2014 ACC/AHA PeriOp CVS Eval & Rx of Pts Having Non-Cardiac Surgery

Clinical risk factors:

**Coronary artery disease** – Wait >60days after MI before surgery.

**Heart failure** – Significant risk for periop complication including mortality-Greater than AF and CAD.

**LVEF** – If <30% worse outcome than >30%. Diastolic dysfunction +/- Systolic dysfunction associated with higher major adverse cardiac event (MACE). Risk of asymptomatic LV dysfunction is unknown.

Pre-op BNP predict CVS events post vascular surgery.

**Cardiomyopathies** – little information on preop evaluation of nonischaemic cardiomyopathies prior to noncardiac surgery

**Restrictive** – Multidisciplinary approach. Optimise underlying pathology, volume status and HF.

**Hypertrophic obstructive cardiomyopathy.** Avoid overdiuresis and ionotropic agents not usually used because of increased LV outflow gradient.

**Arrhythmogenic right ventricular cardiomyopathy +/- dysplasia.** Peri-op mortality 9.5%. Need ICD.

**Peripartum cardiomyopathy.** Can result in severe ventricular dysfunction. Presents up to 6mth postpartum. Emergency delivery may be lifesaving for both mother and baby.

**Valvular heart disease**

If clinically suspected moderate or severe valve lesion should have pre-op ECHO if
- No prior ECHO within 1yr
- Change in clinical status or physical exam since last ECHO.

If valvular intervention indicated on basis of symptoms and severity then intervention before elective non cardiac surgery is effective in reducing perioperative risk.

**AS** – Asymptomatic severe AS – can proceed with elevated risk non cardiac surgery

**MS** – Asymptomatic severe MS – can proceed with elevated risk non cardiac surgery if valve morphology not favourable for percutaneous mitral balloon commissurotomy.

**AR and MR** – better tolerated than stenotic lesions. Aim to maintain preload and avoid excessive afterload.

**Asymptomatic severe MR** – can proceed with elevated risk non cardiac surgery.

**Asymptomatic severe AR with normal LVEF** – can proceed with elevated risk non cardiac surgery.

**Arrhythmias and conduction disorders**

Presence of an arrhythmia in pre-op setting should prompt investigation into underlying cause depending on nature and acuity of arrhythmia and patients history.

**Cardiovascular implantable electronic devices (CIED)**

Before elective surgery in patient with a CIED the surgical/procedure team and clinician following the CIED should communicate in advance to plan perioperative management of the CIED.

**Pulmonary Vascular Disease** – mortality rate 4-26%

Chronic pulmonary vascular targeted therapy (ie. phosphodiesterase type 5 inhibitors, soluble guanylate cyclase stimulators, endothelin receptor antagonists, and prostanoids) should be continued unless contraindicated or not tolerated in patients with pulmonary hypertension who are undergoing noncardiac surgery.

Unless risk of delay outweighs potential benefits patients should be seen by pulmonary hypertension specialist pre-op

**Adult Congenital Heart Disease.**

Higher risk than normal population. Related to nature of underlying ACHD, the surgical procedure and urgency of intervention.

Calculation of risk to predict perioperative cardiac morbidity:

Validated risk prediction tool can be useful in predicting risk of perioperative MACE.

For patients with a low risk of perioperative MACE, further testing is not recommended before planned operation.

Risk is dependent on surgery – PVD surgery amongst highest risk, lower risk those without fluid shifts and stress such as plastic surgery, cataracts.

Emergency vs Elective – Emergency increases risk.

Lee's criteria for periop CVS risk in non-cardiac surgery (3 day MACE risk):
- high risk surgery (abdo, thoracic or suprainguinal vasc surgery)
- Hx IHD
- Hx stroke/TIA
- Hx of heart failure
- chronic renal impairment = creat >177
- DM on insulin

Risk of cardiac events periop based on number of factors:
- 0 = 0.4%
- 1 = 1%
- 2 = 6%
- ≥3 = 11%

* NB MACE = death, MI, cardiac arrest

* note completely ignores rest disease, frailty, Parkinsonism, pHTN


ACC/AHA Periop - 1
American College of Surgeons NSQIP Surgical Risk Calculator: Collected data on operations performed in more than 525 participating hospitals in the United States. This risk calculator may offer the best estimation of surgery-specific risk of a MACE and death. Issues is it has not been validated in an external population outside the NSQIP, and the definition of MI includes only ST-segment MIs or a large troponin bump (>3 times normal) that occurred in symptomatic patients.

www.riskcalculator.facs.org

Biomarkers: (BNP, CRP) inclusion in risk scores may provide incremental predictive value.

