SUPPLEMENTAL PERIOPERATIVE EVALUATION AND MANAGEMENT GUIDE

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KEY POINTS

Preoperative Risk Stratification
- Cardiac – Gupta, ACA/AHA 2007 or 2014 algorithm
- Pulmonary – Canet, Gupta
- Cirrhosis – Mayo

Post-operative Complications – increased mortality
- monitor for hypotension, delirium, tachycardia, hypoxemia
- be on alert for and try to prevent complications
- delirium work up should be thorough

DVT – at minimum 14 days, may extend to 35 days.

Don’t forget to treat Osteoporosis
Choose One:

- Gupta perioperative cardiac risk calculator (MICA) **
Figure 1. Cardiac evaluation and care algorithm for noncardiac surgery based on active clinical conditions, known cardiovascular disease, or cardiac risk factors for patients 50 years of age or greater. *See Table 2 for active clinical conditions. †See Class III recommendations in Section 5.2.3. Noninvasive Stress Testing in the full-text guideline. ‡See Table 3 for estimated MET level equivalent. §Noninvasive testing may be considered before surgery in specific patients with risk factors if it will change management. ¶Clinical risk factors include ischemic heart disease, compensated or prior heart failure, diabetes mellitus, renal insufficiency, and cerebrovascular disease. ∥Consider perioperative beta blockade (see Table 12 in the full-text guideline) for populations in which this has been shown to reduce cardiac morbidity/mortality. ACC/AHA indicates American College of Cardiology/American Heart Association; HR, heart rate; LOE, level of evidence; and MET, metabolic equivalent.
Figure 1. Cardiac evaluation and care algorithm for noncardiac surgery based on active clinical conditions, known cardiovascular disease, or cardiac risk factors for patients 50 years of age or greater. *See Table 2 for active clinical conditions. †See Class III recommendations in Section 5.2.3.

Stepwise Approach to Perioperative Cardiac Assessment for CAD

Colors correspond to the Classes of Recommendations in Table 1. Step 1: In patients scheduled for surgery with risk factors for or known CAD, determine the urgency of surgery. If an emergency, then determine the clinical risk factors that may influence perioperative management and proceed to surgery with appropriate monitoring and management strategies based on the clinical assessment (see Section 2.1 for more information on CAD). (For patients with symptomatic HF, VHD, or arrhythmias, see Sections 2.2, 2.4, and 2.5 for information on evaluation and management.) Step 2: If the surgery is urgent or elective, determine if the patient has an ACS. If yes, then refer patient for cardiology evaluation and management according to GDMT according to the UA/NSTEMI and STEMI CPGs (18,20). Step 3: If the patient has risk factors for stable CAD, then estimate the perioperative risk of MACE on the basis of the combined clinical/surgical risk. This estimate can use the American College of Surgeons NSQIP risk calculator (http://www.surgicalriskscalculator.com) or incorporate the RCRi (131) with an estimation of surgical risk. For example, a patient undergoing very low-risk surgery (e.g., ophthalmologic surgery), even with multiple risk factors, would have a low risk of MACE, whereas a patient undergoing major vascular surgery with few risk factors would have an elevated risk of MACE (Section 3). Step 4: If the patient has a low risk of MACE (<1%), then no further testing is needed, and the patient may proceed to surgery (Section 3). Step 5: If the patient is at elevated risk of MACE, then determine functional capacity with an objective measure or scale such as the DASI (133). If the patient has moderate, good, or excellent functional capacity (≥4 METs), then proceed to surgery without further evaluation (Section 4.1). Step 6: If the patient has poor (<4 METs) or unknown functional capacity, then the clinician should consult with the patient and perioperative team to determine whether further testing will impact patient decision making (e.g., decision to perform original surgery or willingness to undergo CABG or PCI, depending on the results of the test) or perioperative care. If yes, then pharmacological stress testing is appropriate. In those patients with unknown functional capacity, exercise stress testing may be reasonable to perform. If the stress test is abnormal, consider coronary angiography and revascularization depending on the extent of the abnormal test. The patient can then proceed to surgery with GDMT or consider alternative strategies, such as noninvasive treatment of the indication for surgery (e.g., radiation therapy for cancer) or palliation. If the test is normal, proceed to surgery according to GDMT (Section 5.3). Step 7: If testing will not impact decision making or care, then proceed to surgery according to GDMT or consider alternative strategies, such as noninvasive treatment of the indication for surgery (e.g., radiation therapy for cancer) or palliation. ACS indicates acute coronary syndrome; CABG, coronary artery bypass graft; CAD, coronary artery disease; CPG, clinical practice guideline; DASI, Duke Activity Status Index; GDMT, guideline-directed medical therapy; HF, heart failure; MACE, major adverse cardiac event; MET, metabolic equivalent; NB, No Benefit; NSQIP, National Surgical Quality Improvement Program; PCI, percutaneous coronary intervention; RCRi, Revised Cardiac Risk Index; STEMI, ST-elevation myocardial infarction; UA/NSTEMI, unstable angina/non-ST-elevation myocardial infarction; and VHD, valvular heart disease.
Emergency surgery?  
Yes → to OR

