surgery is useful in patients with stable angina who have:

- significant left main coronary artery stenosis
- 3-vessel disease (survival benefit is greater when LVEF <0.50)
- 2-vessel disease with significant proximal LAD stenosis & either EF<0.50 or demonstrable ischemia on noninvasive testing.

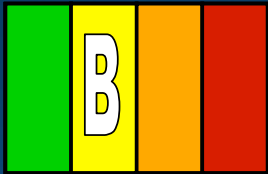


Coronary revascularization before noncardiac surgery is recommended for patients with:

- high-risk UA/NSTEMI
- acute STEMI

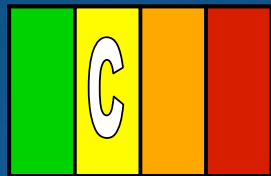
Preoperative Coronary Revascularization With CABG or Percutaneous Coronary Intervention

I IIa IIb III



In patients in whom coronary revascularization with PCI is appropriate for mitigation of cardiac symptoms & who need elective noncardiac surgery in the subsequent 12 months, a strategy of balloon angioplasty or bare-metal stent placement followed by 4-6 weeks of dual-antiplatelet therapy is probably indicated.

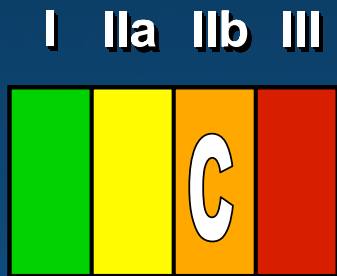
I IIa IIb III



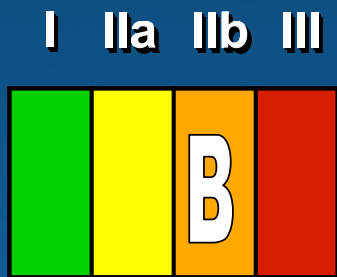
In patients who have received DES & who must undergo urgent surgical procedures that mandate the discontinuation of thienopyridine therapy, it is reasonable to continue ASA if at all possible & restart the thienopyridine as soon as possible.

Preoperative Coronary Revascularization With CABG or Percutaneous Coronary Intervention

The usefulness of preoperative coronary revascularization is not well established in:



High risk ischemic patients (e.g. abnormal dobutamine stress echo with at least 5 segments of wall-motion abnormalities)

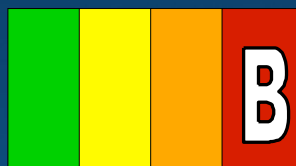


Low risk ischemic patients with an abnormal dobutamine stress echo (segments 1-4)

Preoperative Coronary Revascularization With CABG or Percutaneous Coronary Intervention

It is not recommended that routine prophylactic coronary revascularization be performed in patients with stable CAD before noncardiac surgery

I IIa IIb III



Elective noncardiac surgery is not recommended within:

- 4-6 weeks of bare metal coronary stent implantation or within 12 months of drug-eluting coronary stent implantation in patients in whom thienopyridine therapy, or ASA & thienopyridine therapy, will need to be discontinued perioperatively.
- 4 weeks of coronary revascularization with balloon angioplasty

Drug Eluting Stents (DES) and Stent Thrombosis

A 2007 AHA/ACC/SCAI/ACS/ADA science advisory report concludes that premature discontinuation of dual antiplatelet therapy markedly increases the risk of catastrophic stent thrombosis and death or MI.

To eliminate the premature discontinuation of thienopyridine therapy, the advisory group recommends the following:

- Before implantation of a stent, the physician should discuss the need for dual-antiplatelet therapy. In patients not expected to comply with 12 months of thienopyridine therapy, whether for economic or other reasons, strong consideration should be given to avoiding a DES.
- In patients who are undergoing preparation for PCI and who are likely to require invasive or surgical procedures within the next 12 months, consideration should be given to implantation of a bare metal stent or performance of balloon angioplasty with provisional stent implantation instead of the routine use of a DES.

