CHAPTER

214

Update in Preoperative Cardiovascular Evaluation and Perioperative Cardiovascular Medical Management

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INTRODUCTION

Major adverse cardiac events (MACE) are among the most common causes of perioperative mortality and morbidity. As such, the most recent key updates in perioperative medicine are related to perioperative cardiovascular risk assessment and management. The 2014 and 2016 American College of Cardiology/American Heart Association perioperative guidelines provide expert consensus on these topics. These guidelines include new definitions of operative urgency and risk, as well as more direction regarding perioperative cardiovascular testing and medical management. Patient-specific plus procedure-specific risk factors are crucial to determine an individual's perioperative risk profile. Clinical judgement remains a core principle. Close communication among care teams also is essential.[1]

PREOPERATIVE CARDIOVASCULAR RISK STRATIFICATION

The first step of preoperative cardiovascular evaluation is to determine the urgency of the proposed non-cardiac procedure.(1) An emergency procedure is needed in less than six hours, to mitigate threat to life or to limb; in this situation, very limited preoperative evaluation is necessary. An urgent procedure is needed within 6-24 hours, to mitigate threat to life or limb; some preoperative cardiovascular evaluation may be feasible, if warranted. A time-sensitive procedure is necessary within 1-6 weeks; more preoperative testing may be feasible, if indicated; further delay for evaluation and significant changes in management will negatively affect outcome. An elective procedure may be delayed up to one year; this allows greatest time for preoperative evaluation and intervention, if needed.[1]

From a cardiovascular perspective, procedures may be categorized as low procedure-specific risk or elevated procedure-specific risk.[1] Low cardiovascular risk procedures are those which confer less than 1% risk of major adverse cardiac event (MACE). Common examples include endoscopic procedures, superficial procedures, cataract surgery, most breast surgery, and ambulatory surgery. Key examples of elevated cardiovascular risk procedures (risk of MACE greater than 1%) include emergent major operations, particularly in elderly patients; aortic and other major vascular surgery; prolonged procedures with large fluid shifts and/or blood loss; head and neck surgery; intraperitoneal and intrathoracic surgery; major orthopedic surgery; and open urologic surgery.[1]

The risk of perioperative major adverse cardiac event (MACE) may be estimated by compilation of patient-specific and procedure-specific risk factors through the Revised Cardiac Risk Index (RCRI) score, NSQIP score, or other similar scoring method.[2,3,1] A patient is deemed of low perioperative cardiovascular risk if the risk of perioperative major adverse cardiovascular event (MACE) is less than 1%. A patient is of elevated perioperative cardiovascular risk if the risk of perioperative major adverse cardiovascular event (MACE) is greater than 1%. The combination of urgency of procedure, patient-specific risk, and procedure-specific risk is used to determine need for preoperative cardiovascular testing and perioperative cardiovascular medical management.[1]

PREOPERATIVE CARDIOVASCULAR TESTING

A screening preoperative electrocardiogram (ECG) is indicated in the setting of one or more patient-specific perioperative risk factors plus an elevated-risk procedure. A screening preoperative ECG is not clearly warranted in a stable patient undergoing a low-risk procedure, even in a patient with known cardiovascular disease or multiple cardiovascular risk factors. Age alone is not a well proven independent indication for preoperative ECG.[1]

For non-cardiac surgery, routine screening with noninvasive cardiovascular testing is not useful for patients at low cardiovascular risk. If a patient has a functional capacity greater than 10 METs, even with known cardiovascular disease, then additional screening preoperative cardiac testing is not indicated.[1]

Resting echocardiography is indicated or reasonable if clinically-suspected moderate or greater cardiac valvular disease (particularly if no echocardiography within one year, or if significant change in clinical status or physical exam); in adults who meet standard indications for cardiac valvular intervention (replacement or repair), on basis of symptoms and severity of valvular stenosis or regurgitation; if dyspnea of unknown origin; or if heart failure with worsening dyspnea or other decline in clinical status. Resting echocardiography may be considered in a clinically stable patient with history of LV dysfunction, if no such assessment within one year; however, this recommendation is weaker, and is most applicable if results will affect management.(1)

