Preoperative Cardiac Risk Evaluation and Management

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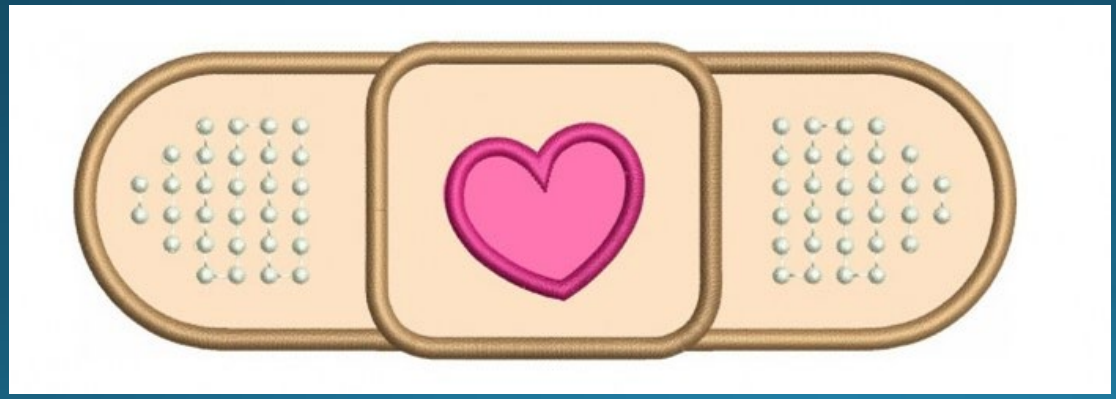
Goals

- Case example
- How to evaluate clinical risk profile and medical status
- Use of risk algorithms
- When to revascularize
- Perioperative medications
- Special cases

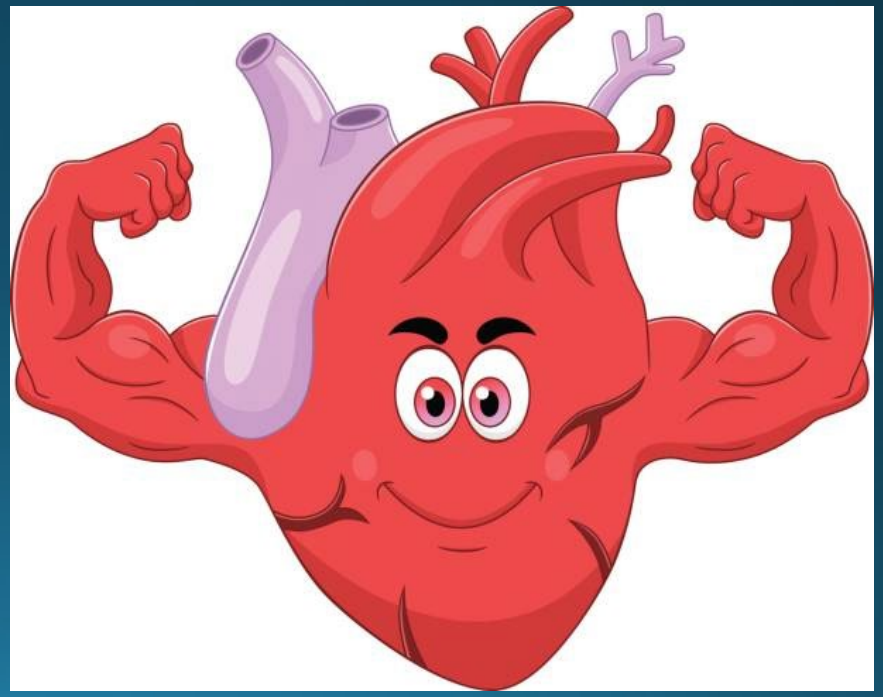
Case

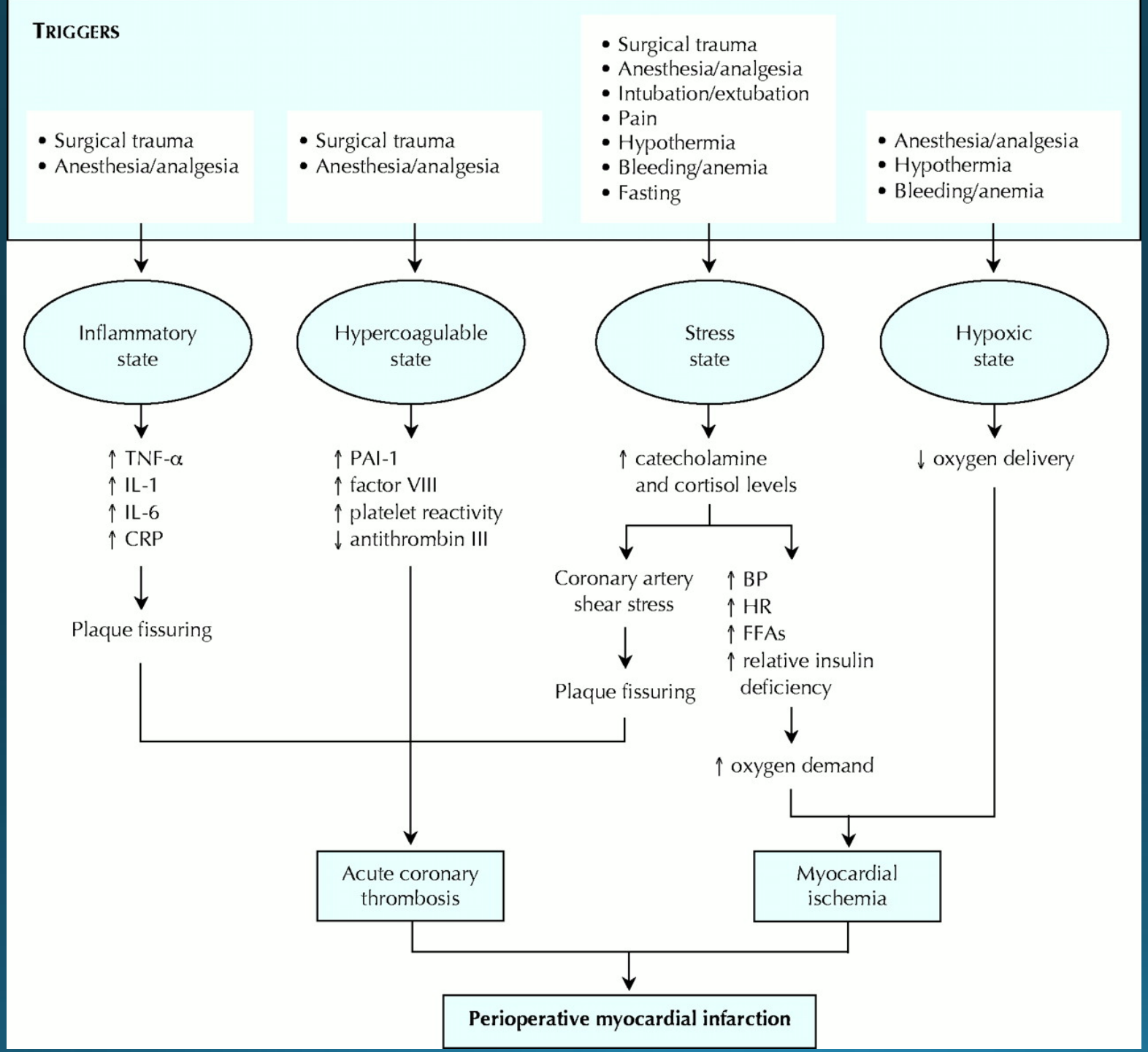
- 70-year-old man with hypertension, hyperlipidemia, and type-II diabetes on insulin
- Scheduled for right total knee replacement surgery
- Sedentary job but tries to exercise by walking in neighborhood. Limited by knee pain
- Does not have any specific cardiac complaints



