

Perioperative Management of Cardiovascular Medications

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Perioperative Management

Overview

- **Learning objectives**
- **Beta-blockers**
- **Statins**
- **Alpha-2 agonists**
- **Calcium channel blockers**
- **ACE inhibitors and ARB's**
- **Anticoagulants**
- **Antiplatelet agents**
- **Clinical case scenarios**

Perioperative Management

Abbreviations

- **ACC: American College of Cardiology**
- **AHA: American Heart Association**
- **ACE : Angiotensin-converting enzyme**
- **ARB: Angiotensin receptor blocker**
- **MACE: Major adverse cardiac event(s)**

(cont.)

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Abbreviations (cont.)

- **RCRI: Revised Cardiac Risk Index**
- **ACS: Acute coronary syndrome**
- **PCI: Percutaneous coronary intervention**
- **DAPT: Dual antiplatelet therapy**
- **BMS: Bare metal stent**
- **DES: Drug-eluting stent**

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Learning Objectives

1. Discuss the perioperative management of the following classes of medication in patients undergoing noncardiac surgery:
 - Beta-blockers
 - Statins
 - Alpha-2 agonists
 - Calcium channel blockers
 - ACE inhibitors and ARB's
 - Anticoagulants
 - Antiplatelet agents

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Learning Objectives (cont.)

2. Apply this information to clinical scenarios.

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Beta-blockers

- **Based on most recent ACC/AHA guidelines:**
 - **Should *not* be initiated on the day of surgery!**
 - **Should be continued in patients who have been on beta-blockers chronically**
 - **It *may be reasonable* to begin β -blockers preoperatively*:**
 - **In patients with intermediate- (moderate) or high-risk myocardial ischemia noted on preoperative stress testing**
 - **In patients with 3 or more RCRI risk factors**
- *may be started 2-7 days prior to surgery, although few data suggest starting β -blockers > 30 days prior to surgery is preferred

Revised Cardiac Risk Index⁷

Two or more of the following risk factors make a patient "high risk."

High-risk surgery (intraperitoneal, intrathoracic, or supra-inguinal vascular procedures)

History of ischemic heart disease

History of congestive heart failure

History of cerebrovascular disease

Preoperative treatment with insulin

Preoperative serum creatinine >2.0 mg/dL

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Statins

- **Based on most recent ACC/AHA guidelines:**
 - **Should be continued in patients who have been on statins chronically**
 - ***It is reasonable to begin statins preoperatively in patients undergoing vascular surgery.***
 - **Preoperative initiation of statin therapy *may be considered* in patients scheduled for elevated-risk procedures who have clinical indications for initiation of statin therapy.**

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Alpha-2 agonists

- **Based on most recent ACC/AHA guidelines:**
 - **Preoperative initiation of an alpha-2 agonist for prevention of cardiac events *is not recommended.***

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Calcium channel blockers

- Based on most recent ACC/AHA guidelines:
 - Limited data
 - “A large-scale trial is needed to define the value of these agents.”

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ACE inhibitors and ARB's

- Based on most recent ACC/AHA guidelines:
 - *It is reasonable to continue these agents perioperatively.*
 - *If they are held before surgery, it is reasonable to restart them as soon as clinically feasible postoperatively.*

PERIOPERATIVE MEDICAL INTERVENTION WHEN CONSIDERING NONCARDIAC SURGERY				
Beta-blockers <ul style="list-style-type: none"> • Start in intermediate- to high-risk patients • Should not start on day of surgery • Should not be withdrawn if taking chronically 	Statin <ul style="list-style-type: none"> • Continued if on chronically • Start in vascular surgery patients • Considered in patients with clinical indications, undergoing elevated-risk procedures 	Alpha agonist <ul style="list-style-type: none"> • Initiation not recommended prior to noncardiac surgery 	ACE inhibitor <ul style="list-style-type: none"> • Continued, or if held before surgery, restart postoperatively as soon as clinically feasible 	Aspirin <ul style="list-style-type: none"> • Continued when the risk of increased cardiac events outweighs the risk of increased bleeding

Patel, A.Y. et al. J Am Coll Cardiol. 2015; 66(19):2140-8.

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Anticoagulants

- **Based on most recent ACC/AHA guidelines:**
 - ***It is reasonable to continue anticoagulation throughout the perioperative period for low bleeding risk procedures.***
 - **For intermediate- and high-risk procedures, the timing of anticoagulant discontinuation and need for “bridging” therapy depends on the risk of thrombosis while off anticoagulants vs. procedural bleeding risk.**

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Anticoagulants (cont.)

- **Temporary interruption of oral anticoagulant therapy for invasive procedures:**
 - For nonvalvular atrial fibrillation, short-term interruption of oral anticoagulant therapy is safe for most patients, provided that they have not previously suffered a stroke.
 - For patients at higher thromboembolic risk who are undergoing high risk procedures, “bridging” with a parenteral anticoagulant becomes a stronger consideration.