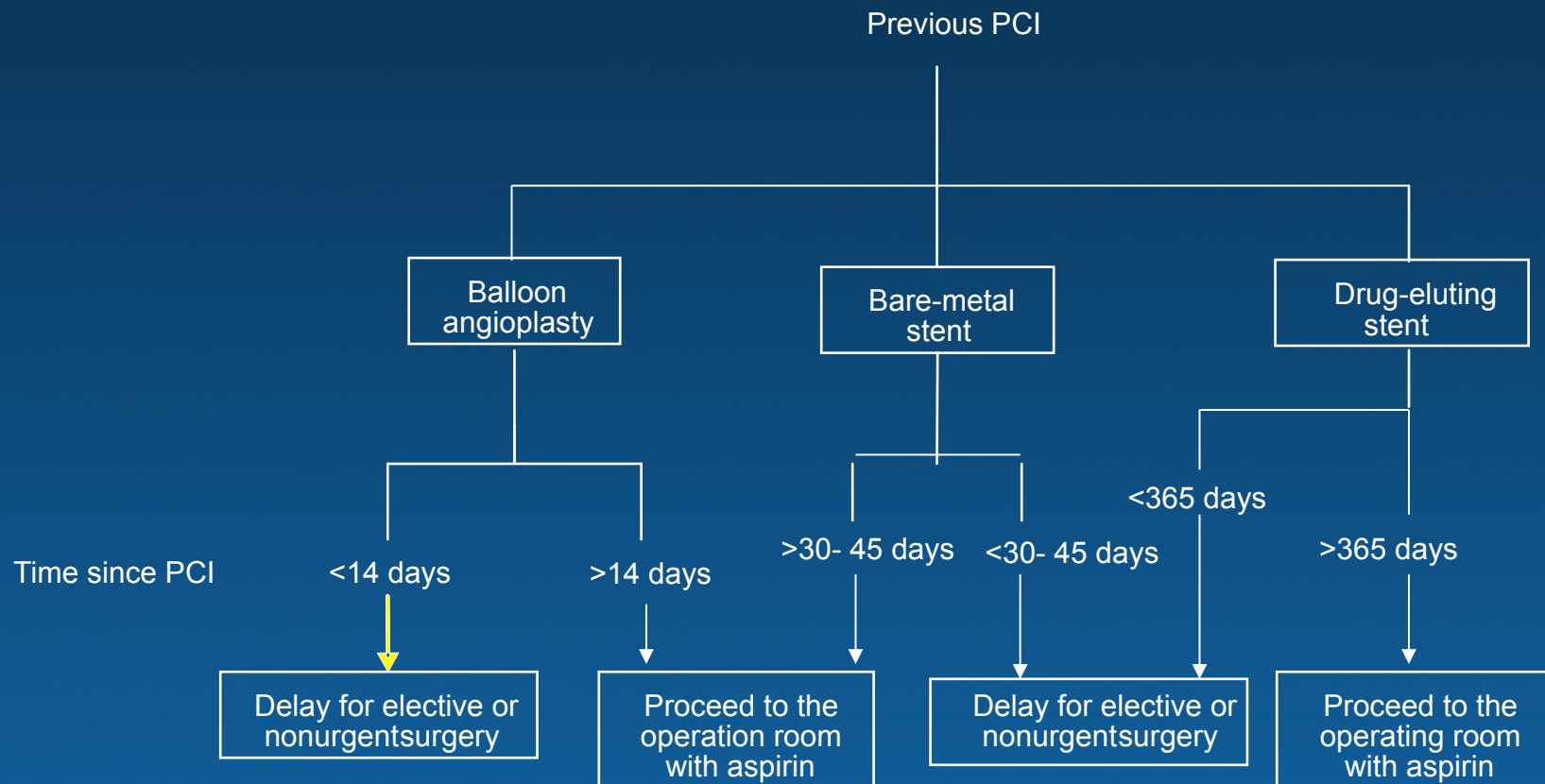
Drug Eluting Stents (DES) and Stent Thrombosis

- A greater effort by healthcare professionals must be made before patient discharge to ensure that patients are properly and thoroughly educated about the reasons they are prescribed thienopyridines and the significant risks associated with prematurely discontinuing such therapy.
- Patients should be specifically instructed before hospital discharge to contact their treating cardiologist before stopping any antiplatelet therapy, even if instructed to stop such therapy by another healthcare provider.
- Healthcare providers who perform invasive or surgical procedures and who are concerned about periprocedural and postprocedural bleeding must be made aware of the potentially catastrophic risks of premature discontinuation of thienopyridine therapy. Such professionals who perform these procedures should contact the patient's cardiologist if issues regarding the patient's antiplatelet therapy are unclear, to discuss optimal patient management strategy.