What does he need before surgery?

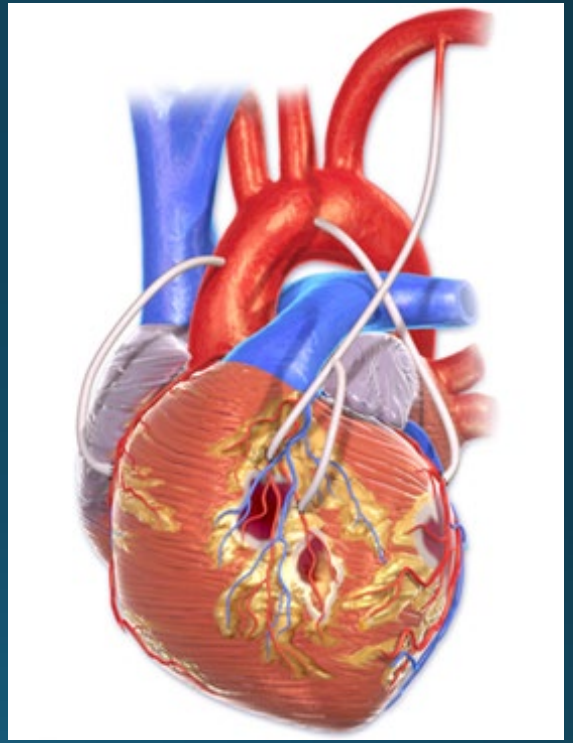
A. Proceed with surgery without further testing
B. EKG and if normal can proceed with surgery
C. Obtain a stress test
D. Obtain a coronary CTA




TRIGGERS
• Surgical trauma
• Anesthesia/analgesia
• Surgical trauma
• Anesthesia/analgesia
• Surgical trauma
• Anesthesia/analgesia
• Intubation/extubation
• Pain
• Hypothermia
• Bleeding/anemia
• Fasting
• Anesthesia/analgesia
• Hypothermia
• Bleeding/anemia
Inflammatory state
Hypercoagulable state
Stress state
Hypoxic state
↑ TNF-α
↑ IL-1
↑ IL-6
↑ CRP
↑ PAI-1
↑ factor VIII
↑ platelet reactivity
↓ antithrombin III
↑ catecholamine and cortisol levels
↓ oxygen delivery
Plaque fissuring
Coronary artery shear stress
Plaque fissuring
↑ BP
↑ HR
↑ FFAs
↑ relative insulin deficiency
↑ oxygen demand
Acute coronary thrombosis
Myocardial ischemia
Perioperative myocardial infarction

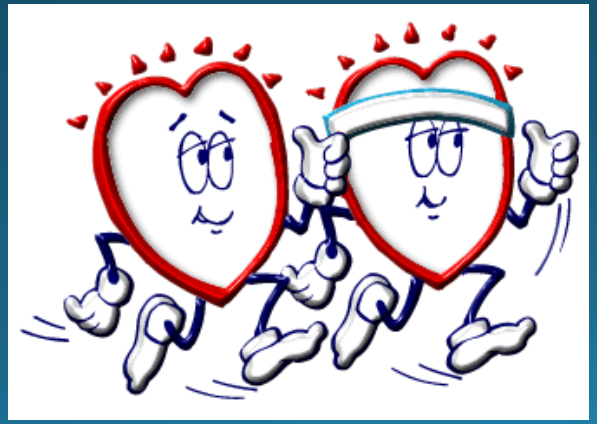
Emergent Surgery

- These patients are at increased risk of a perioperative cardiovascular event at any level of baseline risk
- Risk indices are not accurate but may provide an estimate of the minimal risk.
- We focus on being available postoperatively to manage any cardiovascular complications



What Questions to Answer?

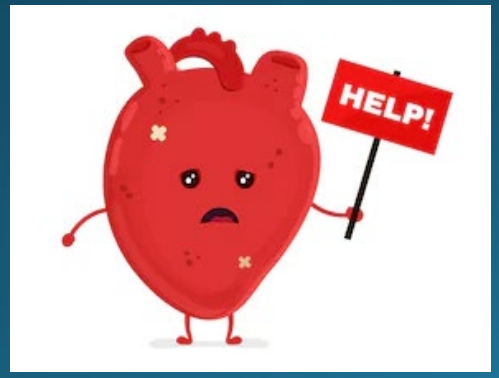
- Patient's clinical risk profile
  - Past medical history
- Patient's current medical status
  - Symptoms, METs, exam
- Provide recommendations for preoperative testing
- Provide recommendations for perioperative risk management



Clinical Risk Factors

Major Risk Factors

- Acute coronary syndrome
- Decompensated heart failure
- Significant arrhythmias
- Prior MI or PAD
- Diabetes



Minor Risk Factors

- Advanced age
- Abnormal EKG
- Rhythm other than sinus
- Low functional capacity
- History of CVA
- Uncontrolled hypertension

Who Goes Straight to Cardiology?

