

PERIOPERATIVE CARDIAC RISK ASSESSMENT

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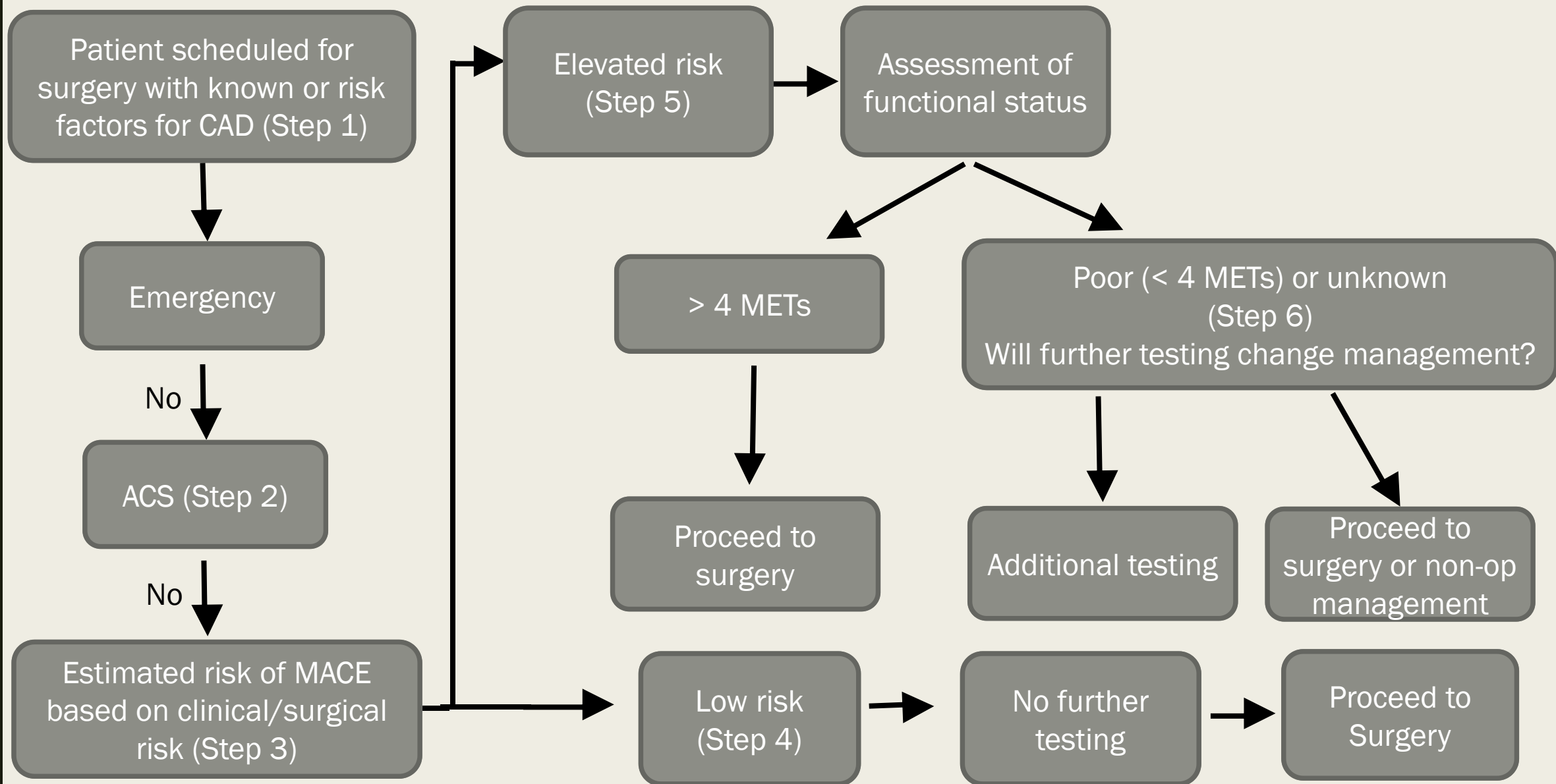
Disclosures

- None

Objectives

- Develop a framework for approaching cardiac risk assessment before non-cardiac surgery
 - Review ACC/AHA 2014 guidelines
 - Briefly discuss CCS 2017 guidelines
 - Discuss role of cardiac testing before surgery
 - Identify pearls of perioperative risk assessment prior to urgent urgency

ACC/AHA 2014 guidelines



Meet your patient

Ms. H is a 68 year-old woman with hemoptysis, found to have a right lung mass. She is scheduled for video-assisted thoracotomy vs. open lung resection.