Preoperative cardiac stress testing is indicated if perioperative MACE risk is greater than 1% and results will affect management. This is particularly true in the setting of poor functional capacity (less than 4 METs) or unknown functional capacity, plus an elevated-risk procedure. If a cardiac stress test is warranted even in the absence of non-cardiac surgery, then it should be obtained prior to non-emergency noncardiac surgery.[1]

Exercise ability, comorbidities, baseline ECG, and institutional expertise influence the choice of a cardiac stress study. Cardiac stress test selection entails selection of a cardiac physiologic stress modality, plus selection of a cardiac functional assessment modality.[1,4-6] These are summarized further as follows:

COMMON CARDIAC PHYSIOLOGIC STRESS MODALITIES

Exercise[4-6]

Exercise should be utilized in cardiac stress testing, when possible. Poor exercise capacity or inability to achieve > 85% predicted maximal heart rate is associated with 24% risk of postoperative cardiac event, independent of ischemic ECG changes. However, exercise may not be feasible in the context of orthopedic limitation, neurologic deficit, poor pulmonary function, severe to critical vascular disease, and/or other exercise limitations.

Adenosine, Regadenoson, and Dipyridamole[4-6]

These are vasodilators that cause a coronary "steal" phenomenon. They may be options for physiologic cardiac stress in some patients with exercise limitations. Major adverse effects of these agents include hypotension, atrioventricular block, and bronchospasm. Adenosine. regadenoson, and dipyridamole should be avoided in patients with low systemic blood pressure, high-grade A-V block, known poor cardiac reserve, severe to critical cerebrovascular disease, or substantial bronchospastic disease. Theophylline and caffeine also decrease the effectiveness of the vasodilators.

Dobutamine[4-6]

Dobutamine is an adrenergic agent. It may be an option for physiologic cardiac stress in some patients with exercise limitations. Major adverse effects of dobutamine include cardiac dysrhythmias and severe hypertension. Dobutamine should be avoided in patients with baseline significant dysrhythmias or poorly-controlled systemic hypertension. Theophylline and caffeine do not impede the efficacy of dobutamine.

CARDIAC FUNCTIONAL ASSESSMENT MODALITIES

Stress ECG Alone[1,4-6]

Stress ECG alone confers high sensitivity and moderate specificity for risk of perioperative major adverse cardiovascular event (MACE). It is widely available, does not involve ionizing radiation, and is relatively inexpensive. Stress ECG may be non-diagnostic if certain baseline ECG abnormalities are present (including left bundle branch block, electronic ventricular pacing, left ventricular hypertrophy with repolarization abnormalities, ventricular preexcitation, baseline ST depression greater than 1 mm, digoxin effect, prior myocardial infarction, percutaneous coronary intervention, and coronary artery bypass surgery). Stress ECG, without cardiac imaging, is a reasonable option for preoperative cardiac stress testing, when feasible, based upon balance of these considerations.

Stress Echocardiography[1,7,8,4-6]

Stress echocardiography (with exercise or pharmacologic stress) is highly sensitive and specific for detection of myocardial ischemia or infarction. Image quality can be impaired by obesity or "barrel chest;" this limitation may be overcome in some patients by the use of saline contrast. Baseline cardiac regional wall motion abnormality or left bundle branch block can lead to falsely-positive stress echocardiography results. Stress echocardiography is relatively widely available and entails no ionizing radiation exposure, but is moderately costly.

SPECT Myocardial Perfusion Imaging (Technetium or Thallium)[1,7,4-6]

SPECT myocardial perfusion imaging (technetium or thallium) confers high sensitivity and specificity for detection of myocardial ischemia or infarction. The specificity of SPECT is slightly less than that of stress echocardiography. Image quality of SPECT myocardial perfusion imaging can be impaired by obesity, "barrel chest," or breast artifact (especially with thallium imaging). SPECT myocardial perfusion imaging is relatively widely available, does entail ionizing radiation exposure, and is costly. It is preferred over stress echocardiography in patients with known regional wall motion abnormalities.

Cardiac PET Imaging[5,6]

Cardiac PET imaging is useful to assess cardiac perfusion in patients with severe obesity. It is not widely available, entails ionizing radiation exposure, and is very costly.