Approach to Perioperative Cardiac Testing
Use step wise approach:
- What is surgery for: Prolong life? Relieve symptoms
- Define life expectancy (excluding surgery):
  - Age/sex/ethnicity
  - Socio-economic status
  - Smoking/DM/HTN/chol
  - ACS/stroke/PVD
- Define surgical risk:
  - Risk of surgery ie insult/size
  - Patient factors ie co-morbidities (stable, optimised), physiological reserve
- Define risk of doing nothing eg AAA
- Use bid data adjuncts: POSSUM, NSQIP, ASA, Frailty index, Lee Revised Index

Exercise capacity and functional capacity
Reliable predictor of peri-op and long term cardiac events. Perioperative cardiac and long-term risks are increased in patients unable to perform 4 METs of work during daily activities

In patients with elevated risk and excellent (>10 METs) functional capacity, it is reasonable to forgo further exercise testing with cardiac imaging and proceed to surgery

For patients with elevated risk and unknown functional capacity, it may be reasonable to perform exercise testing to assess for functional capacity if it will change management

For patients with elevated risk and moderate to good (≥4 METs to 10 METs) functional capacity, it may be reasonable to forgo further exercise testing with cardiac imaging and proceed to surgery

For patients with elevated risk and poor (<4 METs) or unknown functional capacity, it may be reasonable to perform exercise testing with cardiac imaging to assess for myocardial ischemia if it will change management

Supplemental Preoperative Evaluation
ECG.
Pre-op ECG is reasonable for patients with known coronary heart disease, significant arrhythmia, peripheral arterial disease, cerebrovascular disease, or other significant structural heart disease, except for those undergoing low-risk surgery
Pre-op ECG may be considered for asymptomatic patients without known coronary heart disease, except for those undergoing low-risk surgery
Routine preoperative resting 12-lead ECG is not useful for asymptomatic patients undergoing low-risk surgical procedures

Assessment of LV Function
Pre-op evaluation of LV function is reasonable in:
- patients with dyspnoea of unknown origin
- HF with worsening dyspnoea or other change in clinical status
- Reassessment in stable patient with known LV dysfunction if no assessment within a yr
Routine preoperative evaluation of LV function is not recommended

Exercise Stress Testing for Myocardial Ischemia and Functional Capacity
Routine screening with noninvasive stress testing is not useful for patients at low risk for noncardiac surgery

Cardiopulmonary Exercise Testing:
May be considered for patients undergoing elevated risk procedures in whom functional capacity is unknown Low anaerobic threshold was predictive of periop CVS complication and death. AT threshold 10ml O2/kg/min proposed as optimal discrimination point.

Pharmacological Stress Testing
Noninvasive Pharmacological Stress Testing (either DSE or pharmacological stress MPI) is reasonable for patients who are at an elevated risk for noncardiac surgery and have poor functional capacity (<4 METs) if it will change management.
Routine screening with noninvasive stress testing is not useful for patients undergoing low-risk noncardiac surgery

Preoperative Coronary Angiography:
Routine preoperative coronary angiography is not useful
Investigations to Delineate Physiological Reserve

Non-Invasive
- Stair climb - not standardised
- 6MWT with SpO2 probe - >560m = good; <427m => CPET
- Incremental shuttle test
- CPET

Biomarkers
- Pre-op TNT >14. Can add to Lee criteria as extra variable. (highest risk seen in x2 TNT)
- BNP

ECHO
- is a resting test
- helps understand baseline function: LV function, diastolic function, PA pressures, hypertrophy, RV function

Stress Tests
- ETT - v intense & poorly tolerated
- DSE -
  - give massive doses of dobutamine.
  - Useful as rule out test ie if reach max dose and no symptoms is reassuring
  - if >4 areas of RWMA then should have further discussion
  - 1-3 RWMA then ?proceed
- CT coronary angiogram
- cardiac MRI