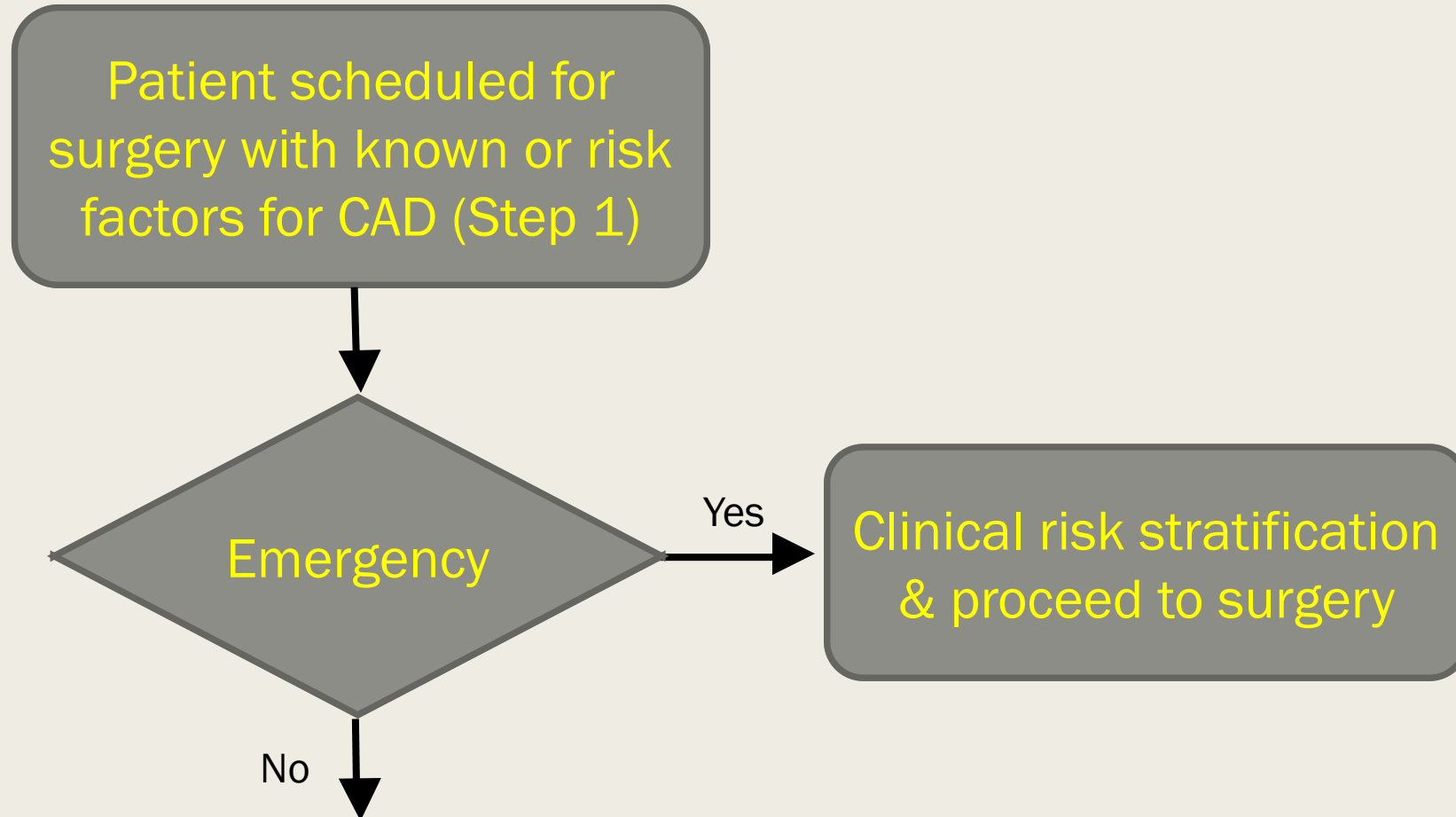
She has a past medical history of TIA, hypertension, diabetes, and tobacco use.