PERIOPERATIVE ANTIPLATELET THERAPY

As with other aspects of perioperative medicine, decisions regarding perioperative management of antiplatelet therapy entail consideration of patient-specific and procedure-specific risk factors.[1] In the POISE-2 Trial, Devereaux et al identified increased perioperative bleeding within 30 days, among patients undergoing noncardiac surgery who received perioperative aspirin (4.6% aspirin vs. 3.8% placebo), with no significant difference in risks of myocardial infarction or mortality. However, in that study, only 23% of patients had known coronary artery disease; patients with recent coronary intervention (defined as PCI with bare metal stent placement within 6 weeks, PCI with drug eluting stent placement within 12 months) were excluded. Aspirin vs. non-aspirin patients had no significant difference in life-threatening bleeding.[9]

Other outcomes have been noted in surgical patients who are at increased cardiovascular risk. In a 2006 meta-analysis by Biondi-Zoccai et al, involving 50,279 surgical patients at elevated cardiovascular risk, perioperative discontinuation of aspirin was associated with three-fold increased risk of major adverse cardiac events

(MACE).[10] In a 2005 meta-analysis by Burger et al, including 41 studies, secondary-prevention aspirin was associated with a 1.5-fold increased risk of perioperative bleeding, but perioperative discontinuation of aspirin preceded 10% of all acute coronary events; there was no significant difference noted in the severity of bleeding between aspirin and non-aspirin patients, except in the context of intracranial surgery and possibly in the context of transurethral resection of the prostate. Burger et al concluded that aspirin should not be discontinued perioperatively, unless the risk of major perioperative bleeding exceeds the risk of cardiovascular events.[11]

Much attention has been devoted to antiplatelet therapy in the setting of coronary artery disease, including in the context of noncardiac surgery. Related care recommendations have been clarified through the, "2016 ACC/AHA Guideline Focused Update on Duration of Dual Antiplatelet Therapy in Patients with Coronary Artery Disease." For patients with stable ischemic heart disease (SIHD) who have undergone cardiac stent placement, elective noncardiac surgery should be postponed and dual antiplatelet therapy maintained for more than 30 days after bare metal stent placement and for more than six months after drug-eluting stent placement, to reduce the risk of major adverse cardiac event (MACE). However, if the risk posed by delay of noncardiac surgery is greater than the risk of stent thrombosis, discontinuation of clopidogrel may be considered after a minimum of three months. Secondary-prevention aspirin should be continued if at all possible. Clopidogrel should be resumed as soon as possible following surgery, once adequate hemostasis is confirmed. Elective noncardiac surgery should be delayed more than twelve months after acute coronary syndrome (ACS), whether the ACS has been addressed by medical therapy alone, PCI with bare metal stent (BMS) placement, PCI with drug-eluting stent (DES) placement, or coronary artery bypass graft (CABG).[1,12]

If noncardiac surgery must be performed within those periods after initial invasive or non-invasive treatment of coronary artery disease, then dual antiplatelet therapy should be maintained perioperatively unless the risk of major bleeding exceeds the risk of perioperative major adverse cardiac event (MACE). Key examples of reasons to hold dual antiplatelet therapy include active life-threatening major bleeding (massive gastrointestinal tract hemorrhage that does not respond to non-surgical measures, life-threatening intracranial hemorrhage) and urgent or emergency intracranial surgery. Primary-prevention antiplatelet therapy should be held preoperatively, unless the risk of major adverse cardiac event (MACE) is deemed greater than the risk of major perioperative bleeding with antiplatelet therapy.[1,12]

These are guidelines, not mandates. Urgency of procedure, major adverse cardiac event (MACE) risk, bleeding risk, and overall clinical judgement remain essential.[1,12]

PERIOPERATIVE BETA BLOCKADE

Patient-specific and procedure-specific considerations remain important to the complex topic of perioperative beta blockade. Perioperative beta blockade is associated with reduced risk of perioperative MACE, though increased risk of bradycardia, hypotension, and stroke. Perioperative beta blockade is associated with increased mortality in patients with zero or one RCRI risk factor, while also associated with decreased mortality in those with three or more RCRI risk factors. Ultimately, the decision regarding perioperative beta blockade is based on a balance of these.[13, 1]

