



Pre-Operative Clearance for Outpatient Joint Replacement

Thomas Meade, MD
Trong Nguyen, MD

Does Cardiac Clearance make any difference for TJA???



History of Cardiac Clearance at Coordinated Health

- 100% of TKA pts required Cardiac Clearance
- Unnecessary Tests
 - Stress
 - Echo
 - Catherization
 - Sleep apnea
- Unnecessary Delay
- Poor pt experience
- Root Cause
 - Anesthesia- Path least resistance



What is Cardiac 'Clearance'??



False Sense Confidence

- **NO study has shown that cardiac interventions performed consequent to the results of pre-op testing improves outcomes. It just assigns risk!**
- **Stress testing or echocardiography** is not indicated in the perioperative patient solely because of the surgery if there is **no other indication**
- **Preoperative EKG** in asymptomatic patients w/o known cardiovascular disease is rarely helpful.

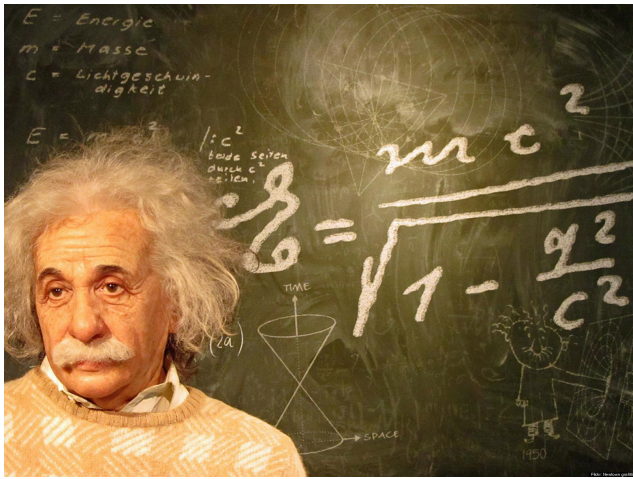


High Altitude View

ASC-NSQIP DATA JBJS 2014 96(1)

- TJA does not kill many pt's
 - 0.18% 30d mortality
 - 0.09% Cardiac Arrest-CPR (NOT DEATH)
 - Highest risk: Old ,DM, ASA ≥ 3 , long surg 2hr 15m





GOAL-Use predictive analytics

- Assess Risk for Cardiac Event peri-operative period
- Why: Assign risk-benefit ratio for pt & surg, timing surgery
- Uncover undiagnosed problem
- Major goal: assess the risk of myocardial infarction (MI), heart failure (HF), or both,
 - The mortality rate of patients with perioperative MI is substantial, ranging from 30% to 50%.



Recognize Very High-Risk Patients- MI, HF, VF, Cardiac Arrest & Death

- Recent MI (30d)
- Unstable Angina,
- Decompensated heart failure (CHF),
- High-grade arrhythmias,
- Hemodynamically important Valvular heart disease (aortic stenosis in particular)
- **IRONICALLY:** Neither the presence or history of:
 - coronary artery disease
 - transient ischemic attack history
 - nor diabetes **predicted three-day mortality**



Best Risk Models – Assign % Risk

Predictive analytics



- RCRI- Revises Cardiac Risk Index (evolution 40 yrs)
 - Widely used
 - Validated over past 15 yrs
- ACS-NSQIP (National Surgical Qual Improvement Program)
 - Universal Risk Calculator
 - MICA Calculator
- **IE <1% Risk- No further testing**



Reality

- Very few cases in which the **surgical outcomes** and treatments are affected by **extensive preoperative cardiac testing**.
- Inappropriate expenditure of resources
- Unnecessary testing could **cause harm &/or delaying surgery**.
- Any useful test should be **accurate**, influence **outcome**, and have a **favorable risk-to-benefit** ratio.



VALUE EKG??

- Most important: Baseline
- Rarely helpful: Asymptomatic pts' w/o known CV Disease
- NOT in RCRI or NSQIP : Lack prognostic significance
- BUT- find
 - Q waves, ST-abnormalities (myocardial ischemia or infarction), LVH, QTc prolongation, bundle-branch block, or arrhythmia's



RCRI: simple, extensively validated, and provides a good estimate of the preoperative risk.