She presents to your clinic for operative “clearance.”

What is your role as the internist?

- **Identify** risk factors
- **Assess** severity & stability of acute & chronic medical issues
- **Recommend** delay or cancellation of surgery, further intervention, or specialty consultation
- **Communicate** with surgeons, anesthesiologists, long-term providers
- **Practice** shared decision-making

Cardiac Risk Assessment Algorithm



Your patient

Ms. Hawk is a 68 y/o woman with a lung mass scheduled for VATs vs. open lung resection.

What is the urgency of her surgery?

Urgency of surgery

Emergent

Life or limb threat if no surgery <6 hours

Urgent

Surgery required within 6 - 24 hours

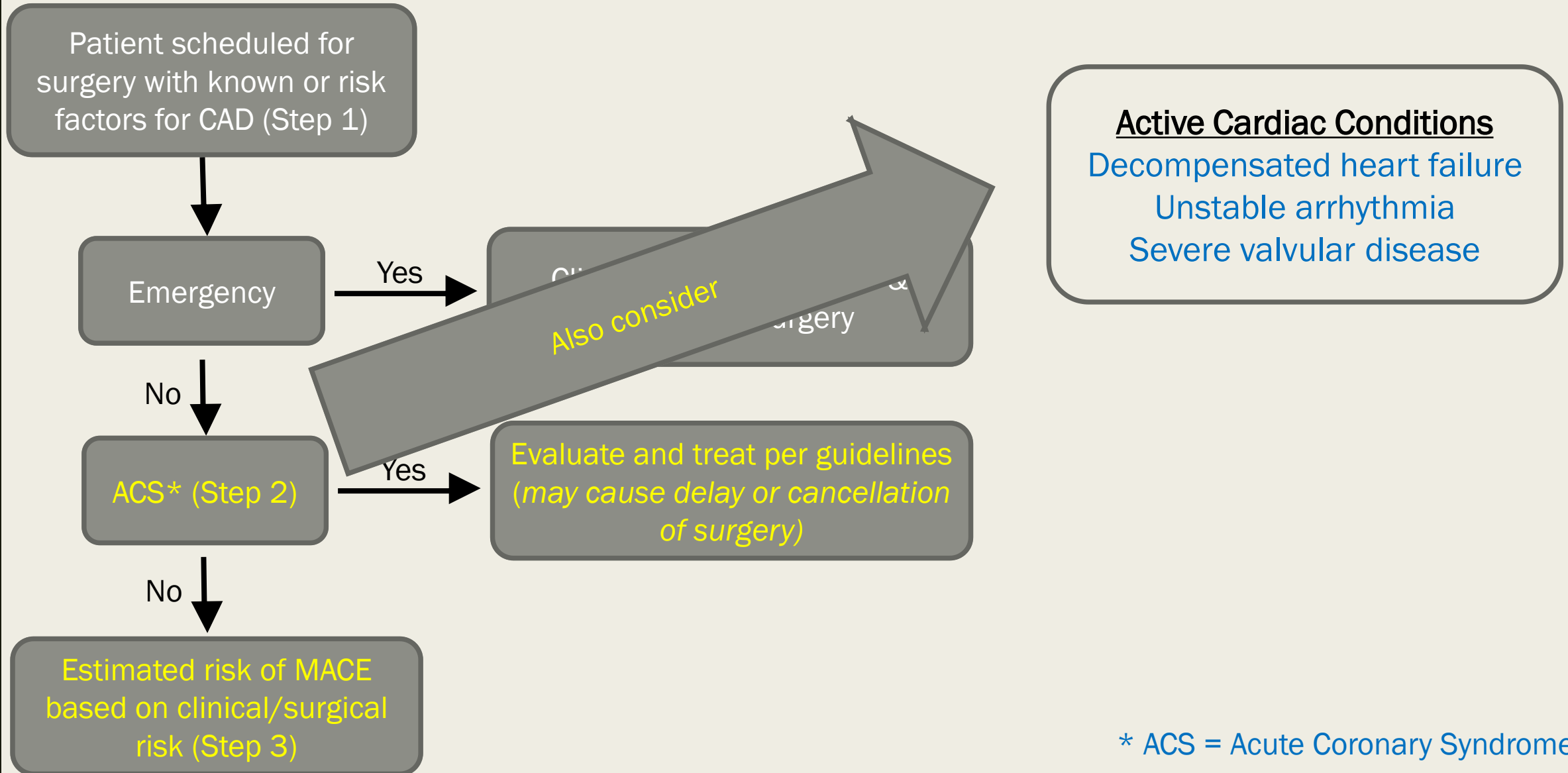
Time-sensitive

Surgery required within 6 weeks