The 2014 American College of Cardiology/American Heart Association Guideline on Perioperative Cardiovascular Evaluation and Management of Patients Undergoing Noncardiac Surgery includes expert consensus on perioperative use of beta blocker therapy. According to that guideline, perioperative beta blockade is recommended if a patient already chronically takes a beta-blocker agent, reasonable if a patient has known or strongly-suspected clinically significant coronary artery disease, and reasonable if a patient has three or more Revised Cardiac Risk Index (RCRI) risk factors for perioperative major adverse cardiac event (MACE) plus a planned elevated-risk procedure.[1] RCRI risk factors, as defined in 1999 by Lee et al, include high-risk surgery (intraperitoneal, intrathoracic, or suprainguinal vascular surgery), history of ischemic heart disease, history of heart failure, cerebrovascular disease, insulin-requiring diabetes mellitus, and serum creatinine level > 2.0 mg/dl.[2]

The 2014 ACC/AHA perioperative guideline supports greatest benefit from at least one week to one month titration of beta-blockade preoperatively (if indicated), continued at least one month postoperatively. Beta blockade should not be initiated on the day of surgery.[1] More cardioselective beta blocker agents (such as bisoprolol and atenolol) might confer lower stroke and mortality risk than less cardioselective agents (such as metoprolol).[13,1] COPD, without severe bronchospastic disease, is not a clear contraindication to cardioselective beta blocker therapy. [14, 15] Many patients who warrant perioperative beta blockade have long-term indications for such therapy; this is best addressed by each patient's primary care provider.[1]

PERIOPERATIVE STATIN THERAPY

Studies of perioperative statin therapy mostly are small, and/or retrospective, and/or limited to cardiac surgery or peripheral vascular surgery. Despite these limitations, perioperative "statin" therapy is associated with deceased perioperative major adverse cardiac event (MACE) risk, particularly in elevated perioperative cardiovascular risk situations. Plausible mechanisms for these benefits include coronary artery plaque stabilization, anti-inflammatory effects, and potentially decreased thrombogenesis.[1]

Studies in 2003 and 2004 demonstrated reduced all-cause mortality, cardiac mortality, and non-fatal cardiac events in patients who received perioperative statin therapy vs. placebo.[16-19] In 2006, a large meta-analysis of 15 trials, including more than 223,000 total patients, demonstrated a significant reduction in perioperative

mortality in patients on statin therapy who underwent cardiac surgery, peripheral vascular surgery, and non-cardiovascular surgery.[20] A 2009 randomized controlled trial of statin-naïve patients undergoing vascular surgery revealed a significant reduction in perioperative myocardial infarction and cardiovascular death.[21] Based on available evidence, the 2014 American College of Cardiology/American Heart Association perioperative guideline supports perioperative continuation of statin therapy, perioperative initiation of statin therapy in patients undergoing cardiac and vascular surgery, and perioperative initiation of statin therapy in patients at elevated cardiovascular risk who undergo elevated-risk procedures.[1]

OTHER PERIOPERATIVE CARDIOVASCULAR MEDICATION MANAGEMENT

Perioperative management of angiotensin converting enzyme-inhibitor (ACE-I) and of angiotensin receptor blocker (ARB) therapy has been controversial. In a 2012 retrospective study of over 79,000 patients who underwent non-cardiac surgery, ACE-I therapy was associated with higher rates of intraoperative hypotension, but was not significantly associated with other cardiovascular outcomes (death, myocardial infarction, and stroke). [(22)] Two trials of ACE-I and ARB therapy in vascular surgery patients demonstrated significantly more hypotensive events with these agents, but no difference in other cardiovascular outcomes.[23,24] In a large observational study, preoperative administration of ACE-Is and ARBs was associated with more frequent intraoperative hypotension, but no difference in rates of postoperative myocardial infarction or of renal failure.[25] A 2008 meta-analysis demonstrated a 50% incidence of perioperative hypotension in patients taking ACEI-s or ARBs, but no significant difference in other major perioperative cardiovascular outcomes.[26]

Two trials addressed the effects of discontinuation of ACE-Is and ARBs prior to non-cardiac surgery. These studies demonstrated no specific harm associated with discontinuation of ACE-Is and ARBs preoperatively. However, patients with poorly controlled hypertension or heart failure were not included in those studies.[24, 27]

Overall data demonstrates that ACE-Is and ARBs do increase the risk of transient intraoperative hypotension, but without clearly proven significant adverse effect on other perioperative cardiovascular outcomes. The 2014 American College of Cardiology/American Heart Association perioperative guideline supports either continuation or withholding of ACE-I and ARBs preoperatively, based on clinical judgement. This guideline further indicates that, if ACE-Is or ARBs are held preoperatively, that it is reasonable to restart them as soon as feasible postoperatively.[(1)] A reasonable approach is as follows: Continue ACE-I or ARB therapy perioperatively in patients with uncontrolled hypertension or with congestive heart failure; withhold ACE-I or ARB therapy preoperatively in patients with satisfactory blood pressures and no known congestive heart failure, but resume these agents postoperatively once stable hemodynamic status and renal function are confirmed.