- Recent MI (6o days) or unstable angina
- Decompensated heart failure
- High-grade arrhythmias
- Hemodynamically important valvular heart disease

Current Medical Status

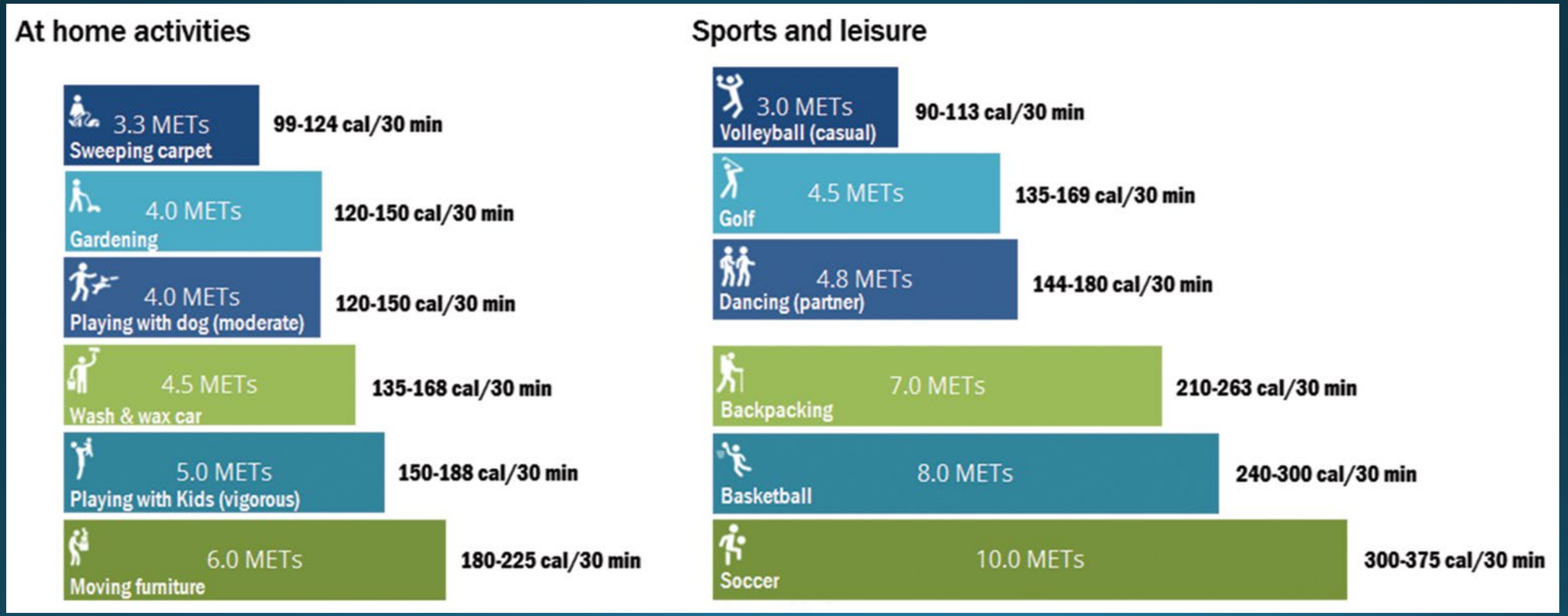
Symptoms/Conditions

- Angina
- Dyspnea
- Syncope
- Palpitations
- Exercise tolerance (METs)

Exam

- Blood pressure
- Heart and lung exam
- Extremities for edema and vascular integrity

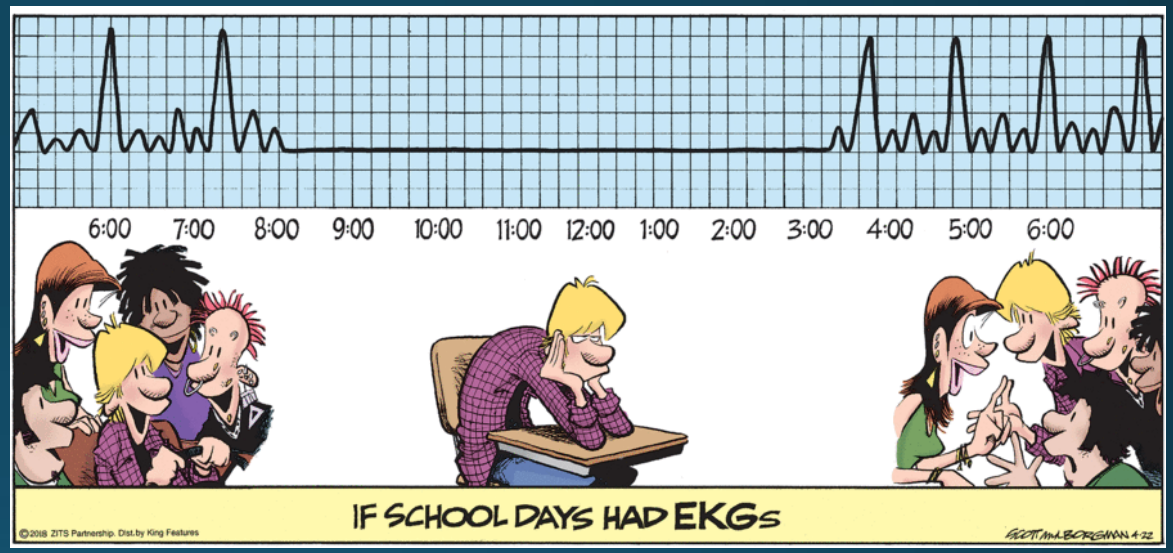
Estimating METs



The EKG

No to EKG
- Asymptomatic
- Age <45 years
- No cardiac risk factors

Yes to EKG
- Any cardiac risk factors
- Age>45
- Not a low-risk surgery



Baseline EKG is helpful should a postoperative EKG be abnormal

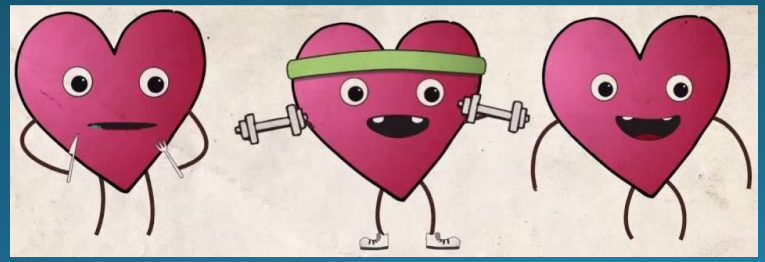
Surgical Category

Risk of Procedure	Surgery
High	Aortic and major vascular surgery, peripheral vascular surgery
Intermediate	Intraperitoneal or intrathoracic surgery, carotid endarterectomy, head and neck injury, orthopedic surgery, prostate surgery
Low	Ambulatory surgery, breast surgery, endoscopic procedures, superficial procedures, cataract surgery

Estimated Risk and Recommendations

Perioperative risk: Likelihood that a patient will suffer a cardiac complication at the time of non-cardiac surgery