Elective

Surgery could be delayed for 1 year without harm

Cardiac Risk Assessment Algorithm



Risk of Surgery

Combined **surgical** and **patient** risk factors to predict risk of major adverse cardiac events (MACE)*

Low risk
($< 1\%$ MACE)

Elevated risk
($> 1\%$ MACE)

* MACE = ACS, MI, HF, unstable arrhythmia, death

Surgical risk factors

Low risk

Breast surgery
Dermatologic
Ophthalmologic surgery
Dental / oral surgery
Endoscopy
Angiography

Elevated risk

Vascular surgery
Intraperitoneal surgery
Thoracic surgery
Head & neck surgery
Orthopedic surgery
Prostate surgery

Perioperative cardiac complications

Surgery

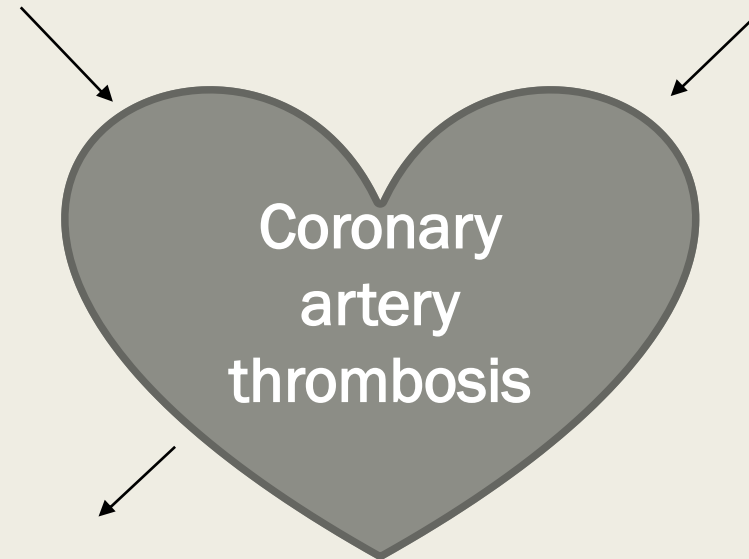
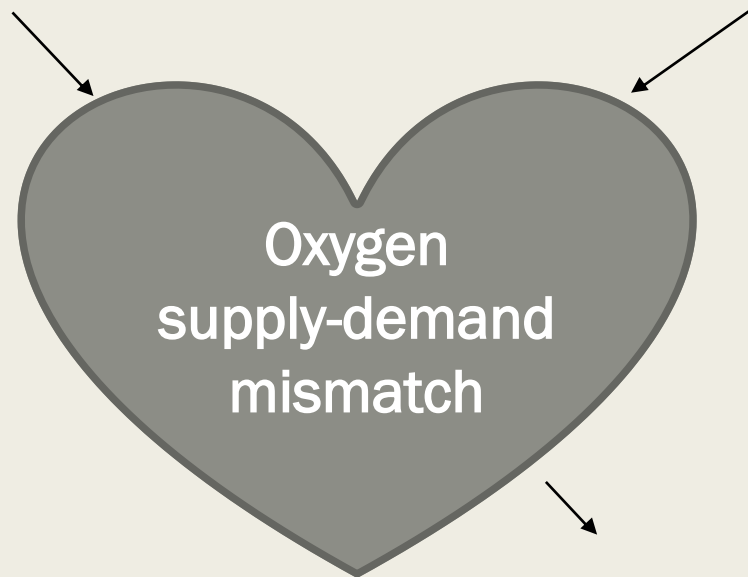
Sympathetic NS stimulation
Bleeding
Inflammation
Hypercoagulability