The use of clonidine in the perioperative setting also has been controversial. A 2014 multicenter randomized control trial, which involved over 10,000 non-cardiac surgery patients, revealed no significant difference in perioperative mortality or myocardial infarction with clonidine compared to placebo.[28] However, in that study, clonidine was associated with substantially-elevated incidence of clinically significant hypotension and of non-fatal cardiac arrest.[28] Based upon this data, the 2014 American College of Cardiology/American Heart Association perioperative guideline includes recommendation against prophylactic use of alpha-2 agonists in the perioperative setting.[1] Initiation of clonidine for treatment of perioperative hypertensive emergency is indeterminate; if clonidine is used in this context, extreme caution and strong consideration of other antihypertensive therapies should be employed. Maintenance clonidine therapy should be continued perioperatively, if well-tolerated, due to risks of rebound hypertension and tachycardia if clonidine is discontinued abruptly.[1, 29]

PERIOPERATIVE MANAGEMENT OF OBSTRUCTIVE SLEEP APNEA

In patients with obstructive sleep apnea (OSA) or obesity hypoventilation syndrome, CPAP or BiPAP begun at least four to six weeks preoperatively is associated with several anatomic and physiologic benefits. These include reduced tongue volume, increased oropharyngeal volume, improved ventilatory drive, and improved cardiac function.[30-32] In the setting of uncontrolled obstructive sleep apnea or uncontrolled obesity hypoventilation syndrome, elective noncardiac surgery should be delayed to allow optimal CPAP or BiPAP therapy for at least four to six weeks preoperatively, if possible. If such delay is not feasible (e.g.: urgent or emergency surgery), then CPAP or BiPAP should be initiated as soon as possible postoperatively.[30-32]

CONCLUSION

Major adverse cardiac events (MACE) remain among the most common causes of perioperative mortality and morbidity. The most recent major updates in perioperative medicine are related to perioperative cardiovascular risk assessment and management. The 2014 and 2016 ACC/AHA perioperative cardiovascular guidelines include new definitions of operative urgency and risk, as well as more direction regarding perioperative cardiovascular testing and medical management. Patient-specific risk factors, procedure-specific risk factors, and clinical judgement remain crucial to determine a perioperative risk profile and subsequent perioperative care. Close communication among care teams also is essential.[1,12]

SAMPLE CASES

1. A 72 year-old female awaits removal of a nodular basal cell carcinoma of her right maxillofacial region. Her additional history is noteworthy for

coronary artery disease, myocardial infarction, hypertension, hyperlipidemia, ten pack-years of cigarette smoking ended 40 years ago, and COPD. She is clinically stable, including regular ambulation of several blocks per day without problem. Medications include bisoprolol, lisinopril, simvastatin, and aspirin. Vital signs are normal. Physical examination findings are noncontributory.

Based upon the 2014 ACC/AHA perioperative guideline, which of the following is recommended, to complete this patient's preoperative evaluation?

A. ECG within past 12 months

B. ECG within past 6 months

C. ECG within past 30 days

D. ECG within past 7 days

E. Preoperative ECG not indicated

Correct Answer: E) Preoperative ECG not indicated. This patient is medically stable, with a good functional capacity, and pending low-risk procedure.

2. A 58 year-old male awaits elective left total hip arthroplasty, due to advanced osteoarthritis. He walks several blocks at a time, limited only by chronic left hip pain. His additional history is noteworthy for obesity. His only medication is ibuprofen twice daily as needed. Vital signs are normal. Physical examination findings are noteworthy for obese habitus (BMI 38 kg/m^2), remainder noncontributory.

Based upon the 2014 ACC/AHA perioperative guideline, which of the following is recommended, to complete this patient's preoperative evaluation?