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Anticoagulants (cont.)

- **Temporary interruption of oral anticoagulant therapy for invasive procedures (cont.):**
 - **Warfarin**
 - Number of days warfarin must be withheld prior to procedure depends on that individual’s usual maintenance dose
 - Check INR prior to procedure to assure subtherapeutic level
 - **Dabigatran**
 - If CrCl > 50 ml/min, stop dabigatran at least 1-2 days prior to procedure
 - If CrCl < 50 ml/min, stop dabigatran at least 3-5 days prior to procedure

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Anticoagulants (cont.)

- **Temporary interruption of oral anticoagulant therapy for invasive procedures (cont.):**
 - **Apixaban**
 - For moderate-high-bleeding risk procedures, stop apixaban at least 48 hours prior to the procedure.
 - For low bleeding-risk procedures, stop apixaban at least 24 hours prior to the procedure.
 - **Rivaroxaban & edoxaban**
 - Stop rivaroxaban and edoxaban at least 24 hours (\geq 48 hours for procedures in which hemostatic control is essential) prior to the procedure.

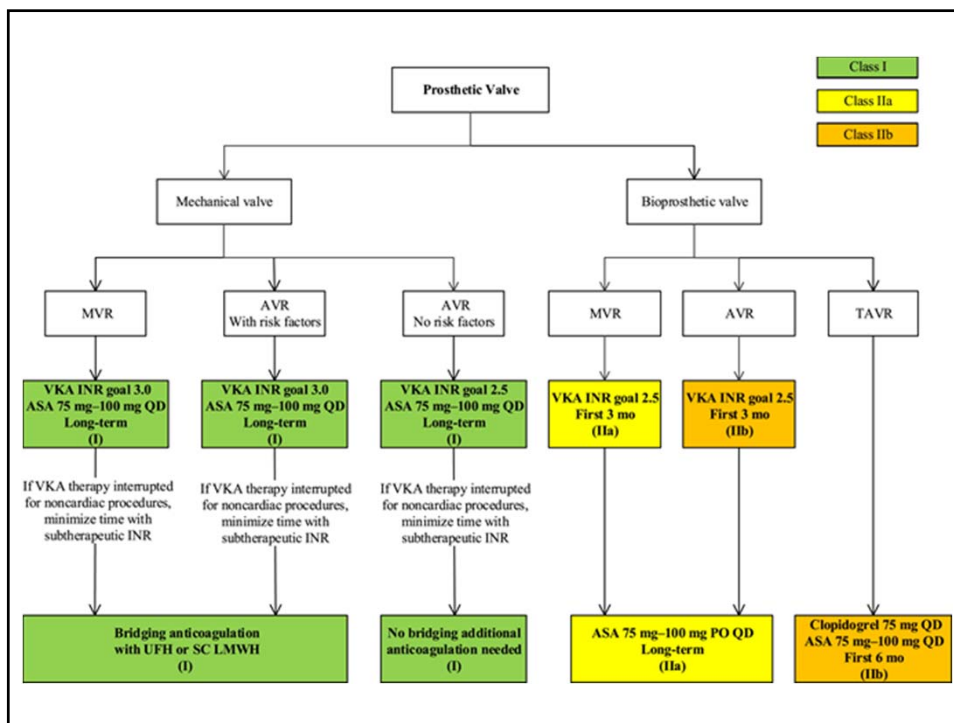
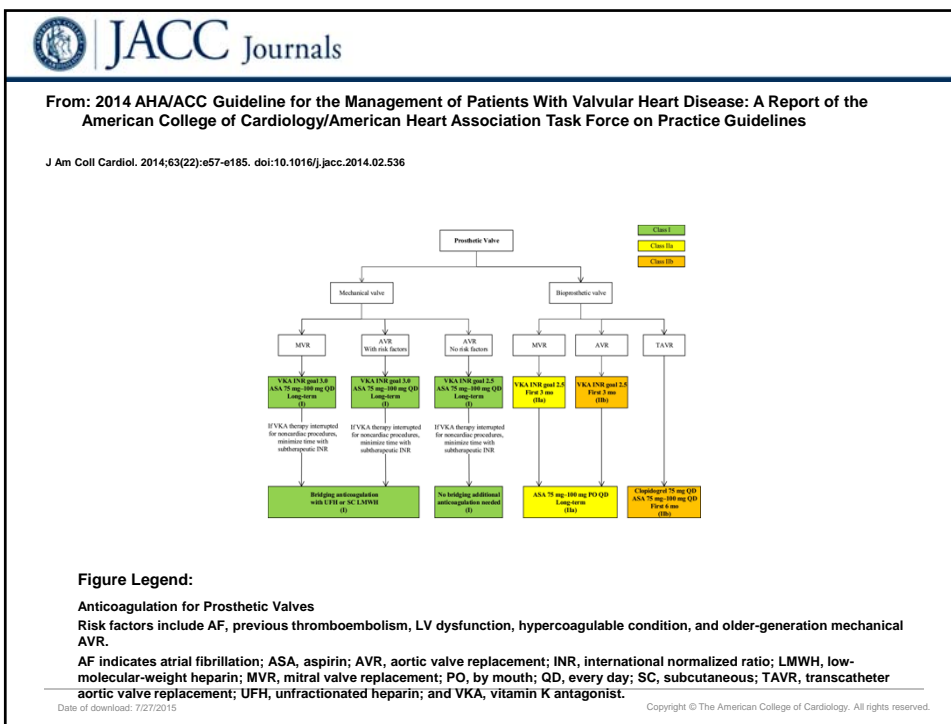
Cardiology > Prevention