- Proceed with surgery without further testing
- Postpone surgery pending further testing
- Change to a procedure with less risk/ non-surgical alternative
- Cancel procedure for coronary revascularization or valve surgery

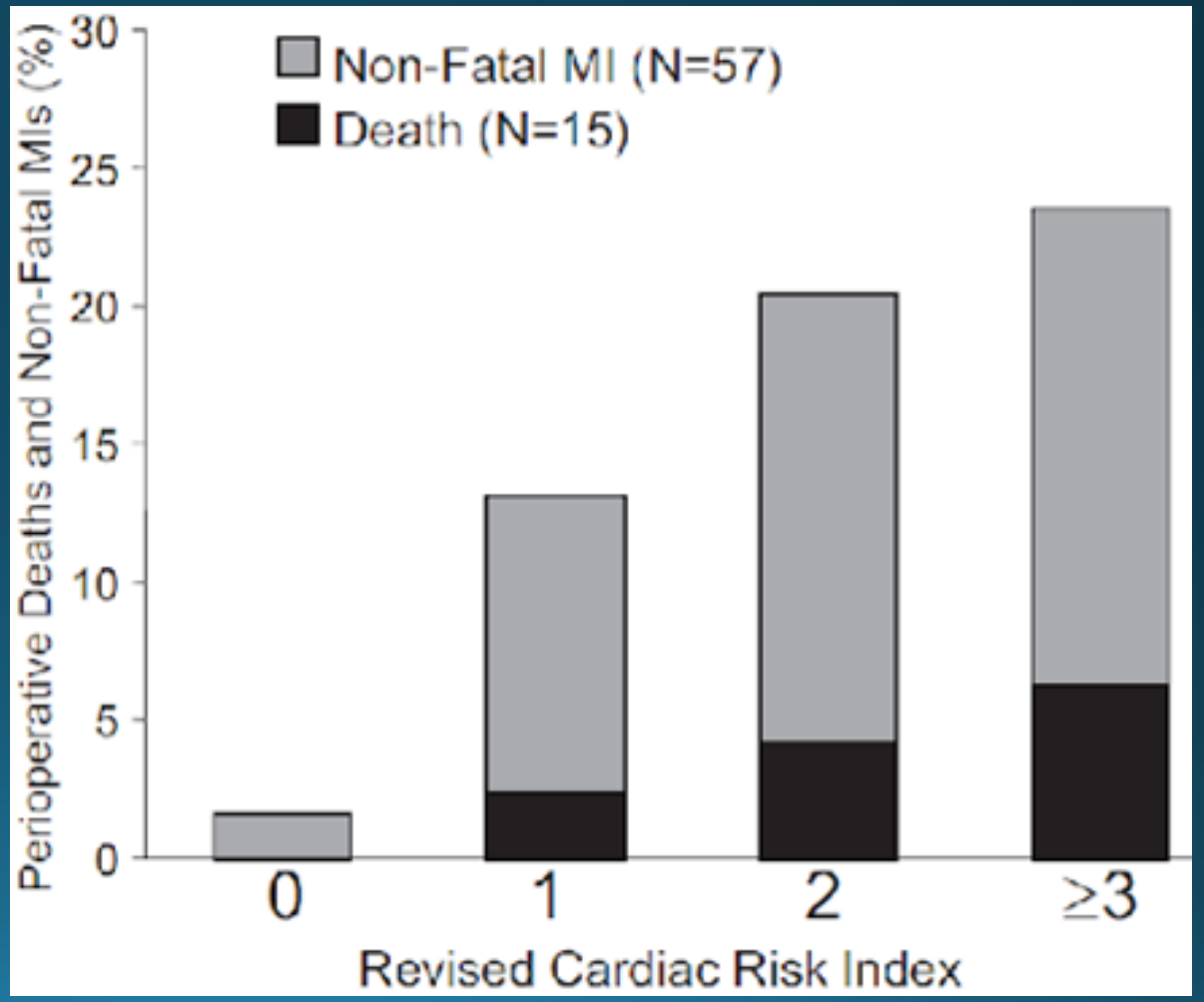


Risk Calculator

- Revised Cardiac Risk Index (RCRI)
- Gupta Myocardial Infarction or Cardiac Arrest (MICA)
- Vascular Study Group of New England Cardiac Risk Index (VSG-CRI)

Revised Cardiac Risk Index

- High risk surgery
- History of ischemic heart disease
- History of congestive heart failure
- History of CVA
- Insulin use for diabetes
- Pre-op Cr > 2.0 mg/dl



Vascular Study Group Cardiac Risk Index

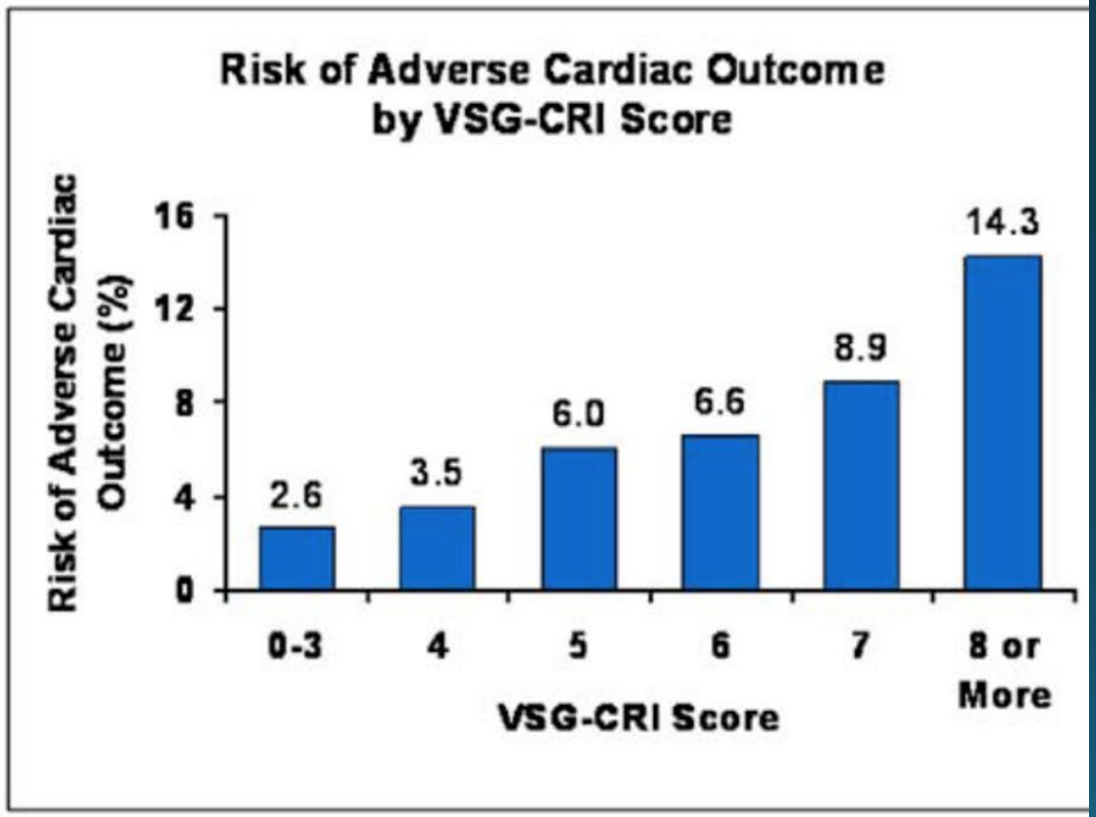
Step 1:

Calculate VSG-RCI Score

Step 2:

Use VSG-CRI Score To Predict Risk of Adverse Cardiac Outcome

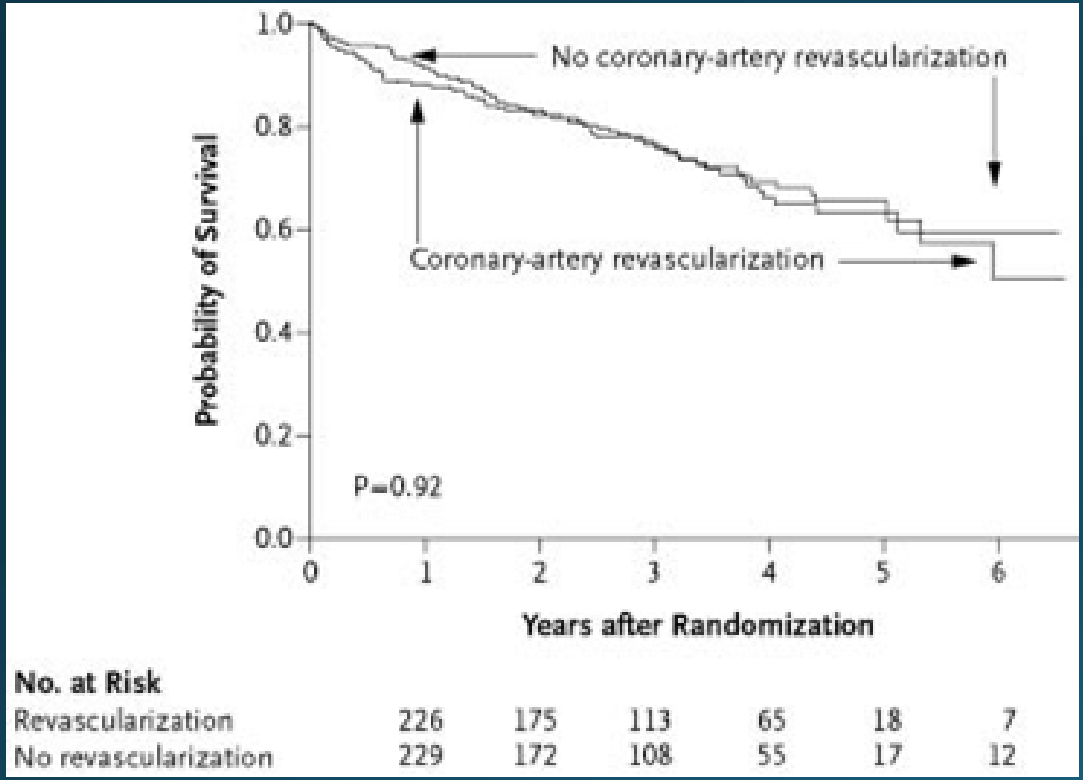
VSG-CRI Risk Factors	# Points
Age ≥ 80	4
Age 70-79	3
Age 60-69	2
CAD	2
CHF	2
COPD	2
Creatinine > 1.8	2
Smoking	1
Insulin Dependant Diabetes	1
Long term β-Blockade	1
History of CABG or PCI	-1



Cardiac Testing

- Echocardiography
  - Cardiomyopathy, valve disease, pulmonary hypertension
- Stress imaging
  - To evaluate ischemic symptoms
  - Major vascular surgery
  - Elevated risk score
- Invasive angiogram
  - Unstable angina
  - Abnormal stress imaging?

Revascularization?



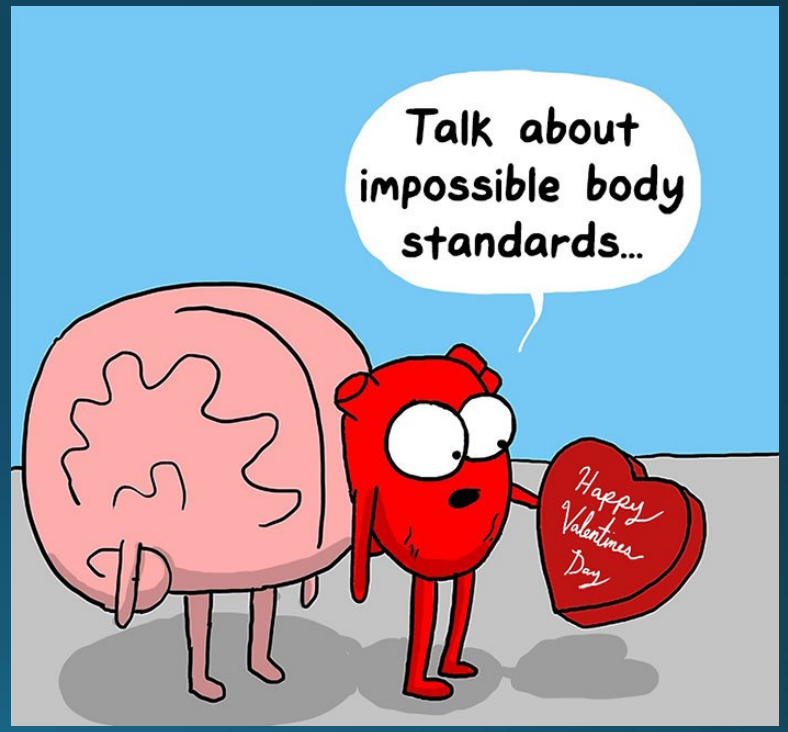
	Preoperative Coronary Revascularization		No Preoperative Coronary Revascularization		
Risks	N	Complications (%)	N	Complications (%)	*P*
0	26	0 (0)	36	1 (2.8)	0.99
1	79	8 (10.1)	90	14 (15.6)	0.36
2	84	17 (20.2)	83	17 (20.5)	0.99
≥3	33	7 (21.2)	31	8 (25.8)	0.77