A. ECG within past 12 months

B. ECG within past 6 months

C. ECG within past 30 days

D. ECG within past 7 days

E. Preoperative ECG not indicated

Correct Answer: E) Preoperative ECG not indicated. This patient awaits an elevated-risk procedure, but has adequate functional capacity and no known perioperative cardiovascular risk factor (RCRI or NSQIP).

3. A 70 year-old male awaits elective ventral hernia repair. His additional history is noteworthy for coronary artery disease, hypertension, 50 pack-years of cigarette smoking through the present, COPD with bronchospasm, and obesity. He is unable to ambulate more than one block, due to exertional dyspnea and diffuse chest discomfort. His medications include atenolol, lisinopril, simvastatin, aspirin, combination fluticasone/salmeterol diskus, and albuterol inhaler as-needed. His vital signs are normal. Physical examination is remarkable for obese habitus (BMI 32 kg/m^2), carotid pulses diminished bilaterally, pulmonary sounds diffusely diminished, and a large non-reducible ventral hernia.

Which of the following is most helpful to further stratify this patient's perioperative cardiovascular risk?

A. Resting transthoracic echocardiography

B. Exercise electrocardiography

C. Dobutamine stress echocardiography

D. Adenosine-Tc sestamibi myocardial perfusion study (SPECT)

E. Cardiac PET myocardial perfusion study

Correct Answer: C) Dobutamine stress echocardiography. This patient awaits an elective, elevated risk procedure. He has known cardiovascular disease with a poor functional capacity, limited by exertional dyspnea and chest discomfort. A cardiac pharmacologic stress test is indicated. The patient has known COPD with bronchospasm and clinical evidence of cerebrovascular disease; therefore, acute vasodilator agents should be avoided in him. The patient has no known contraindication to dobutamine. Although either stress echocardiography or stress myocardial SPECT would be reasonable in this situation, stress echocardiography confers high sensitivity and specificity, involves no ionizing radiation, and is feasible with his BMI. Based upon all of these considerations, dobutamine stress echocardiography is preferred in this case.

4. A 64 year-old female awaits elective bladder suspension, due to urinary incontinence. Her additional history is noteworthy for hypertension and hyperlipidemia. She is clinically stable, including regular ambulation of several blocks per day without problem. Medications include lisinopril, atorvastatin, and aspirin. Physical examination findings are noncontributory.

Which of the following is the best choice for perioperative management of aspirin in this case?

A. Continue aspirin perioperatively

B. Hold aspirin for at least 3 days preoperatively

C. Hold aspirin for at least 7 days preoperatively

D. Hold aspirin for at least 14 days preoperatively

E. Hold aspirin for at least 30 days preoperatively

Correct Answer: C) Hold aspirin for at least 7 days preoperatively. This patient takes aspirin for primary prevention and awaits a procedure which entails increased bleeding risk. In this situation, aspirin should be held at least 7 days preoperatively.

5. A 64 year-old male awaits open surgical repair of an asymptomatic 5.5 cm diameter abdominal aortic aneurysm. His additional history is noteworthy for coronary artery disease, myocardial infarction 6 years ago, percutaneous coronary intervention (PCI)

with drug-eluting stent (DES) placement 2 months ago for treatment of acute coronary syndrome, HTN, 30 pack-years of cigarette smoking ended 10 years ago, COPD with bronchospasm, and chronic kidney disease. He has been clinically stable since PCI with DES placement, including regular ambulation of several blocks at a time without problem. His medications include diltiazem, isosorbide mononitrate, clopidogrel, aspirin, fluticasone/salmeterol diskus, and albuterol MDI as needed. Physical examination is noncontributory.

How soon should elective AAA repair be performed?

A. As soon as possible, if no clopidogrel for at least 7-14 days before surgery.

B. 3 months after PCI/stent placement

C. 6 months after PCI/stent placement

D. More than 12 months after PCI/stent placement

E. Elective AAA repair should not be performed in this patient

Correct Answer: D) More than 12 months after PCI/stent placement. Based upon the 2016 ACC/AHA update on antiplatelet therapy, elective non-cardiac surgery should be delayed more than 12 months after treatment of acute coronary syndrome (whether ACS is addressed by medical therapy alone or by invasive therapy), if possible.