Drug Eluting Stents (DES) and Stent Thrombosis

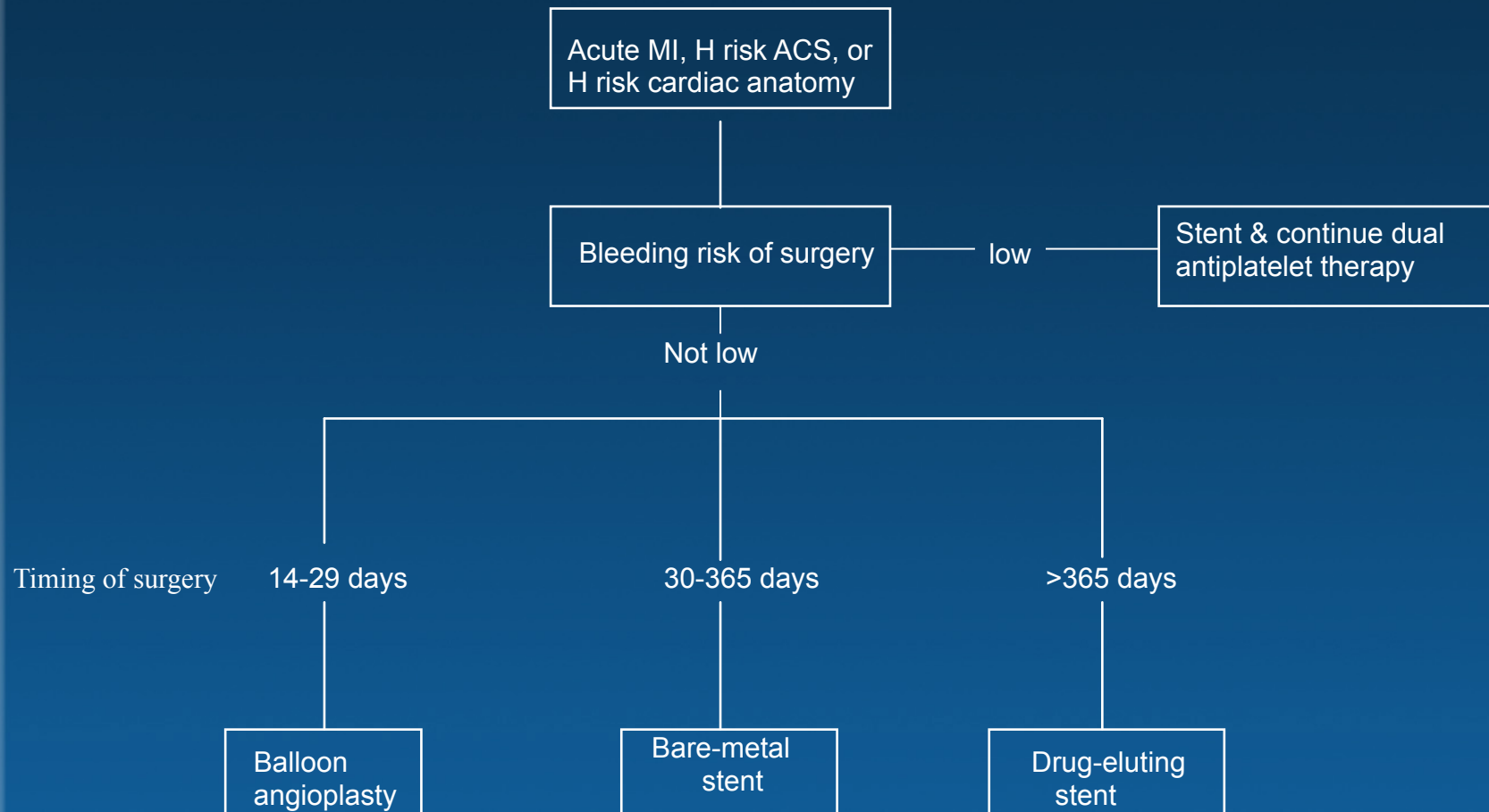
- Elective procedures for which there is significant risk of perioperative or postoperative bleeding should be deferred until patients have completed an appropriate course of thienopyridine therapy (12 months after DES implantation if they are not at high risk of bleeding and a minimum of 1 month for bare-metal stent implantation).
- For patients treated with DES who are to undergo subsequent procedures that mandate discontinuation of thienopyridine therapy, aspirin should be continued if at all possible and the thienopyridine restarted as soon as possible after the procedure because of concerns about late stent thrombosis.