Revised Cardiac Risk Index

1. History of ischemic heart disease

2. History of congestive heart failure

3. History of cerebrovascular disease (stroke or transient ischemic attack)

4. History of diabetes requiring preoperative insulin use

5. Chronic kidney disease (creatinine > 2 mg/dL)

6. Undergoing suprainguinal vascular, intraperitoneal, or intrathoracic surgery

Risk for cardiac death, nonfatal myocardial infarction, and nonfatal cardiac arrest:

0 predictors = 0.4%, 1 predictor = 0.9%, 2 predictors = 6.6%, ≥3 predictors = >11%

High-Risk Surgery

- ☒ Intraoperative
- ☒ Intrathoracic
- ☒ Suprainguinal vascular

History of ischemic heart disease

- ☒ History of MI
- ☒ History of positive exercise test
- ☒ Current chest pain considered due to myocardial ischemia
- ☒ Use of nitrate therapy
- ☒ ECG with pathological Q waves

History of congestive heart failure

- ☒ Pulmonary edema, bilateral rales or S3 gallop
- ☒ Paroxysmal nocturnal dyspnea
- ☒ CXR showing pulmonary vascular redistribution

History of cerebrovascular disease

- ☒ Prior TIA or stroke

Pre-operative insulin treatment

Pre-operative creatinine >2 mg/dL

CALCULATE

RESET

No

No

No

No

No

No

Revised Cardiac Risk Index (RCRI) Calculator

This **Revised Cardiac Risk Index (RCRI) calculator** estimates the risk of perioperative cardiac events to be suffered by the patient undergoing a heart operation. You can find more about the criteria in the score and how the result is interpreted below the form.

Revised Cardiac Index = 0

Interpretation: This score belongs to **Class I** of risk for perioperative cardiac events with a **risk percentage of 0.4%.**

Disclaimer: This tool should NOT be considered as a substitute for any professional medical service, NOR as a substitute for clinical judgement.

Revised Cardiac Risk Index (Lee Criteria)

Rapid pre-op assessment using the Revised Cardiac Risk Index

High Risk Surgery?

High Risk Surgery defined as: Intraabdominal, intrathoracic, or suprainguinal vascular

No

Yes

Coronary Artery Disease?

Coronary Artery Disease defined as: History of myocardial infarction, positive exercise test, current complaint of ischemic chest pain or use of nitrate with prior CABG surgery or PTCA are included only if they had current complaints of chest pain that are presumed to be due to ischemia

No

Yes

Congestive Heart Failure?

Congestive Heart Failure defined as: History of congestive heart failure, pulmonary edema, or paroxysmal nocturnal dyspnea; physical examination; chest radiograph showing pulmonary vascular redistribution

No

Yes

Cerebrovascular Disease?

Cerebrovascular Disease defined as: History of transient ischemic attack or stroke

No

Yes

Diabetes Mellitus on Insulin?

No

Yes

Serum Creatinine >2 mg/dl or >177 μ mol/L?

No

Yes

Results

Estimated Risk of Adverse Outcome with Non-cardiac Surgery

Very Low Risk

Estimated Rate of Myocardial Infarction, Pulmonary Edema, Ventricular Fibrillation, Cardiac Arrest, or Complete Heart Block

0.4 %



Enter Patient and Surgical Information

i Procedure

27447 - Arthroplasty, knee, condyle and plateau; medial AND lateral compartments with or without patella resurfacing (total knee arthroplasty)

Clear

Begin by entering the procedure name or CPT code. One or more procedures will appear below the procedure box. You will need to click on the desired procedure to properly select it. You may also search using two words (or two partial words) by placing a '+' in between, for example: "cholecystectomy + cholangiography"

Reset All Selections

i Are there other potential appropriate treatment options? ☐ Other Surgical Options ☐ Other Non-operative options ☒ None

Please enter as much of the following information as you can to receive the best risk estimates.
A rough estimate will still be generated if you cannot provide all of the information below.

Age Group

Under 65 years

Sex

Male

Functional Status **i**

Independent

Emergency Case **i**

No

ASA Class **i**

Healthy patient

Steroid use for chronic condition **i**

No

Ascites within 30 days prior to surgery **i**

No

Systemic Sepsis within 48 hours prior to surgery **i**

None

Ventilator Dependent **i**

No

Disseminated Cancer **i**

No

Diabetes **i**

No

Hypertension requiring medication **i**

No

Congestive Heart Failure in 30 days prior to surgery **i**

No

Dyspnea **i**

No

Current Smoker within 1 Year **i**

No

History of Severe COPD **i**

No

Dialysis **i**

No

Acute Renal Failure **i**

No

BMI Calculation: **i**

Height: 69 in / 175 cm

Weight: 155 lb / 70 kg

Back

Continue

Step 2 of 4

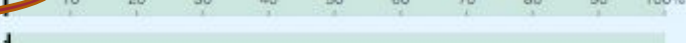
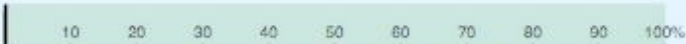
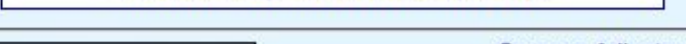
[Risk Calculator Home Page](#)[About](#)[FAQ](#)[ACS Website](#)[ACS NSQIP Website](#)