Another NOAC, Bevyxxa, Approved; PCSK9 Vaccine; HF and Diabetes

Recent developments of interest in cardiovascular medicine

by [Crystal Phend](#), Senior Associate Editor, MedPage Today June 26, 2017

The FDA [approved direct factor Xa inhibitor betrixaban \(Bevyxxa\)](#) for the prophylaxis of venous thromboembolism in adults hospitalized for an acute medical illness at risk due to moderate or severe restricted mobility and other risk factors. The recommended dose is an initial single dose of 160 mg then 80 mg once daily for 35 to 42 days.



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Anticoagulants (cont.)

“Risk factors” on previous slide include:

- **Atrial fibrillation**
- **Previous thromboembolism**
- **LV dysfunction**
- **Hypercoagulable condition**
- **Older-generation mechanical valve prosthesis**

Cardiovascular Case for questions 1 & 2

Use the following case for the next two questions:

A 46-year-old female presents for preoperative evaluation prior to elective total abdominal hysterectomy. Her medical history is significant for uterine fibroids, hypertension, and paroxysmal atrial fibrillation. An echocardiogram performed last month revealed normal left ventricular systolic function, mild tricuspid regurgitation, trace mitral regurgitation, and no significant structural abnormalities. Her medications include warfarin 2 mg PO daily and atenolol 25 mg PO BID. Her INR is 2.8. The remainder of her lab work (CBC and CMP) is within normal limits. Physical examination reveals: blood pressure 126/82 mmHg, pulse 80 bpm, and respirations 12 per min. There is no jugular venous distension, lungs are clear to auscultation bilaterally (no crackles or wheezes), cardiac rhythm is regular and there is no S3, S4, murmur, or rub. There is no peripheral edema.

Cardiovascular Case 1**Question 1**

Which of the following is the most appropriate recommendation regarding anticoagulation prior to surgery?

- A. Discontinue warfarin now, as anticoagulation is not indicated in this patient.
- B. Discontinue warfarin four days prior to scheduled surgery. Check the INR daily. When the INR is < 2 , begin enoxaparin 1 mg/kg SQ BID and continue it until the morning of surgery.
- C. Discontinue warfarin four days prior to scheduled surgery. Check the INR the morning of scheduled surgery. Proceed with surgery if the INR is < 2 .
- D. Continue warfarin through the day before scheduled surgery. Withhold warfarin on the morning of surgery and initiate a continuous intravenous infusion of unfractionated heparin, which may then be discontinued on call to the operating room.

Cardiovascular Case 1**Question 1**

Which of the following is the most appropriate recommendation regarding anticoagulation prior to surgery?

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- B. Discontinue warfarin four days prior to scheduled surgery. Check the INR daily. When the INR is < 2 , begin enoxaparin 1 mg/kg SQ BID and continue it until the morning of surgery.
- C. Discontinue warfarin four days prior to scheduled surgery. Check the INR the morning of scheduled surgery. Proceed with surgery if the INR is < 2 .
- D. Continue warfarin through the day before scheduled surgery. Withhold warfarin on the morning of surgery and initiate a continuous intravenous infusion of unfractionated heparin, which may then be discontinued on call to the operating room.

Cardiovascular Case 1**Question 2**

Provided that the surgery was uneventful, which of the following is the most appropriate recommendation regarding anticoagulation postoperatively?

- A. Do not resume anticoagulation postoperatively, as it is not indicated in this patient.
- B. Resume warfarin as soon as the surgeon feels that the patient is at a low risk for bleeding. Discharge the patient when the INR is ≥ 2 .
- C. Begin enoxaparin 1 mg/kg SQ BID and resume warfarin 2 mg PO daily as soon as the surgeon feels that the patient is at a low risk for bleeding. Check the INR daily. Discontinue enoxaparin and discharge the patient when the INR is ≥ 2 .
- D. Begin enoxaparin 1 mg/kg SQ BID and resume warfarin 2 mg PO daily as soon as the surgeon feels that the patient is at a low risk for bleeding. Check the INR daily until the INR is ≥ 2 . Discontinue enoxaparin after 10 doses regardless of INR.