Anesthesia

Sympathetic NS stimulation
Tachycardia
Hypotension

Post-op factors

Hypotension
Tachycardia
Bleeding
Hypoxemia



Cardiac complications: Heart failure, MI, arrhythmia, cardiac arrest, death

Quantifying clinical risk

- Revised Cardiac Risk Index (RCRI) score¹
- MICA (Myocardial infarction and cardiac arrest) risk calculator²
- ACS NSQIP Surgical Risk Calculator³
- Brain natriuretic peptide (BNP)

1. Lee TH, et al. *Circulation* 1999;100:1043-1049

2. Gupta, et al. *Circulation*. 2011;124:381-387

3. Bilimoria KY, et al. *J Am Coll Surg*. 2013;217(5):833-42.e1-3.

RCRI score

Point	Risk factor	Odds Ratio (OR)
1	History of CHF	4.3
1	Known CAD	3.8
1	History of TIA/CVA	3
1	DM on insulin	2.6
1	Renal insufficiency	1.0
1	High risk surgery	0.9

# of Risk Factors	% Major Cardiac Complications*
0	0.4 (0.05-1.5)
1	0.9 (0.3-2.1)
2	6.6 (3.9-10.3)
>3	11 (5.8-18.4)

* Major Cardiac Complications = MI, cardiac arrest, pulmonary edema, complete heart block

MICA Risk Calculator

Estimate risk of perioperative myocardial infarction or cardiac arrest.