CARP Trial (2004)

- 510 patients prior to vascular surgery
- Time to surgery: 54 vs 18 days
- 30-day post-op MI: 12% vs 15%
- 3 years post-op mortality: 22% vs 23%

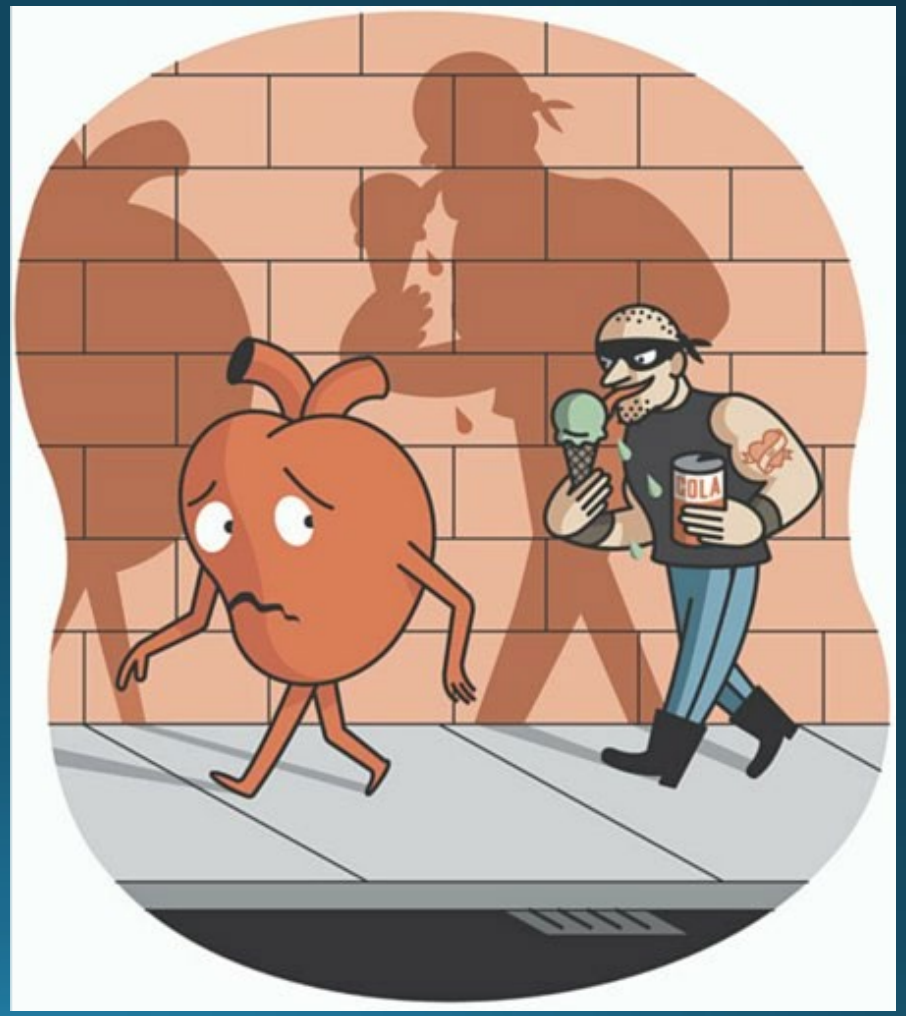
Outline of Assessment

- List the patient's known risk factors
- Assess current medical status
- Surgical category
- EKG?
- Patient's risk score
- Make your recommendation!



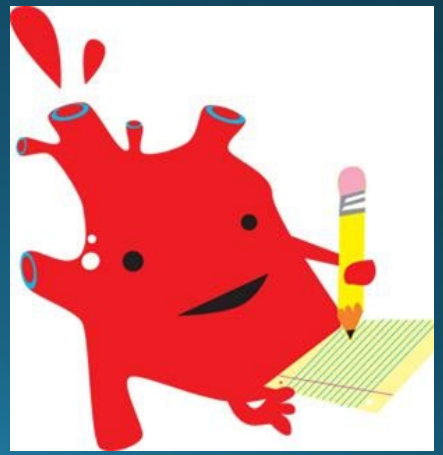
Our Case

- Clinical risk factors
  - Hypertension, hyperlipidemia, diabetes
- Current medical status
  - No cardiac complaints
  - Sedentary job = Unknown METs
- Surgical category
  - Intermediate risk



Our Case: In Clinic

- Exam
  - Vitals: HR 76, regular. BP 145/87. RR 16. Wt 80
  - Pedal edema, otherwise benign
- EKG
  - Sinus rhythm, T-wave inversion in lead III, normal intervals
- Risk index
  - RCRI risk: 1 point (use of insulin), Class II risk
  - MICA risk: ASA class II
  - VSG-CRI: 3.5% risk