No

↓

Acute coronary syndrome?  
Yes → treat

No

↓

Estimate risk of MACE using RCRI - Low risk → to OR

Not low risk

↓

Is the patient active with >4 METs?  
Yes → to OR

No

↓

Assess risks with RCRI

- discuss risk with family
high-risk surgery (intraperitoneal, intrathoracic or suprainguinal vascular surgery)

history of heart disease

history of compensated or prior heart failure

history of cerebrovascular disease

diabetes mellitus requiring insulin

renal insufficiency greater than 2.0 *1 point each
Risk of major perioperative cardiac events

No risk factors = 0.4 % - low
One risk factor = 1.0 % - low
Two risk factors = 2.4 % - intermediate
Three or more risk factor = 5.4 % - high

*Includes cardiac death, nonfatal myocardial infarction and nonfatal cardiac arrest, postoperative cardiogenic pulmonary edema and complete heart block.
METABOLIC EQUIVALENTS

>4 METs

- climbing a flight of stairs or walking up a hill, walking on level ground at 4 mph, and performing heavy work around the house. >4 METs are
- climbing a flight of stairs or walking up a hill, walking on level ground at 4 mph, and performing heavy work around the house.

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GUPTA PERIOPERATIVE CARDIAC RISK DETERMINE PERI-OPERATIVE RISK FOR A WIDE ARRAY OF SURGERIES.

- Age
- Creatinine
- ASA
- Type of surgery
- Preoperative Functional Status
ASA PHYSICAL STATUS CLASSIFICATION

ASA 1 = Normal healthy patient
ASA 2 = Patients with mild systemic disease
ASA 3 = Patients with severe systemic disease
ASA 4 = Patients with severe systemic disease that is a constant threat to life
ASA 5 = Moribund patients who are not expected to survive without the operation
Stress testing should be performed on patients with

- Elevated risk (> 1%) and
- < 4 METS

**IF** it will change management

- Not beneficial in hip fracture patient, delays timing of surgery
PATHOPHYSIOLOGY OF SURGERY

Characteristics
- Age ≥75 yr
- Male sex
- Chronic conditions
  - Renal insufficiency
  - Coronary artery disease
  - Peripheral vascular disease
  - Cerebrovascular disease
  - Diabetes
  - Congestive heart failure
  - Atrial fibrillation
  - Hypertension
  - Severe aortic stenosis

Preoperative Factors

Intraoperative Factors

Recent and acute conditions (e.g., acute aneurysm rupture)
- Recent high-risk coronary artery disease
- Recent placement of coronary-artery stent
- Recent stroke
- Acute trauma (e.g., hip fracture)
- Urgent or emergency surgery

Surgery
- SNS stimulation
  - Hypocoagulability
  - Bleeding
  - Inflammation

Anesthesia
- SNS stimulation
  - Hypotension
  - Tachycardia
  - Hypothermia

Complications
- Mismatch between oxygen supply and demand
- Coronary-artery thrombosis

Congestive heart failure
- Myocardial infarction
- Cardiac arrest

Death from cardiovascular causes

Postoperative Factors
- Hypotension
- Tachycardia
- Bleeding
- Hypoxemia
- Pain

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BETA BLOCKERS

- **Continue** a beta blocker if they are on it
- **Start** on High risk patient > 1 day before

- **Don’t start** on the day of surgery – harm
- **Don’t start** on low risk patients

- Monitor and titrate the beta blockers
- Use clinical judgement to guide management of beta blockers

When NPO
Hold oral medications, Hold short acting insulin
Check glucose every 4 – 6 hours

QHS dosing
- Long-acting or intermediate
  - based on glucose levels at home
  - or full dose if A1c > 8% or 75% dose A1c <8%

QAM dosing
- Long-acting insulin, 75% to full dose
- 50% of Intermediate-acting insulin

Type 1 DM – must have glucose containing fluid if NPO > 8 hours
ORTHOPEDIC TRIFECTA

BEWARE

NSAIDS, ACE-I, Anemia = AKI

Trifecta - a bet in which the person betting forecasts the first three finishers in a race in the correct order.
Can cause perioperative hypotension