Cardiovascular Case 1**Question 2**

Provided that the surgery was uneventful, which of the following is the most appropriate recommendation regarding anticoagulation postoperatively?

- A. Do not resume anticoagulation postoperatively, as it is not indicated in this patient.
- B. Resume warfarin as soon as the surgeon feels that the patient is at a low risk for bleeding. Discharge the patient when the INR is ≥ 2 .
- C. Begin enoxaparin 1 mg/kg SQ BID and resume warfarin 2 mg PO daily as soon as the surgeon feels that the patient is at a low risk for bleeding. Check the INR daily. Discontinue enoxaparin and discharge the patient when the INR is ≥ 2 .
- D. Begin enoxaparin 1 mg/kg SQ BID and resume warfarin 2 mg PO daily as soon as the surgeon feels that the patient is at a low risk for bleeding. Check the INR daily until the INR is ≥ 2 . Discontinue enoxaparin after 10 doses regardless of INR.

Cardiovascular Case for questions 3 & 4**Use the following case for the next two questions:**

A 66-year-old male presents for preoperative evaluation prior to elective total right knee arthroplasty. His medical history is significant for DJD, type II diabetes mellitus, and paroxysmal atrial fibrillation. An echocardiogram performed three months ago revealed mild left ventricular systolic dysfunction (LVEF 45%), mild mitral regurgitation, trace tricuspid regurgitation, and mild thickening of the aortic valve without stenosis. His medications include rivaroxaban 20 mg PO daily, metformin 500 mg PO BID, sitagliptin 100 mg PO daily, metoprolol 25 mg PO BID, and acetaminophen 650 mg PO q 6 hrs. PRN pain. His preoperative lab work (including PT/INR, CBC, and CMP) are within normal limits. Physical examination reveals: Temperature 97.8°F, blood pressure 122/76 mmHg, pulse 68 bpm, and respirations 14 per min. There is no jugular venous distension, lungs are clear to auscultation bilaterally, cardiac rhythm is regular, a soft S4 is present, and there is no S3. A grade 2/6 pansystolic murmur is heard at the cardiac apex. Abdominal exam is unremarkable. With the exception of mild swelling of the right knee, there is no peripheral edema.

Cardiovascular Case 2**Question 3**

Which of the following is the most appropriate recommendation regarding anticoagulation prior to surgery?

- A. Discontinue rivaroxaban now, as anticoagulation is not indicated in this patient.
- B. Discontinue rivaroxaban 48 hours prior to scheduled surgery. Begin enoxaparin 1 mg/kg SQ BID 24 hours after the last rivaroxaban dose. Discontinue enoxaparin on the morning of surgery.
- C. Discontinue rivaroxaban 48 hours prior to scheduled surgery. Order a factor Xa inhibition assay on the morning of scheduled surgery. Proceed with surgery if the assay reveals subtherapeutic factor Xa inhibition.
- D. Discontinue rivaroxaban 48 hours prior to scheduled surgery.

Cardiovascular Case 2**Question 3**

Which of the following is the most appropriate recommendation regarding anticoagulation prior to surgery?

- A. Discontinue rivaroxaban now, as anticoagulation is not indicated in this patient.
- B. Discontinue rivaroxaban 48 hours prior to scheduled surgery. Begin enoxaparin 1 mg/kg SQ BID 24 hours after the last rivaroxaban dose. Discontinue enoxaparin on the morning of surgery.
- C. Discontinue rivaroxaban 48 hours prior to scheduled surgery. Order a factor Xa inhibition assay on the morning of scheduled surgery. Proceed with surgery if the assay reveals subtherapeutic factor Xa inhibition.
- D. Discontinue rivaroxaban 48 hours prior to scheduled surgery.

Cardiovascular Case 2**Question 4**

Provided that the surgery was uneventful, which of the following is the most appropriate recommendation regarding anticoagulation postoperatively?

- A. Do not resume anticoagulation postoperatively, as it is not indicated in this patient.
- B. Resume rivaroxaban 20 mg PO daily as soon as the surgeon feels that the patient is at a low risk for bleeding. Obtain a factor Xa inhibition assay daily after resuming rivaroxaban. Discharge the patient when the assay reveals therapeutic factor Xa inhibition.
- C. Begin enoxaparin 1 mg/kg SQ BID and resume rivaroxaban 20 mg PO daily as soon as the surgeon feels that the patient is at a low risk for bleeding. Discontinue enoxaparin after four days, as it takes five half-lives to achieve steady state with rivaroxaban.
- D. Resume rivaroxaban 20 mg PO daily as soon as the surgeon feels that the patient is at a low risk for bleeding.

Cardiovascular Case 2**Question 4**

Provided that the surgery was uneventful, which of the following is the most appropriate recommendation regarding anticoagulation postoperatively?