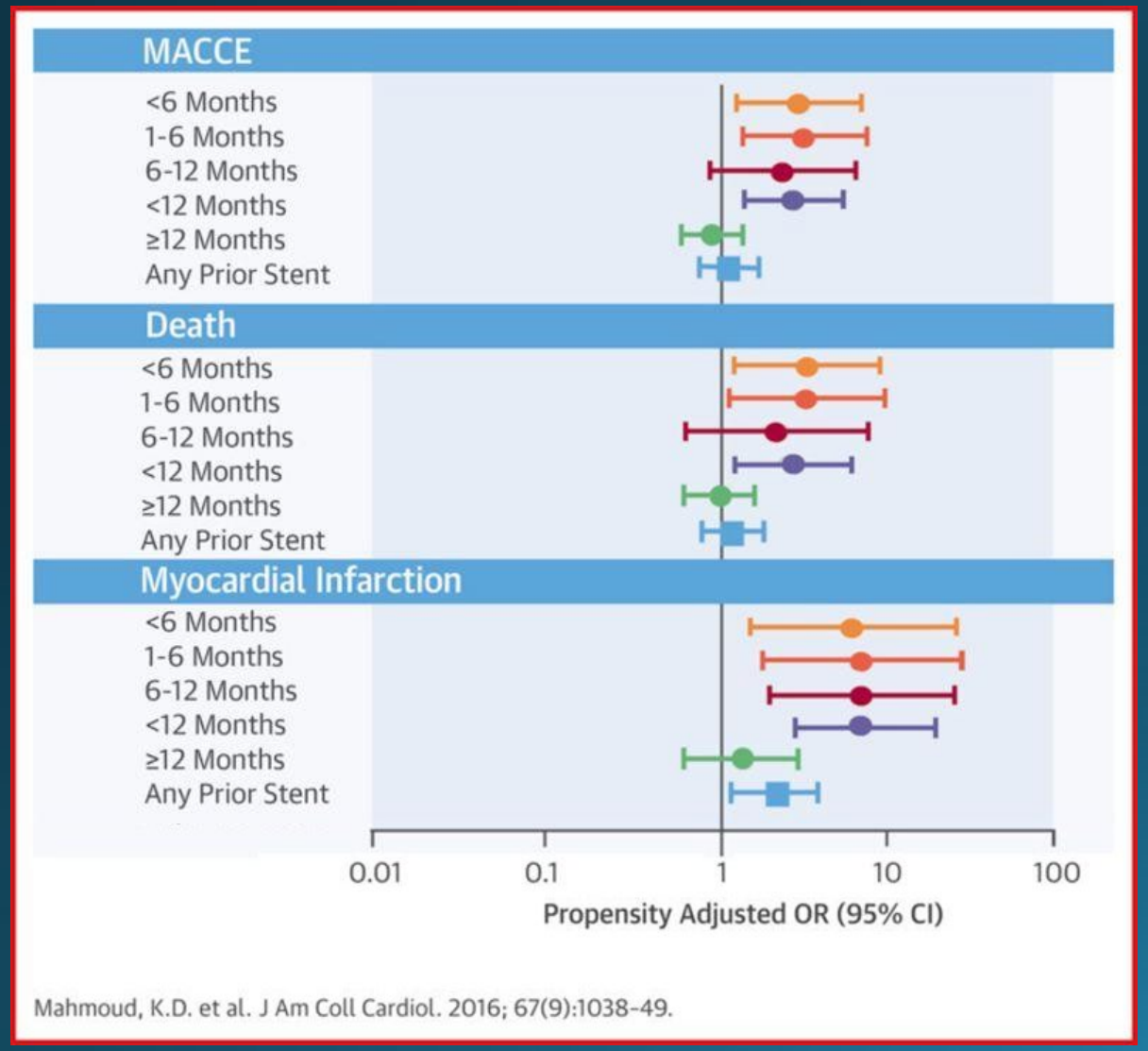
Our Recommendation

A. Proceed with surgery without further testing
B. EKG and if normal can proceed with surgery
C. Obtain a stress test
D. Obtain a coronary CTA

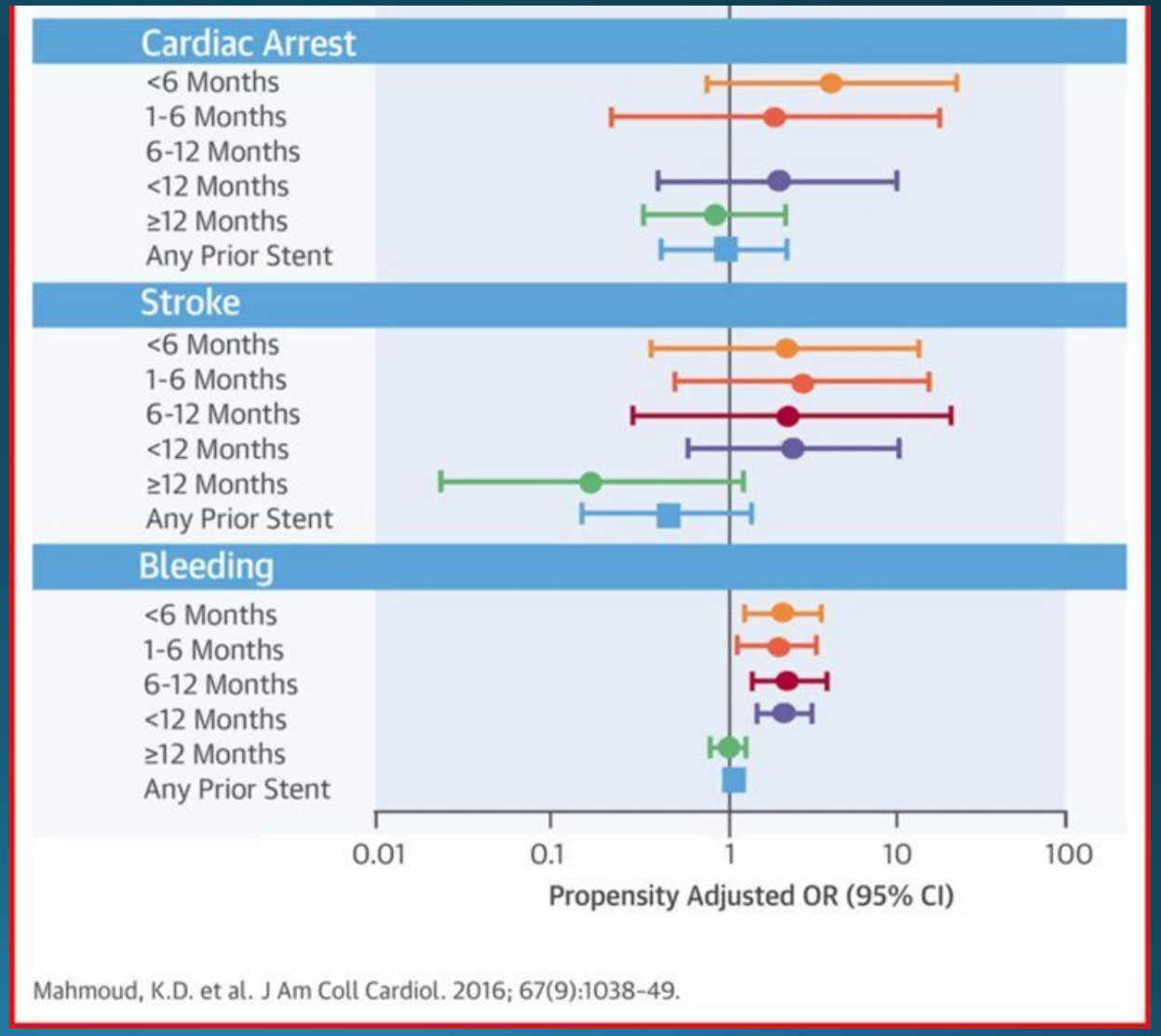
Perioperative Medications

- ACEi or ARB
  - Discretion of anesthesia
  - Can discontinue 24 hours before surgery
  - Restart by post-op day 2
- Beta-blocker
  - Continue if already taking
- Statin
  - Continue
- Aspirin
  - Safe to discontinue unless s/p stent or CABG

Perioperative Risk with Prior Stent



Mahmoud, K.D. et al. J Am Coll Cardiol. 2016; 67(9):1038-49.