6. In this same patient, if open surgical repair of abdominal aortic aneurysm must be performed within one month, due to rate of increase of aneurysm size, which of the following is the best choice for perioperative antiplatelet therapy management?

A. Continue clopidogrel and aspirin perioperatively, if approved by Vascular Surgery team

B. Hold clopidogrel for at least 7-14 days preoperatively, but continue aspirin

C. Hold both clopidogrel and aspirin perioperatively

D. Hold both clopidogrel and aspirin perioperatively, add unfractionated heparin IV as perioperative "bridge" therapy

E. Hold both clopidogrel and aspirin perioperatively, add therapeutic-dose low molecular weight heparin as perioperative "bridge" therapy

Correct Answer: A) Continue clopidogrel and aspirin perioperatively, if approved by Vascular Surgery team. This is a very challenging scenario. Aortic surgery certainly poses high risk of major perioperative bleeding. However, the risk of life-threatening in-stent coronary artery thrombosis is prohibitively high, if dual antiplatelet therapy is discontinued within six months after coronary artery stent placement. In the absence of absolute contraindication to antiplatelet therapy (such as life-threatening gastrointestinal hemorrhage or intracranial hemorrhage), dual antiplatelet therapy should be continued for more than 12 months after PCI with DES placement in the setting of acute coronary syndrome (ACS), more than six months after PCI with DES placement in the setting of stable ischemic heart disease (SIHD). If major surgery must be performed within those time periods, dual antiplatelet therapy should be continued perioperatively, if approved by the surgical team. Close communication among involved medical and surgical teams, and with patient, is especially important in such situations.

7. A 74 year-old female awaits elective revision left shoulder arthroplasty, due to failed prosthesis. She walks several blocks at a time, without problem. Her additional history is noteworthy for obesity, type II diabetes mellitus, hyperlipidemia, 40 pack-years of cigarette smoking ended 10 years ago, and osteoarthritis. Her medications include lisinopril, metformin, atorvastatin, aspirin, and acetaminophen. Vital signs are normal. Physical examination findings are noteworthy for obese habitus (BMI 34 kg/m^2), remainder noncontributory.

Which of the following is recommended, to reduce this patient's risk of perioperative major adverse cardiac event (MACE)?

A. Add bisoprolol 1week preoperatively, continue through at least 1 week postoperatively

B. Add bisoprolol 1 week preoperatively, continue through at least 1 month postoperatively

C. Add bisoprolol 2 weeks preoperatively, continue through at least 1 month postoperatively

D. Add bisoprolol 2 weeks preoperatively, continue through at least 1 month postoperatively

E. Perioperative beta blockade not indicated in this case

Correct Answer: E) Perioperative beta blockade not indicated in this case. This patient's risk of MACE likely is less than 1%. She does not already take beta blockade, does not have known or strongly suspected coronary artery disease, and does not have three or more RCRI risk factors for perioperative major adverse cardiac event. Based upon the 2014 ACC/AHA perioperative guideline and supporting literature, perioperative beta blockade is not indicated in this situation.

8. A 65 year-old female awaits elective bilateral femoral-popliteal artery bypass, due to atherosclerotic peripheral artery disease with progressively worsened claudication. She walks two blocks at a time, without other problem. Her additional history is noteworthy for type II diabetes mellitus, hyperlipidemia, 60 pack-years of cigarette smoking ended 15 years ago, and osteoarthritis. Her medications include lisinopril, metformin, aspirin, and acetaminophen. She discontinued atorvastatin 5 years ago. The patient has had no known medication adverse effect. Vital signs

are normal. Physical examination findings are noteworthy for absent pulses throughout bilateral lower extremities, dependent rubor and elevation pallor of bilateral lower extremities, remainder noncontributory.

Which of the following is recommended, to reduce this patient's risk of perioperative major adverse cardiac event (MACE)?

A. Initiate atorvastatin as early as possible preoperatively

B. Initiate atorvastatin on the morning of surgery

C. Initiate atorvastatin immediately postoperatively

D. Initiate atorvastatin within one week postoperatively

E. Do not initiate atorvastatin perioperatively

Correct Answer: A) Initiate atorvastatin as early as possible preoperatively. This patient has known atherosclerotic peripheral artery disease and awaits major peripheral vascular surgery (an elevated-risk procedure). "Statin" therapy is warranted in this situation, both perioperatively and long-term. Although the optimal timing of perioperative statin therapy has not been established, initiation of such therapy as early as possible preoperatively is recommended, when indicated.