- A. Do not resume anticoagulation postoperatively, as it is not indicated in this patient.
- B. Resume rivaroxaban 20 mg PO daily as soon as the surgeon feels that the patient is at a low risk for bleeding. Obtain a factor Xa inhibition assay daily after resuming rivaroxaban. Discharge the patient when the assay reveals therapeutic factor Xa inhibition.
- C. Begin enoxaparin 1 mg/kg SQ BID and resume rivaroxaban 20 mg PO daily as soon as the surgeon feels that the patient is at a low risk for bleeding. Discontinue enoxaparin after four days, as it takes five half-lives to achieve steady state with rivaroxaban.
- D. Resume rivaroxaban 20 mg PO daily as soon as the surgeon feels that the patient is at a low risk for bleeding.

<https://youtu.be/-4EDhdAHrOg>

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Antiplatelet agents

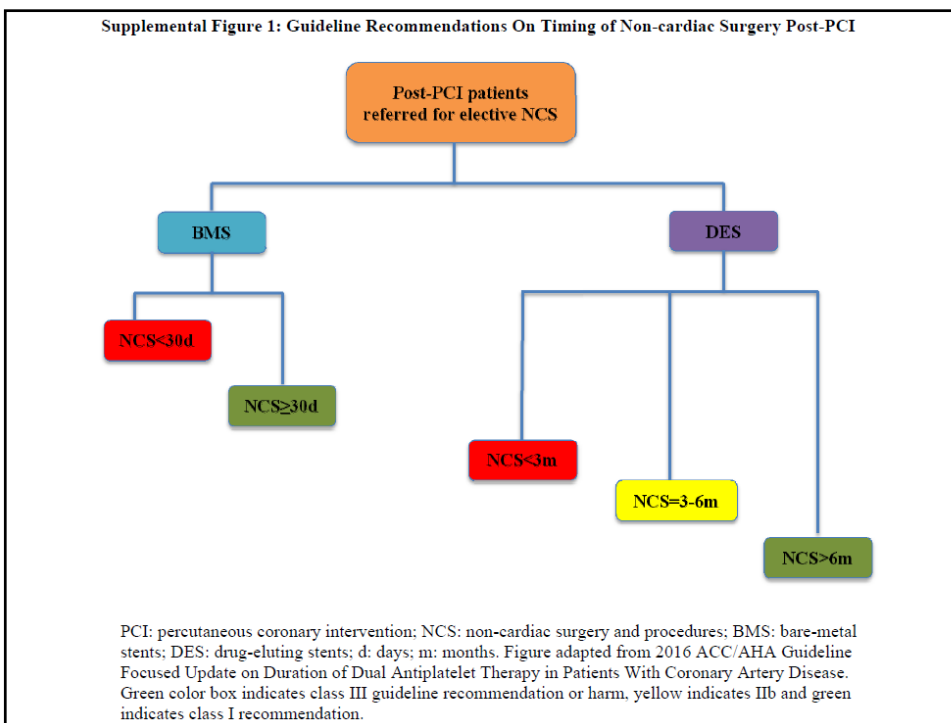
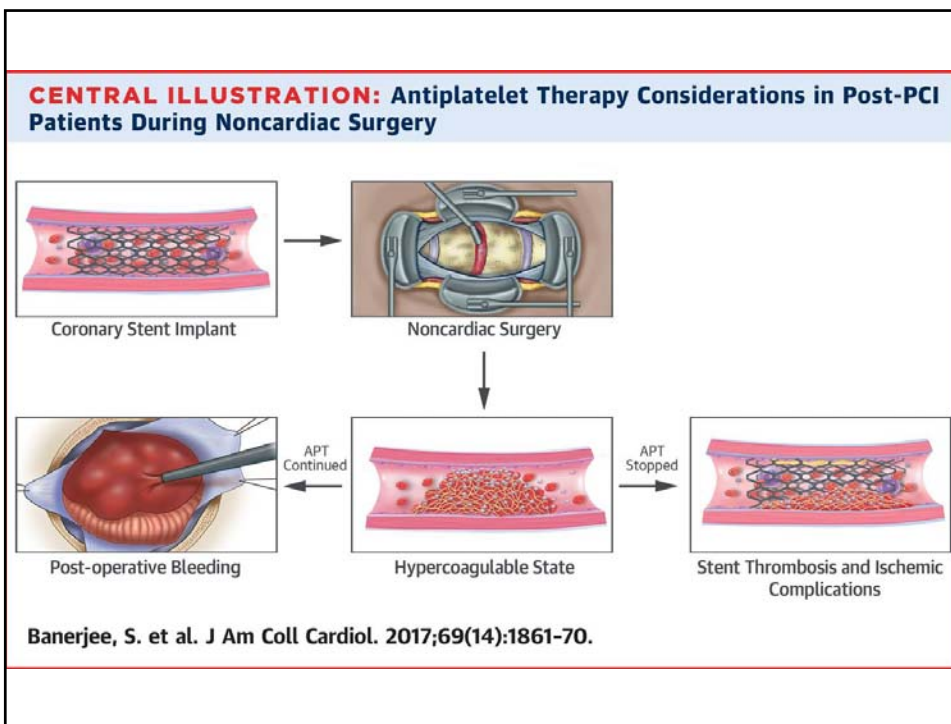
- **Based on most recent ACC/AHA guidelines:**
 - **For elective (non-urgent, non-emergent) noncardiac noncarotid surgery in patients who have *not* had previous coronary stenting:**
 - **Initiation or continuation aspirin is *not beneficial***
 - **“It *may be reasonable* to continue aspirin (low-dose) perioperatively when the risk of increased cardiac events outweighs the risk of increased bleeding.”**

(cont.)