Proposed Approach to the Management of Patients with Previous PCI Who Require Noncardiac Surgery



PCI, percutaneous coronary intervention

Proposed Treatment for Patients Requiring PCI Who Need Subsequent Surgery

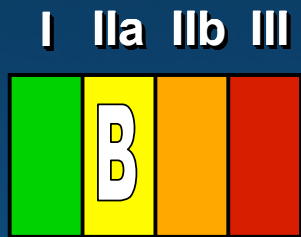


Recommendations for Beta-Blocker Medical Therapy



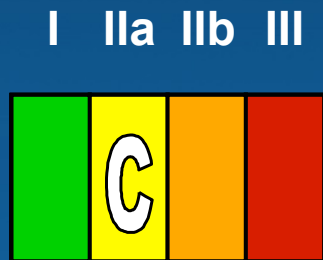
Beta blockers should be continued in patients undergoing surgery who are receiving beta blockers for treatment of conditions with ACCF/AHA Class I guideline indications for the drugs

Recommendations for Beta-Blocker Medical Therapy



Beta blockers titrated to heart rate and blood pressure are probably recommended for patients undergoing vascular surgery who are at high cardiac risk owing to coronary artery disease or the finding of cardiac ischemia on preoperative testing (4, 5).

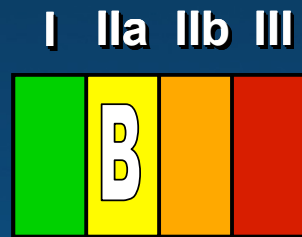
Modified



Beta blockers titrated to heart rate and blood pressure are reasonable for patients in whom preoperative assessment for vascular surgery identifies high cardiac risk, as defined by the presence of > 1 clinical risk factor.*

Modified

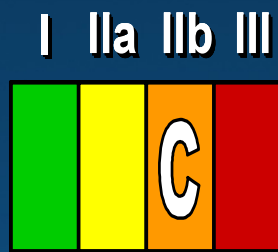
Recommendations for Beta-Blocker Medical Therapy



Beta blockers titrated to heart rate and blood pressure are reasonable for patients in whom preoperative assessment identifies coronary artery disease or high cardiac risk, as defined by the presence of > 1 clinical risk factor,* who are undergoing intermediate-risk surgery.

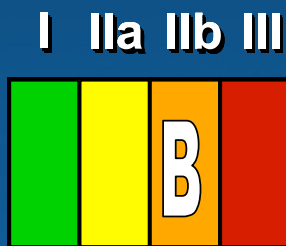


Recommendations for Beta-Blocker Medical Therapy



The usefulness of beta blockers is uncertain for patients who are undergoing either intermediate-risk procedures or vascular surgery in whom preoperative assessment identifies a single clinical risk factor in the absence of coronary artery disease.*

← NO CHANGE



The usefulness of beta blockers is uncertain in patients undergoing vascular surgery with no clinical risk factors who are not currently taking beta blockers.

← NO CHANGE

Recommendations for Beta-Blocker Medical Therapy



Beta blockers should not be given to patients undergoing surgery who have absolute contraindications to beta blockade.