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Dual Antiplatelet Therapy

Aspirin

- Continue unless bleeding risk is catastrophic (neurosurgery)

- P2Y12 inhibitors
  - Ideal is to continue for 12 months, hopefully 6 months
  - Clopidogrel: Stop 5 days prior (load postoperatively)
  - Prasugrel: Stop 7 days prior
  - Ticagrelor: Stop 3-5 days prior

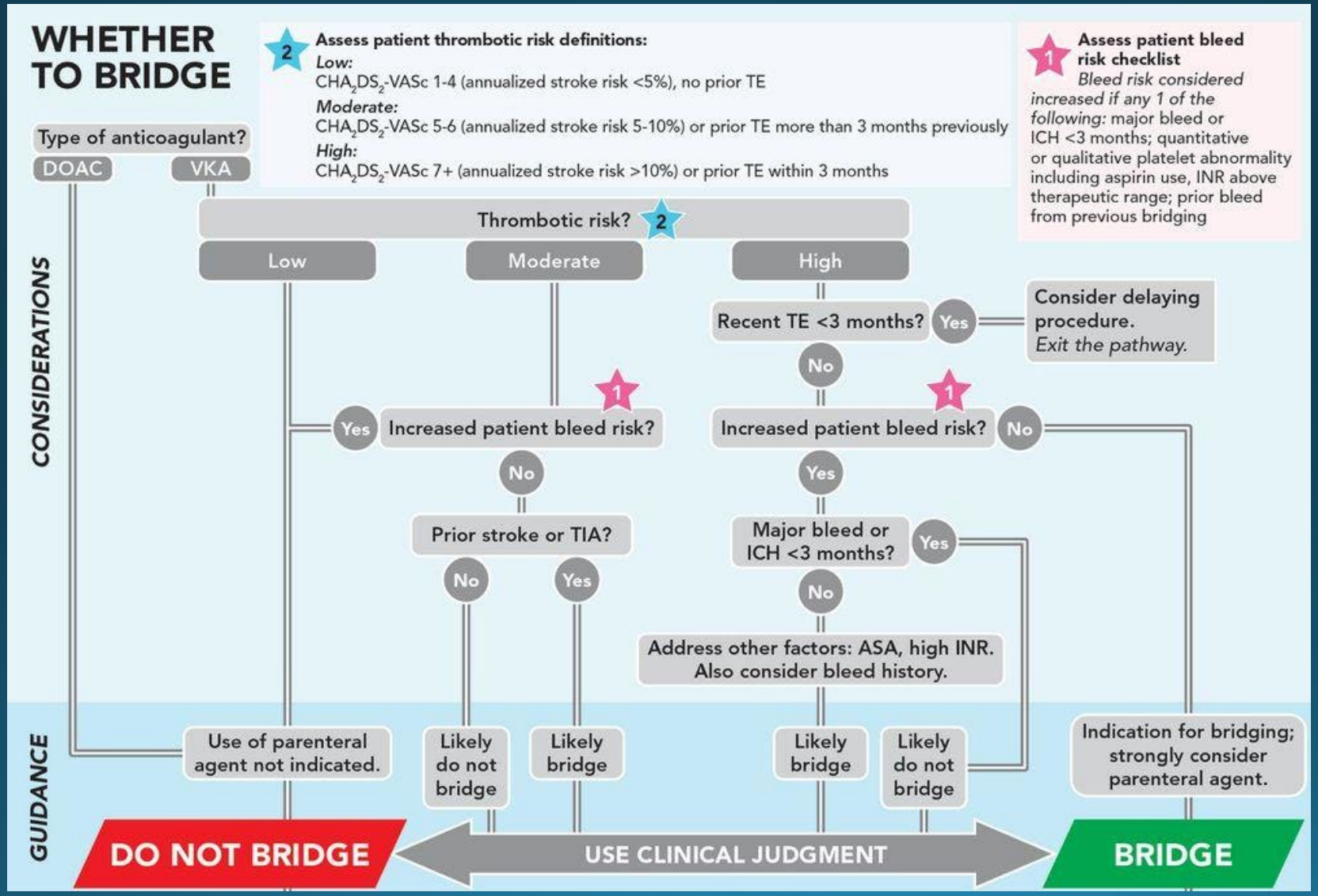
No bridging

Anticoagulation

Bleeding risk vs thromboembolic risk

- Dental procedures: Continue
  - Stop if multiple tooth extractions
- Warfarin: Stop 5 days prior
  - Check INR day before surgery
  - Restart 12-24 hours after surgery
- Novel anticoagulants: Stop 2 days prior
  - Restart 1-2 days after surgery

Bridge to Surgery



Bridge to Surgery

Perioperative Anticoagulant Management Alg

Please select the type of surgery:

- Elective
- Emergency Surgery/procedure <12 h (e.g. intracran viscus, cardiac tamponade)
- Urgent surgery/procedure 12-24 h (e.g. hip fracture cholecystitis)

Perioperative Anticoagulant Management A

Procedural Bleeding Risk

- Low (minor non-dental procedure)
- Low (minor dental procedure)
- Moderate
- High

Perioperative Anticoagulant Management Algorithm

Summary

Bleeding Risk: **Moderate (2-day risk of major bleed 0-2%)**
Anticoagulant: **Apixaban**
Creatinine Clearance: **57.3 mL/min**
Indication For Antithrombotic: **Atrial fibrillation**
Thromboembolic Risk: **Moderate**

Preoperative Recommendations

Last dose of apixaban: 2 days before surgery (skip 2 doses).

Postoperative Recommendations

Resume usual dose of apixaban one day after surgery (24 hours postoperative), assuming hemostasis is adequate and patient will not be undergoing additional invasive procedures.

Schedule

Day	Instructions
-3	Apixaban as usual (morning and night)
-2	Apixaban as usual (morning and night)
-1	No apixaban
Surgery	No apixaban

ve Anticoagulant Management Algorithm

or Antithrombotic

llation

rative Anticoagulant Management Algorithm

embolic Risk (Atrial Fibrillation)

is 5 - 6, or
TIA within 3 months, or
tic mitral stenosis

te
is 3 - 4

is 0 - 2

Patients with Devices

Preoperative assessment

- Device interrogation
- Is the patient pacemaker dependent?
- Is there an ICD?

Intraoperative assessment

- Caution with anesthesic agents
- Continuous telemetry

Postoperative assessment

- Hemodynamically unstable patients
- If ICD is exposed to significant electromagnetic interference

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Thank You!