Studies show no difference in mortality with or without

Beware of the orthopedic trifecta – NSAIDS, ACE-I, Anemia = AKI
ASPIRIN AND SURGERY

- Increases risk of postoperative bleeding, hold aspirin
- No significant effect on the rate of death or non-fatal MI (excluding recent stent patients)
- If patient has a recent stent, discuss with Cardiology
- Discuss with orthopedics, can restart ASA after 48 hours

Aspirin in Noncardiac Surgery, NEJM 370;16 april 17, 2014
Continue home dose of steroids if
< 5mg a day
10 mg every other day
< 3 weeks of treatment

Taking 10 – 20 mg/day- home dose of steroids plus:

Moderate surgical stress (eg, lower extremity revascularization, total joint replacement),
- 50 mg hydrocortisone IV, then 25 mg IV q 8 hrs x 24 hrs.
- Resume usual dose thereafter.

Major surgical stress (eg, esophagogastrectomy, total proctocolectomy, open heart surgery)
- 100 mg of hydrocortisone IV 50 mg q 8hrs x 24 hrs.
- Taper dose by half per day to maintenance level.
OTHER MEDICATION GUIDELINES

Clopidogrel - don’t delay surgery, can continue if necessary

Diuretics – hold on the day of surgery

No need to bridge for CHADS ≤ 3 (87%)
Maybe need to bridge CHADS 4 (10%)
Bridge for CHADS ≥ 5 (2.7%)

TIMING OF SURGERY

Earlier surgery associated with reduction in

- **mortality** (RR 0.81)
- **hospital pneumonia** (RR 0.59)
- **pressure sores** (RR 0.48).

Poorer baseline health status causes delays and accounted for the poorer outcomes

- NEEDS RCT
- To surgery within 48 hours if possible
- Reduce Unacceptable (administrative) delays

*Effect of early surgery after hip fracture on mortality and complications: systematic review* CMAJ Oct 19, 2010 vol.182 no.15
HIP fracture motto

BE VIGILANT

Symptoms can be vague

Common complications have atypical presentations

-CPJ. Devereaux, M.D., Ph.D., and Daniel I. Sessler, M.D. Cardiac complications in noncardiac surgery n engl j med 373;23
**TYPES OF HIP FRACTURE AND RISK OF TRANSFUSION**

- Intertrochanteric vs. FM neck OR 2.37
- Subtrochanteric vs. FM neck OR 4.03

Factors affecting transfusion requirement after hip fracture: Can we reduce the need for blood
INCREASE TRANSFUSION RISK AND TYPE OF FRACTURE AND TYPE OF SURGERY

- Subtrochanteric and Intratrochanteric > Femoral neck fractures

- Intramedullary nail and Hemiarthroplasty > Dynamic Hip Screw
LMWH – preferred
NOAC- rivaroxiban, dabigatran, apixaban
Warfarin – not recommended
Unable to use Heparins – asa, fondiparinaux, IPC
PCD’s 18 hours a day in addition to anticoagulation

Minimum of 10-14 days, consider up to 35 days

Hip fracture surgery – high risk for DVT – 6%
**Without prophylaxis 4 to 7 percent fatal PE**
Without extended prophylaxis after 7 days, DVT rate 18.9%

PLEASE TREAT OSTEOPOROSIS
in low impact fracture patients

NO NEED FOR DEXA

Ca/Vit D
Bisphosphonates
Endocrine outpatient referral

Rates of treatment
- Cal+D - 6.6%
- antiresorptive /bone-forming medications - 7.3%

SUMMARY

- Pick a Risk Assessment Tool and use it
- Assess perioperative risk based on co-morbid conditions
- Be vigilant and proactive
- Treat osteoporosis
BIBLIOGRAPHY 1

- Effect of early surgery after hip fracture on mortality and complications: systematic review CMAJ Oct 19, 2010 vol.182 no.15
BIBLIOGRAPHY 2

- **Derivation and Prospective Validation of a Simple Index for Prediction of Cardiac Risk of Major Noncardiac Surgery**


- **2014 ACC/AHA Guideline on Perioperative Cardiovascular Evaluation and Management of Patients Undergoing Noncardiac Surgery: Executive Summary**

- **Devereaux PJ, Goldman L, Cook DJ, et al Perioperative cardiac events in patients undergoing noncardiac surgery: a review of the magnitude of the problem, the pathophysiology of the events and methods to estimate and communicate risk**
  *CMAJ* 2005; 173:627

- Effect of early surgery after hip fracture on mortality and complications: systematic review CMAJ Oct 19, 2010 vol.182 no.15
SUPPLEMENT END