← NO CHANGE



Routine administration of high-dose beta blockers in the absence of dose titration is not useful and may be harmful to patients not currently taking beta blockers who are undergoing noncardiac surgery.

← New

Clinical Risk Factors for Perioperative Cardiovascular Complications

Those used in our 2009 recommendations, are unchanged from the 2007 document and include the following:

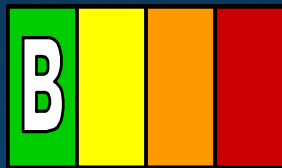
- history of ischemic heart disease
- history of compensated or prior heart failure;
- history of cerebrovascular disease;
- diabetes mellitus; and
- renal insufficiency (defined in the Revised Cardiac Risk Index as a preoperative serum creatinine of >2 mg/dL)

Recommendations for Perioperative Beta-Blocker Therapy

Surgery	No Clinical Risk Factors	CAD or High Risk (1 or more clinical risk factors)	Patients Currently Taking Beta Blockers
Vascular	Class IIb, Level of Evidence: B	Class IIa, Level of Evidence: B	Class 1, Level of Evidence: C
Intermediate risk	...	Class IIa, Level of Evidence: B	Class 1, Level of Evidence: C
Low risk	Class 1, Level of Evidence: C

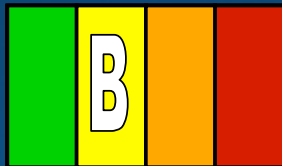
Recommendations for Statin Therapy

I IIa IIb III



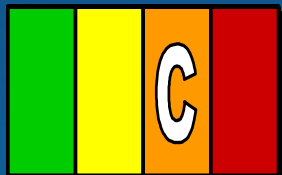
For patients currently taking statins and scheduled for noncardiac surgery, statins should be continued.

I IIa IIb III



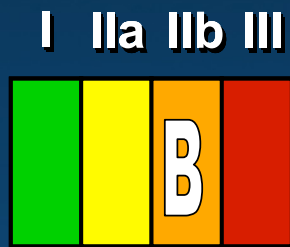
For patients undergoing vascular surgery with or without clinical risk factors, statin use is reasonable.

I IIa IIb III

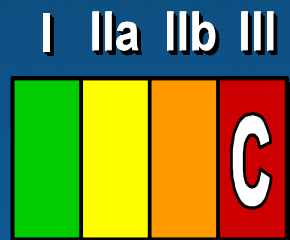


For patients with at least 1 clinical risk factor who are undergoing intermediate-risk procedures, statins may be considered.

Recommendations for Alpha-2 Agonists

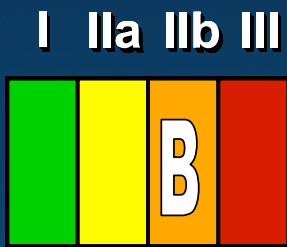


Alpha-2 agonists for perioperative control of hypertension may be considered for patients with known CAD or at least 1 clinical risk factor who are undergoing surgery.



Alpha-2 agonists should not be given to patients undergoing surgery who have contraindications to this medication.

Recommendations for PA Catheters & Anesthetic agents



Preoperative intensive care monitoring with a pulmonary artery catheter for optimization of hemodynamic status might be considered; however, it is rarely required and should be restricted to a very small number of highly selected patients whose presentation is unstable and complex and who have multiple comorbid conditions.

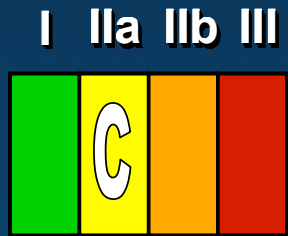
It can be beneficial to use volatile anesthetic agents during noncardiac surgery for the maintenance of general anesthesia in hemodynamically stable patients at risk for myocardial Ischemia (Class IIa, level B).