Procedure: 27447 - Arthroplasty, knee, condyle and plateau; medial AND lateral compartments with or without patella resurfacing (total knee arthroplasty)

Risk Factors:

[Change Patient Risk Factors](#)

Outcomes ⓘ

		Your Risk	Average Risk	Chance of Outcome
Serious Complication		1.7%	3.8%	Below Average
Any Complication		2.0%	4.4%	Below Average
Pneumonia		0.1%	0.2%	Below Average
Cardiac Complication		0.0%	0.2%	Below Average
Surgical Site Infection		0.3%	0.7%	Below Average
Urinary Tract Infection		0.4%	0.8%	Below Average
Venous Thromboembolism		0.5%	1.3%	Below Average
Renal Failure		0.0%	0.1%	Below Average
Readmission		1.5%	3.1%	Below Average
Return to OR		0.5%	0.9%	Below Average
Death		0.0%	0.1%	Below Average
Discharge to Nursing or Rehab Facility		6.5%	23.2%	Below Average

Predicted Length of Hospital Stay: 2 days

How to Interpret the Graph Above:



Surgeon Adjustment of Risks ⓘ

This will need to be used infrequently, but surgeons may adjust the estimated risks if they feel the calculated risks are underestimated. This should only be done if the reason for the increased risks was NOT already entered into the risk calculator.

1 - No adjustment necessary

Gupta Perioperative Cardiac Risk

Determine peri-operative risk for a wide array of surgeries.

Age?

58

Years

Creatinine?

≥1.5 mg/dL

<1.5 mg/dL

Creatinine level not known

ASA Class?

ASA 1

ASA 2

ASA 3

ASA 4

ASA 5

Preoperative Functional Status?

Total independent

Partially dependent

Totally dependent

Procedure Site?

Obstetric/Gynecologic

Orthopedic and non-vascular Extremity

Other abdominal

Peripheral Vascular

Skin

Spine

Non-esophageal Thoracic

Vein

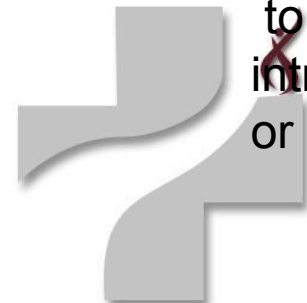
Urology

Results

Estimated Risk Probability for Perioperative Myocardial Infarction or Cardiac Arrest

0.02 %

NSQIP database (200,000 surg pts)
to determine risk factors associated with
intraoperative/postoperative myocardial infarction
or cardiac arrest (MICA)



Cardiologists: Assign Risk-(NOT CLEARANCE) Surgeons & Pt's decide When, Where & IF To Proceed

- **Low-risk patients** — estimated risk of death is less than 1% are require no additional cardiovascular testing.
- **Higher-risk patients** — risk of death is 1% or higher may require additional cardiovascular evaluation



IE < 1% risk- No further testing

- If higher risk- will further testing improve outcome?
- In most cases NO! But can lower long-term risk
- So testing should be done for life risk
- Testing should not be done solely for upcoming surgery



Other Risk Factors-not included

- **●Atrial fibrillation** – risk was higher than that associated with a diagnosis of coronary artery disease.
- **●Obesity** – Obese patients are at increased risk for adverse cardiovascular events at the time of non-cardiac surgery. (but not independent risk factor)
- **Cardiac Functional Status- <4 MET's (2 flight stairs, 3-4 blks)**



SUMMARY AND RECOMMENDATIONS

- Assess risk of perioperative cardiac event. (H&P, type surgery)
- Suggest Revised (Lee) Cardiac Risk Index or the ACS-NSQIP Data
 - Use 2 of 3 Calculators
 - RCRI Calculator
 - ACS-NSQIP Risk Calculator
 - Gupta MICA Calculator
- Baseline EKG.
- Cardiac risk < 1% no cardiac consultation
- Cardiac Consultation for RISK:
 - Known or suspected heart disease
 - (ie, CV disease, significant valvular heart disease, symptomatic arrhythmias, recent MI)
 - Further cardiac evaluation (echocardiography, stress testing, or 24-hour ambulatory monitoring) if it is indicated in the absence of proposed surgery.
 - A-Fib
 - Poor Functional Status < 4 MET's

Use Good Judgement!