Criticisms of this Algorithm
- METS only measurable via CPET
- Algorithm used to only to define MACE risk
- In AS & CHF: functional status is more imp than any ECHO finding
- Can have ↓ functional capacity with normal coronaries eg diastolic dysfunction
- No evidence that revascularisation prior to surgery effects mortality/outcome
Perioperative Therapy

Coronary Revascularization Before Noncardiac Surgery

Revascularization before noncardiac surgery is recommended in circumstances in which revascularization is indicated according to existing CPGs

Indications for CABG:
- LMS >50%
- prox LAD or Lcx >7p%
- 3VD >50%
- unstable angina
- recent STEMl/NSTEMI

It is not recommended that routine coronary revascularization be performed before noncardiac surgery exclusively to reduce perioperative cardiac events as shown by CARP trial - mortality same at 2yrs (excluded pts with indications for CABG as above)

Timing of Elective Noncardiac Surgery in Patients with Previous PCI:

Delay elective noncardiac surgery for:
- 14 days after balloon angioplasty
- 365 days after drug-eluting stent (DES) implantation
- 180 days after DES implantation if the risk of further delay is greater than the expected risks of ischemia and stent thrombosis

NB other delay periods:
- post CABG = 3/12
- post MI = 2/12
- post stroke 6/52 (3-6/12 is better)

Delay elective noncardiac surgery in patients whom DAPT will need to be discontinued peri-op: 30 days BMS and 12 months DES

In patients in whom noncardiac surgery is required, a consensus decision among treating clinicians as to the relative risks of surgery and discontinuation or continuation of antplatelet therapy can be useful.

Perioperative Medical Therapy

Prehabilitation
- routine exercise incl simple walking shown to be of sig benefit

Beta Blockers
If on a beta blocker continue, if intermediate or high risk of MI peri-op (>3RCRI risk factors - diabetes mellitus, HF, CAD, renal insufficiency, cerebrovascular accident) can start betablocker pre-op, if long term indication but no RCRI risk factors unknown if should be started.
If it is initiated, start it in advance >1day before surgery. Do not start it on the day.
- titrate BB to target HR 60-80 & SBP 120-160. Increase dose in minimum intervals of 1 week

Statins
If on a statin continue. If undergoing vascular surgery start it, if any clinical indication with elevated risk procedure start it.

Alpha 2 Agonist
Are not recommended in patients who are undergoing noncardiac surgery

Calcium channel blocker:
Calcium channel blockers were associated with trends toward reduced death and MIA large-scale trial is needed to define the value of these agents

Angiotensin-Converting Enzyme Inhibitors:
Continue perioperatively, if withheld pre-op restart as soon as clinically feasible post op.

Antiplatelet Agents
- In patients undergoing urgent noncardiac surgery during the first 4 to 6 weeks after BMS or DES implantation, DAPT should be continued unless the relative risk of bleeding outweighs the benefit of the prevention of stent thrombosis.
- In patients who have received coronary stents and must undergo surgical procedures that mandate the discontinuation of P2Y12 platelet receptor–inhibitor therapy, it is recommended that aspirin be continued if possible and the P2Y12 platelet receptor–inhibitor be restarted as soon as possible after surgery.
- Management of the perioperative antiplatelet therapy should be determined by a consensus of the surgeon, anesthesiologist, cardiologist, and patient, who should weigh the relative risk of bleeding versus prevention of stent thrombosis.
- In patients undergoing nonemergency/nonurgent noncardiac surgery who have not had previous coronary stenting, it may be reasonable to continue aspirin when the risk of potential increased cardiac events outweighs the risk of increased bleeding
- Initiation or continuation of aspirin is not beneficial in patients undergoing elective noncardiac noncarotid surgery who have not had previous coronary stenting unless the risk of ischemic events outweighs the risk of surgical bleeding

Anticoagulants
Use of therapeutic or full-dose anticoagulants is generally discouraged because of their harmful effect on the ability to control and contain surgical blood loss. In some instances in which there is minimal to no risk of bleeding, such as cataract surgery or minor dermatologic procedures, it may be reasonable to continue anticoagulation perioperatively.
The risks of bleeding for any surgical procedure must be weighed against the benefit of remaining on anticoagulants on a case-by-case basis. Patients with mechanical mitral valve, or patients with an aortic valve and ≥1 additional risk factor bridging anticoagulation may be appropriate.