Perioperative Management

Antiplatelet agents

- **Based on most recent ACC/AHA guidelines:**
 - **For noncardiac surgery in patients who *have* previously undergone coronary stenting:**
 - **Elective surgery should be delayed ≥ 30 days after BMS implantation, and optimally ≥ 6 months after DES implantation.**
 - **In patients receiving DAPT after stenting who must undergo surgery that mandates the discontinuation of P2Y₁₂ inhibitor therapy, it is recommended that aspirin be continued if possible and the P2Y₁₂ inhibitor be restarted as soon as possible after surgery.**
 - **Elective surgery after DES implantation in patients undergoing procedures in which P2Y₁₂ inhibitor therapy will need to be discontinued *may be considered* after 3 months if the risk of further delay of surgery is greater than the expected risk of stent thrombosis.**



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ACC/AHA FOCUSED UPDATE

2016 ACC/AHA Guideline Focused Update on Duration of Dual Antiplatelet Therapy in Patients With Coronary Artery Disease

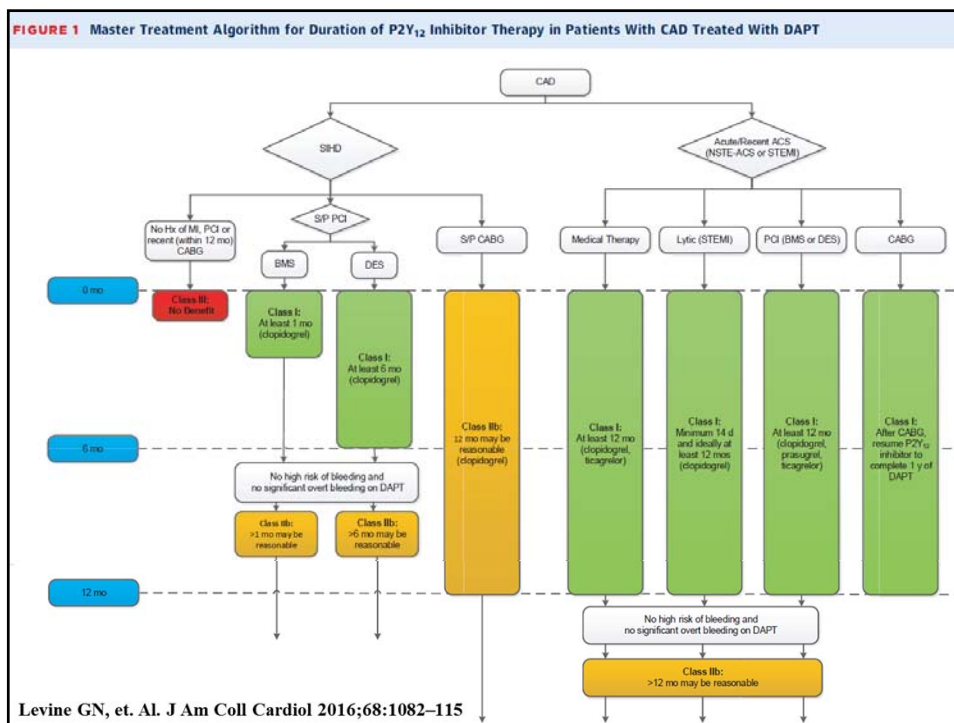
A Report of the American College of Cardiology/American Heart Association
 Task Force on Clinical Practice Guidelines

An Update of the 2011 ACCF/AHA/SCAI Guideline for Percutaneous Coronary Intervention,
 2011 ACCF/AHA Guideline for Coronary Artery Bypass Graft Surgery, 2012 ACC/AHA/ACP/AATS/
 PCNA/SCAI/STS Guideline for the Diagnosis and Management of Patients With Stable Ischemic Heart
 Disease, 2013 ACCF/AHA Guideline for the Management of ST-Elevation Myocardial Infarction,
 2014 AHA/ACC Guideline for the Management of Patients With Non-ST-Elevation Acute Coronary
 Syndromes, and 2014 ACC/AHA Guideline on Perioperative Cardiovascular Evaluation and
 Management of Patients Undergoing Noncardiac Surgery

*Developed in Collaboration With the American Association for Thoracic Surgery,
 American Society of Anesthesiologists, Society for Cardiovascular Angiography and Interventions,
 Society of Cardiovascular Anesthesiologists, and Society of Thoracic Surgeons.*