Recommendations for IV Nitro

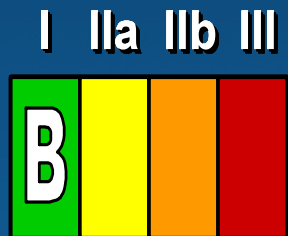


The usefulness of intraoperative nitroglycerin as a prophylactic agent to prevent myocardial ischemia and cardiac morbidity is unclear for high-risk patients undergoing noncardiac surgery, particularly those who have required nitrate therapy to control angina. The recommendation for prophylactic use of nitroglycerin must take into account the anesthetic plan and patient hemodynamics and must recognize that vasodilation and hypovolemia can readily occur during anesthesia and surgery.

Use of TEE and Maintenance of Body Temperature



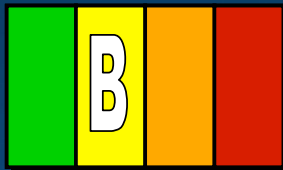
The emergency use of intraoperative or perioperative TEE is reasonable to determine the cause of an acute, persistent, and life-threatening hemodynamic abnormality.



Maintenance of body temperature in a normothermic range is recommended for most procedures other than during periods in which mild hypothermia is intended to provide organ protection (e.g. during high aortic cross-clamping)

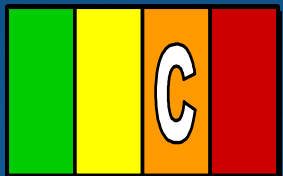
Perioperative Control of Blood Glucose Concentration

I IIa IIb III



It is reasonable that blood glucose concentration be controlled during the perioperative period in patients with diabetes mellitus or acute hyperglycemia who are at high risk for myocardial ischemia or who are undergoing vascular and major surgical procedures with planned ICU admission.

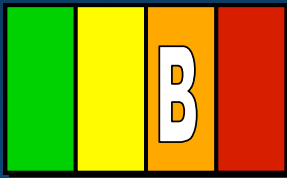
I IIa IIb III



The usefulness of strict control of blood glucose concentration during the perioperative period is uncertain in patients with diabetes mellitus or acute hyperglycemia who are undergoing noncardiac surgical procedures without planned ICU admission.

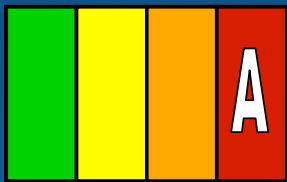
Perioperative Use of PACs

I IIa IIb III



The use of a PAC may be reasonable in patients at risk for major hemodynamic disturbances that are easily detected by a PAC. However, the decision must be based on 3 parameters: patient disease, surgical procedure (i.e. intraoperative and postoperative fluid shifts), and practice setting (experience in PAC use and interpretation of results), because incorrect interpretation of the data from a PAC may cause harm.

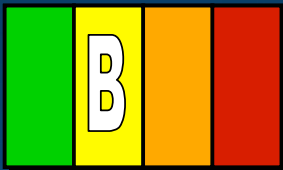
I IIa IIb III



Routine use of a PAC perioperatively, especially in patients at low risk of developing hemodynamic disturbances, is not recommended.

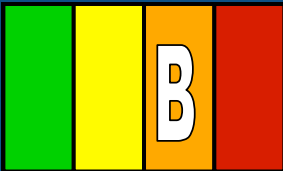
Intraoperative and Postoperative Use of ST-Segment Monitoring

I IIa IIb III



Intraoperative and postoperative ST-segment monitoring can be useful to monitor patients with known CAD or those undergoing vascular surgery, with computerized ST segment analysis, when available, used to detect myocardial ischemia during the perioperative period.

I IIa IIb III



Intraoperative and postoperative ST-segment monitoring may be considered in patients with single or multiple risk factors for CAD who are undergoing noncardiac surgery.

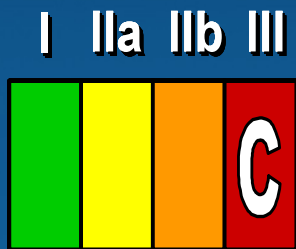
Surveillance for Perioperative MI



Postoperative troponin measurement is recommended in patients with ECG changes or chest pain typical of acute coronary syndrome



The use of postoperative troponin measurement is not well established in patients who are clinically stable and have undergone vascular and intermediate-risk surgery.



Postoperative troponin measurement is not recommended in asymptomatic stable patients who have undergone low-risk surgery.