Management of Postoperative Arrhythmias and Conduction Disorders
AF and atrial flutter—most common, Peak incidence occurs 1 to 3 days post-op. Treatment of postoperative AF is similar to that for other forms of new-onset AF
Ventricular rate control in the acute setting is generally accomplished with beta blockers or nondihydropyridine calcium channel blockers (i.e., diltiazem or verapamil), with digoxin reserved for patients with systolic HF or with contraindications or inadequate response to other agents.

Perioperative Management of Patients With CIEDs:
Patients with ICDs who have preoperative reprogramming to inactivate tachytherapy should be on cardiac monitoring continuously during the entire period of inactivation, and external defibrillation equipment should be readily available. Systems should be in place to ensure that ICDs are reprogrammed to active therapy before discontinuation of cardiac monitoring and discharge from the facility.
Anaesthetic Consideration and Intraoperative Management

Neuraxial Versus General Anesthesia: There is no evidence to suggest a cardioprotective benefit from the use or addition of neuraxial anesthesia for intraoperative anesthetic management.

Volatile General Anesthesia Versus Total Intravenous Anesthesia: Use of either a volatile anesthetic agent or total intravenous anesthesia is reasonable for patients undergoing noncardiac surgery, and the choice is determined by factors other than the prevention of myocardial ischemia and MI.

Monitored Anesthesia Care Versus General Anesthesia: There are no RCTs to suggest a preference for monitored anesthesia care over general anesthesia for reducing myocardial ischemia and MI.

Perioperative Pain Management:
Neuraxial anesthesia for postoperative pain relief can be effective in patients undergoing abdominal aortic surgery to decrease the incidence of perioperative MI.
Perioperative epidural analgesia may be considered to decrease the incidence of preoperative cardiac events in patients with a hip fracture.

Prophylactic Perioperative Nitroglycerin: Prophylactic intravenous nitroglycerin is not effective in reducing myocardial ischemia in patients undergoing noncardiac surgery.

Intraoperative Monitoring Techniques:
The emergency use of perioperative transesophageal echocardiogram (TEE) is reasonable in patients with hemodynamic instability undergoing noncardiac surgery to determine the cause of hemodynamic instability when it persists despite attempted corrective therapy, if expertise is readily available.
The routine use of intraoperative TEE during noncardiac surgery to screen for cardiac abnormalities or to monitor for myocardial ischemia is not recommended in patients without risk factors or procedural risks for significant hemodynamic, pulmonary, or neurologic compromise.

Maintenance of Body Temperature:
Maintaining normothermia may reduce peri-op cardiac events.

Hemodynamic Assist Devices:
Use of hemodynamic assist devices may be considered when urgent or emergency noncardiac surgery is required in the setting of acute severe cardiac dysfunction (i.e., acute MI, cardiogenic shock) that cannot be corrected before surgery.

Perioperative Use of Pulmonary Artery Catheters:
Consider use of PAC when underlying medical conditions that significantly affect hemodynamics cannot be corrected before surgery.
Routine use of PAC in patients, even those with elevated risk, is not recommended.

Perioperative Anaemia Management:
Maintain Hb≥8 g/dL (restrictive transfusion strategy).

Perioperative Surveillance:
Measurement of troponin levels is recommended in the setting of signs or symptoms suggestive of myocardial ischemia or MI.
Obtaining an ECG is recommended in the setting of signs or symptoms suggestive of myocardial ischemia, MI, or arrhythmia.
The usefulness of postoperative screening with troponin levels in patients at high risk for perioperative MI, but without signs or symptoms suggestive of myocardial ischemia or MI, is uncertain in the absence of established risks and benefits of a defined management strategy. The usefulness of postoperative screening with ECGs in patients at high risk for perioperative MI, but without signs or symptoms suggestive of myocardial ischemia, MI, or arrhythmia, is uncertain.