Endorsed by Preventive Cardiovascular Nurses Association and Society for Vascular Surgery

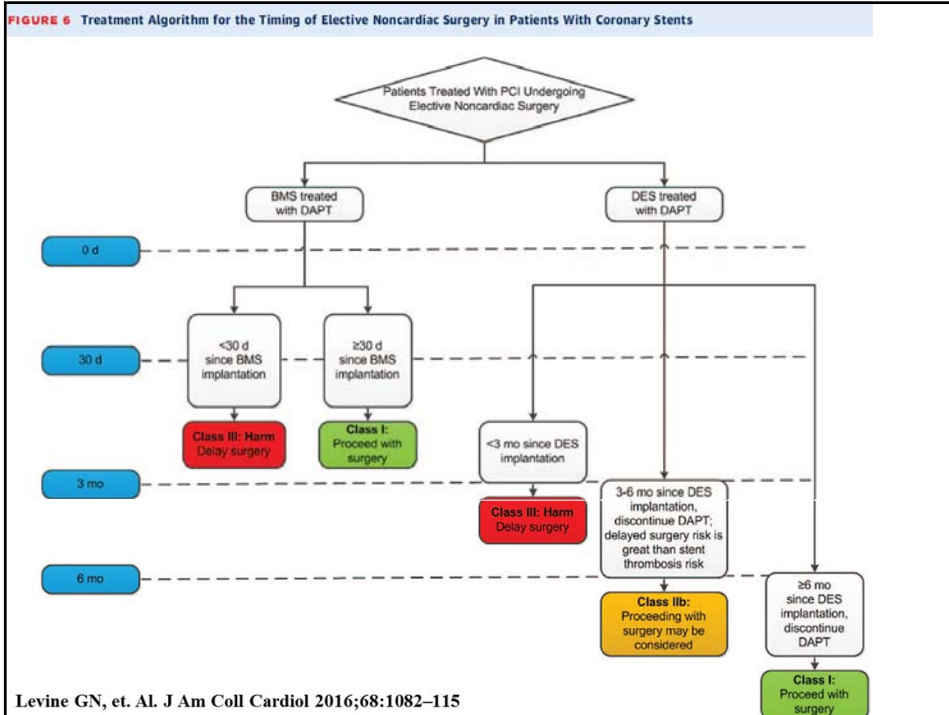
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Legend for the preceding figure:

Colors correspond to Class of Recommendation in Table 1. Clopidogrel is the only currently used P2Y₁₂ inhibitor studied in patients with SIHD undergoing PCI. Aspirin therapy is almost always continued indefinitely in patients with CAD. Patients with a history of ACS >1 year prior who have since remained free of recurrent ACS are considered to have transitioned to SIHD. In patients treated with DAPT after DES implantation who develop a high risk of bleeding (e.g., treatment with oral anticoagulant therapy), are at high risk of severe bleeding complication (e.g., major intracranial surgery), or develop significant over bleeding, discontinuation of P2Y₁₂ inhibitor therapy after 3 months for SIHD or after 6 months for ACS may be reasonable. Arrows at the bottom of the figure denote that the optimal duration of prolonged DAPT is not established. ACS indicates acute coronary syndrome; BMS, bare metal stent; CABG, coronary artery bypass graft surgery; CAD, coronary artery disease; DAPT, dual antiplatelet therapy; DES, drug-eluting stent; Hx, history; lytic, fibrinolytic therapy; NSTEMI-ACS, non-ST-elevation acute coronary syndrome; PCI, percutaneous coronary intervention; SIHD, stable ischemic heart disease; S/P, status post; and STEMI, ST-elevation myocardial infarction.

Levine GN, et. Al. J Am Coll Cardiol 2016;68:1082–115



A few more Cardiovascular Case Presentations...

Management of DAPT in noncardiac surgery patients...

The following cases were taken from...

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REVIEW TOPIC OF THE WEEK

Use of Antiplatelet Therapy/DAPT for Post-PCI Patients Undergoing Noncardiac Surgery



Subhash Banerjee, MD,^{a,b} Dominick J. Angiolillo, MD, PhD,^c William E. Boden, MD,^d Joseph G. Murphy, MD,^e
Houman Khalili, MD,^{a,b} Ahmed A. Hasan, MD, PhD,^f Robert A. Harrington, MD,^g Sunil V. Rao, MD^{h,i}

ABSTRACT

Dual antiplatelet therapy (DAPT) is prescribed to millions of patients worldwide following coronary stenting. DAPT is indicated to lower the risk of ischemic events, such as myocardial infarction, including stent thrombosis, ischemic stroke, or death from cardiovascular causes. A significant number of these patients undergo noncardiac surgery and may require DAPT interruption. This poses a significant clinical dilemma because DAPT interruption exposes patients to the potential risk of stent thrombosis, perioperative myocardial infarction, or both. Conversely, continuing DAPT may be associated with excess bleeding complications. Observational data in this area are conflicting, and there are no randomized clinical trials to guide practitioner decision making. On the basis of predominantly consensus recommendations, various strategies for managing DAPT during the perioperative period have been proposed. This review presents 3 commonly encountered clinical scenarios that lead into an evidence-based discussion of practical strategies for managing perioperative antiplatelet therapy in patients following percutaneous coronary intervention. (J Am Coll Cardiol 2017;69:1861-70) Published by Elsevier on behalf of the American College of Cardiology Foundation.