Age

68

Creatinine

<1.5 mg/dL / 133 μ mol/L ▼

ASA Class

ASA 3 ▼

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

Preoperative Function

Partially Dependent ▼

Procedure

Non-esophageal Thoracic ▼

Submit

ACS NSQIP Risk Calculator

Procedure 32100 - Thoracotomy; with exploration Clear

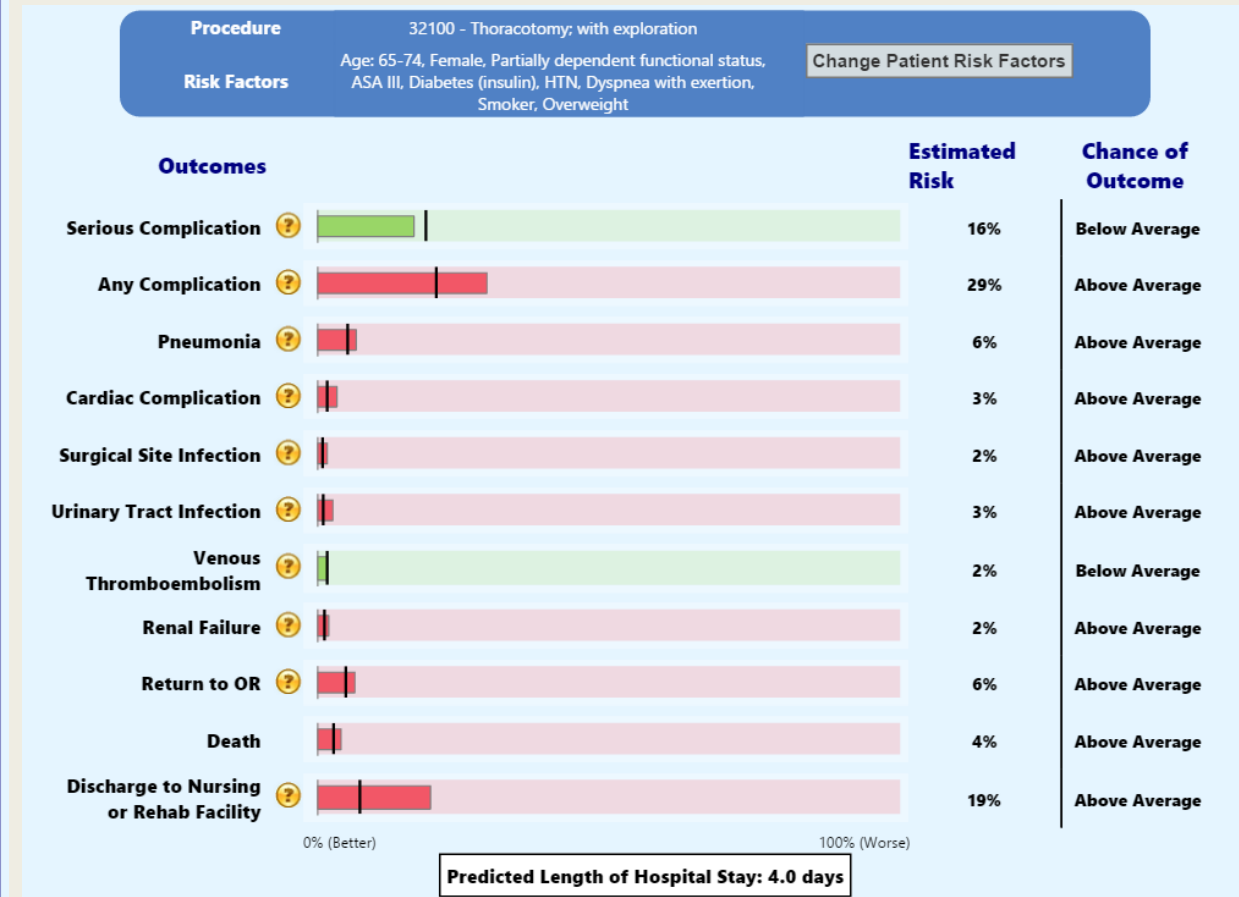
Begin by entering the procedure name or CPT code. One or more procedures will appear below the procedure box. You will need to click on the desired procedure to properly select it. You may also search using two words (or two partial words) by placing a '+' in between, for example: "cholecystectomy+cholangiography"

Reset All Selections

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: 65-74 years | Diabetes: Insulin | Sex: Female | Hypertension requiring medication: Yes | Functional status: Partially Dependent | Previous cardiac event: No | Emergency case: No | Congestive heart failure in 30 days prior to surgery: No | ASA class: III - Severe systemic disease | Wound class: Clean | Dyspnea: With Moderate exertion | Steroid use for chronic condition: No | Current smoker within 1 year: Yes | Ascites within 30 days prior to surgery: No | History of severe COPD: No | Systemic sepsis within 48 hours prior to surgery: None | Dialysis: No | Acute Renal Failure: No | Ventilator dependent: No | BMI Calculation: Height (in): 63 | Disseminated cancer: No | Weight (lbs): 150



Perioperative use of BNP

- ↑ BNP associated with periop morbidity & mortality
 - No standard cut-offs, benefit of BNP-guided management unclear
- **2017 Canadian Cardiovascular Society perioperative guidelines recommend checking BNP pre-op to risk stratify and guide post-op management**
 - **If elevated → daily troponins, EKG, medical co-management**