9. A 70 year-old male awaits elective robotic-assisted radical prostatectomy, due to biopsy-proven adenocarcinoma of the prostate. He walks several blocks at a time, without problem. His additional history is noteworthy for obesity, congestive heart failure, hypertension, type II diabetes mellitus, hyperlipidemia, 30 pack-years of cigarette smoking ended 10 years ago, and osteoarthritis. His medications include atenolol, lisinopril, metformin, simvastatin, aspirin, and acetaminophen. Vital signs are noteworthy for heart rate of 58 beats per minute, blood pressure 154/86 mm Hg, remainder normal. Physical examination findings are noteworthy for obese habitus (BMI 36 kg/m2), remainder noncontributory.

Which of the following is the best choice for perioperative cardiovascular medication management in this case?

A. Hold simvastatin perioperatively

B. Hold lisinopril perioperatively

C. Hold lisinopril perioperatively only if the patient develops acute kidney injury

D. Hold both simvastatin and lisinopril perioperatively

E. Continue simvastatin and lisinopril perioperatively, if these remain well-tolerated

Correct Answer: E) Continue simvastatin and lisinopril perioperatively, if these remain well-tolerated. Established "statin" therapy should be continued perioperatively, as long as it is well-tolerated. Also, this patient has a history of congestive heart failure and of hypertension, with currently-elevated systemic blood pressure. It is most appropriate to continue ACE-inhibitor therapy perioperatively in this situation, as long as it remains well-tolerated.

10. A 64 year-old male awaits removal tomorrow of a chronically-infected right knee arthroplasty prosthesis. His additional history is noteworthy for coronary artery disease, myocardial infarction 4 years ago, HTN, 30 pack-years of cigarette smoking ended 10 years ago, COPD with bronchospasm, and chronic kidney disease. He has been clinically stable, including regular ambulation of several blocks at time, limited only by right knee pain and stiffness. His medications include diltiazem, lisinopril, atorvastatin, aspirin, fluticasone/salmeterol diskus, albuterol MDI as needed, and acetaminophen. Vital signs are remarkable for systemic blood pressure of 178/90 mm Hg, remainder of vital signs normal. Physical examination is noteworthy for apparent inflammation and decreased range of motion of the right knee, remainder noncontributory.

Which of the following is the best choice to reduce this patient's risk of perioperative major adverse cardiac event (MACE)?

A. Begin clonidine now

B. Begin clonidine on the morning of surgery, if blood pressure still elevated

C. Begin clonidine postoperatively, if blood pressure still elevated

D. Begin clonidine postoperatively, only if hypertension becomes symptomatic

E. Avoid clonidine perioperatively, if possible

Correct Answer: E) Avoid clonidine perioperatively, if possible. Perioperative use of clonidine can increase the risk of non-fatal cardiac arrest and of clinically-significant hypotension. This medication should be avoided perioperatively, if possible.

11. A 74 year-old male awaits elective lumbar spinal decompression. Additional history is noteworthy for morbid obesity (BMI 46), CAD with MI six years ago (asymptomatic), HTN, hyperlipidemia, type II DM, OSA (untreated), tobacco smoking, OA, and lumbar spinal stenosis with chronic neuroclaudication. His functional capacity is > 4 METs. Medications include bisoprolol, lisinopril, rosuvastatin, metformin, ASA, and APAP. Examination is remarkable for morbidly obese habitus and apparent widespread osteoarthritic changes (most prominent in the lumbar spine).

Which of the following is the best choice for perioperative management of this patient's OSA?

1. Elective surgery should be canceled, due to multiple comorbidities.

2. Proceed with surgery; start CPAP immediately postoperatively.
3. Initiate CPAP at least 4-6 weeks preoperatively, then proceed with surgery.
4. Initiate CPAP at least one week preoperatively, then proceed with surgery.

Correct Answer: 3) Initiate CPAP at least 4-6 weeks preoperatively, then proceed with surgery. In patients with OSA or obesity hypoventilation syndrome, CPAP or BiPAP begun at least four to six weeks preoperatively is associated with several anatomic and physiologic benefits. This is preferred before proceeding with elective surgery, if feasible.

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