CASE 1. A 52-year-old man with no significant past medical history is admitted for evaluation of painless rectal bleeding. Colonoscopy shows stage I transverse colon carcinoma with near lumen obstruction. The patient experiences retrosternal chest discomfort while in recovery, relieved partially with sublingual nitroglycerin, accompanied by 2 mm of ST-segment depression in leads V₁₋₃, an elevated troponin I level consistent with the diagnosis of non-ST-segment elevation acute coronary syndrome (NSTEMI-ACS), and a stable hemoglobin value. The cardiology consult team recommends coronary angiography, which is performed the following day. It reveals preserved left ventricular systolic function and a severe proximal left anterior descending coronary artery (LAD) stenosis. Your interventionalist reaches out to you for guidance on how to best address this “on-table” coronary revascularization dilemma and ensuing questions surrounding dual antiplatelet therapy (DAPT) recommendations preceding the patient’s colon surgery, which, by all measures, cannot be postponed indefinitely.

Case 1	
Clinical problem	Post-colonoscopy NSTEMI-ACS with high-grade proximal LAD stenosis
Management options	(a) Medical management of NSTEMI-ACS with IV nitroglycerin, aspirin, and beta-blockers as tolerated and recommend urgent colectomy during this hospital admission
	(b) Perform LAD PCI with a BMS followed by treatment with daily low-dose aspirin (81 mg) and clopidogrel (75 mg) after a loading dose, and a recommendation for colectomy in 6 weeks

(cont.)

Case 1	
	(c) Perform LAD PCI with DES, prescribe daily low-dose aspirin (81 mg) and clopidogrel (75 mg) after a loading dose and recommend colectomy after 6 months
	(d) Perform balloon angioplasty of the proximal LAD lesion followed by treatment with daily low-dose aspirin (81 mg) and clopidogrel (75 mg) after a loading dose and defer colectomy for at least 2 weeks
	(e) Consider off-pump CABG with planned LIMA graft to the LAD followed by colectomy in 6 weeks

What the experts say...

Case 1	
Clinical problem	Post-colonoscopy NSTEMI-ACS with high-grade proximal LAD stenosis
Proposed strategy	Balloon angioplasty of the proximal LAD lesion followed by treatment with daily low-dose aspirin (81 mg) and clopidogrel (75 mg) after a loading dose and defer colectomy for at least 2 weeks

CASE 2. A 72-year-old obese woman, with a history of type 2 diabetes mellitus, prior MI, and 4-vessel CABG 5 years ago, presents for pre-operative evaluation before an elective right knee replacement surgery to treat her longstanding disabling osteoarthritis. Since CABG, she has undergone 3 PCI procedures and received 12 coronary DES implants, the latest approximately 14 months ago (3 DES to the right coronary artery). She is currently on low-dose aspirin and ticagrelor.

Which of the following options is the preferred perioperative antiplatelet management strategy: 1) advise against knee surgery; 2) perform myocardial perfusion imaging with pharmacological stress and, if low to intermediate risk, stop ticagrelor, proceed with surgery on aspirin, and resume clopidogrel soon after NCS; 3) stop aspirin and ticagrelor, and restart both agents as soon as feasible post-operatively; or 4) continue DAPT during scheduled NCS?

Case 2
Elective knee surgery for disabling osteoarthritis in a 72 year old patient with diabetes mellitus, prior MI, CABG, and most recent PCI 14 months ago with 3 DES. She is currently on low dose aspirin and ticagrelor
(a) Advise against knee surgery
(b) Myocardial perfusion imaging with pharmacologic stress and if low to intermediate risk, stop ticagrelor, proceed with surgery on aspirin, and resume clopidogrel soon after NCS

(cont.)

Case 2
(c) Stop aspirin and ticagrelor and restart both agents as soon as feasible post-operatively
(d) Continue DAPT during scheduled NCS

What the experts say...

Case 2
Elective knee surgery for disabling osteoarthritis in a 72 year old patient with diabetes mellitus, prior MI, CABG, and most recent PCI 14 months ago with 3 DES. She is currently on low dose aspirin and ticagrelor
Strategy to withhold ticagrelor 5 days prior to NCS and continue low-dose aspirin perioperatively following a low or intermediate risk stress myocardial perfusion imaging may be the best course of action

Perioperative Management

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