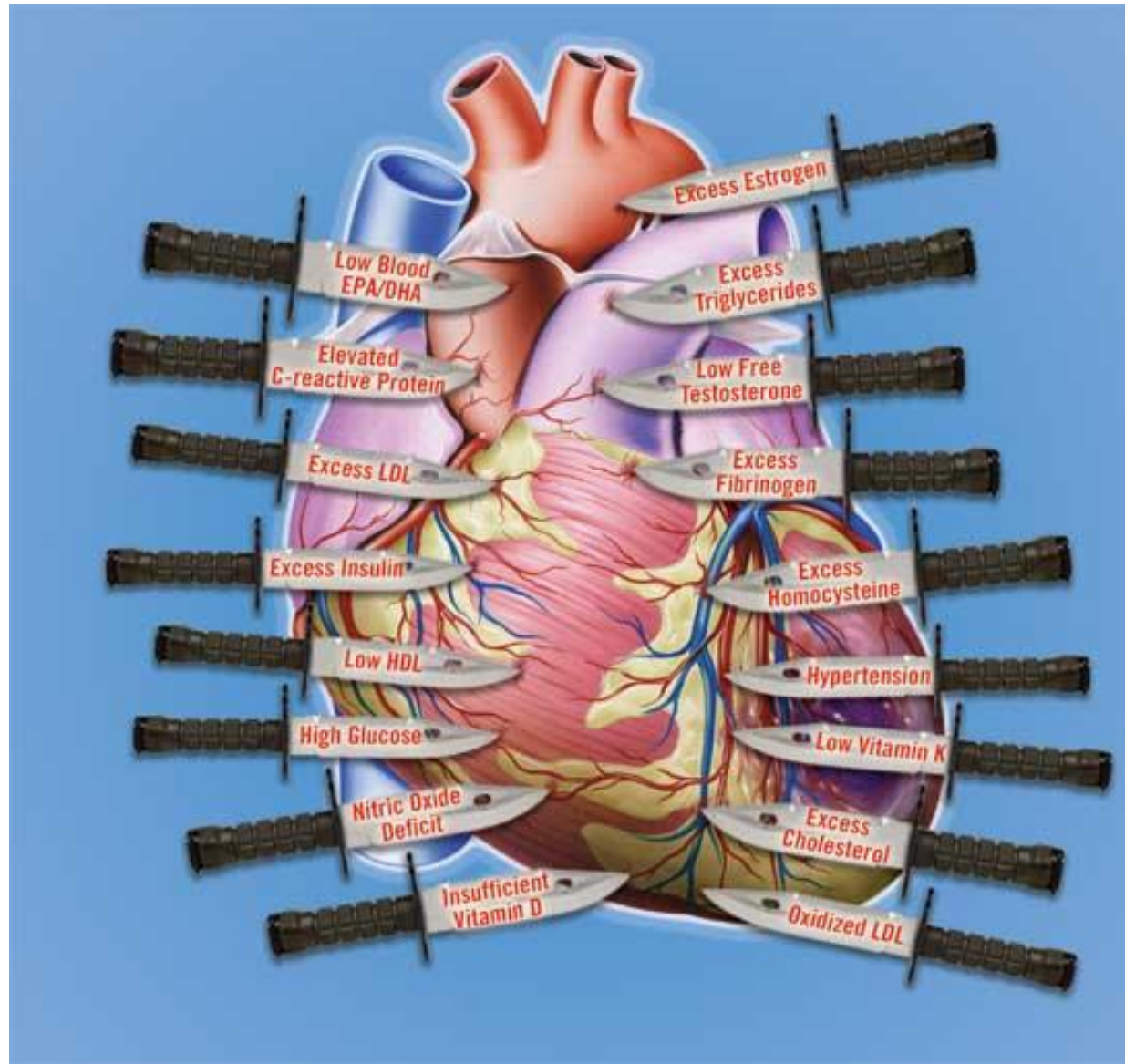


Cardiac Functional Status-MET's

- Self Care: eat, dress, toilet (1 MET)
- Walk up a flight of steps, a hill or walk at 3 to 4 mph (4 METs)
- Heavy work around the house such as scrubbing floors or lifting or moving heavy furniture or climb two flights of stairs (4to10 METs).
- Strenuous sports: swimming, tennis, basketball, and skiing (>10 METs)
- Increased risk of postoperative cardiopulmonary complications after major noncardiac surgery is the inability to climb two flights of stairs or walk four blocks-(Non-orthopaedic conditions)



Thank You!



Opening

- Train left the station
- 1994-2014 20 yrs hosp beds dec 901K -787K 13%
- Hosp admissions dec 12%
- OP visits inc 200% 300M inc
- OP proc inc 32% 4M
- OP surg centers 8%
- SCA 3rd largest
- As technology advances & HC demands lower cost options, the OP surg space cont to thrive



OP TKA- Swiftpath

- Lowest risk
- Immediate mobilization
- Healthiest pt selection
- Efficient surgery
- Min bld loss
- Min anes
- no opioids
- Optimize- ASA, omega 3 etc
- Pt engagement