Your patient

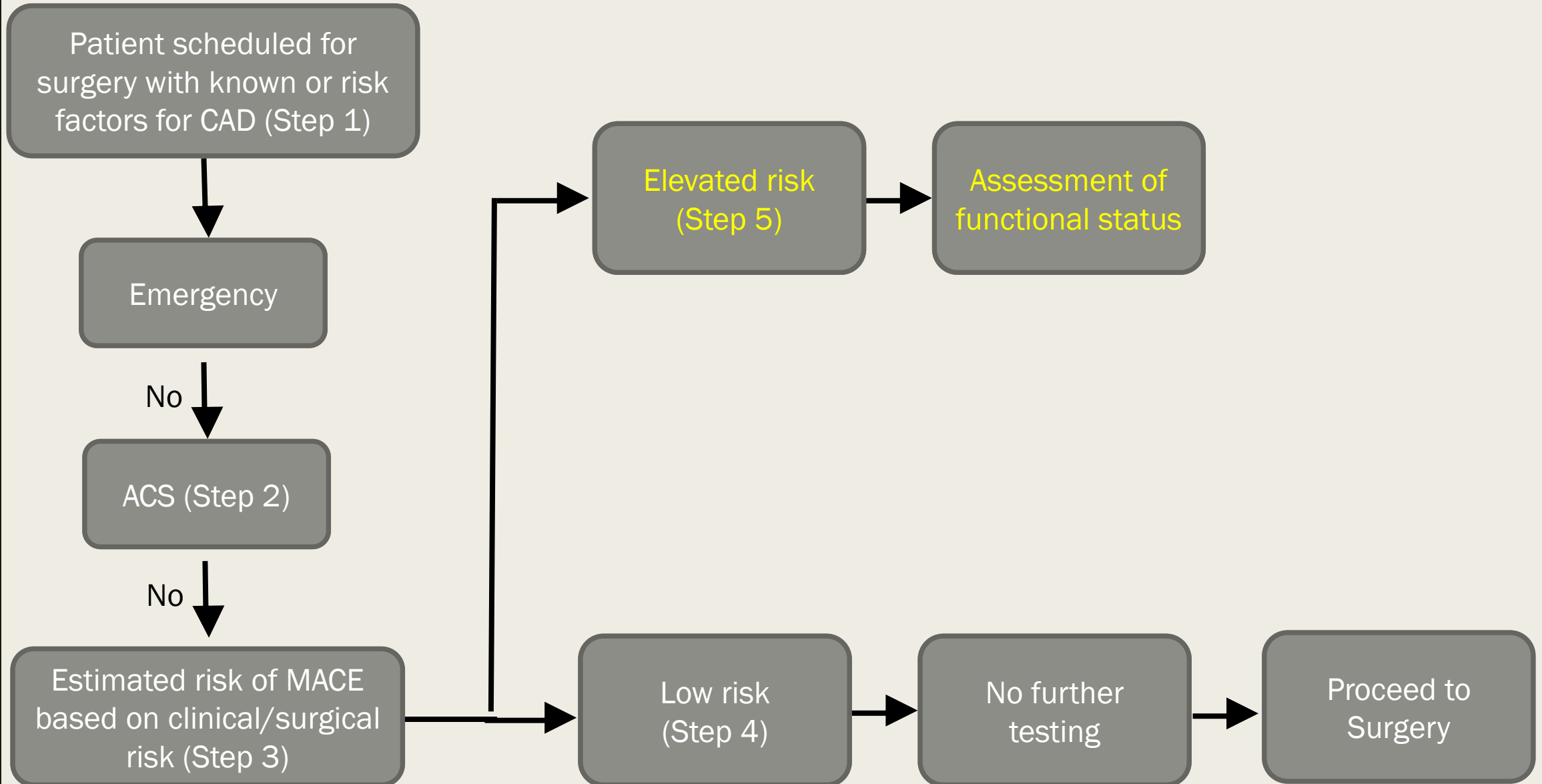
Ms. Hawk's RCRI score is 3 for insulin therapy, CVA, and high risk surgery.

RCRI score suggests 11% risk for cardiac events.

Her MICA risk calculation was 0.83% risk for cardiac arrest and MI.

ACS NSQIP calculator suggest 3% risk for cardiac events.

Cardiac Risk Assessment Algorithm



Your patient

She can walk around her small house without chest pain. She becomes easily winded after prolonged housework or with 1 block. Stairs are difficult for her.

What is her functional status?

Functional Status

METs



Poor

1

Watching television

Eating, dressing, cooking, using the toilet

Walking 1-2 blocks on level ground

Doing light housework

Good

4

Climbing a flight of stairs

Walking on level ground at 4 miles per hour

Running a short distance

Doing heavy chores around the house

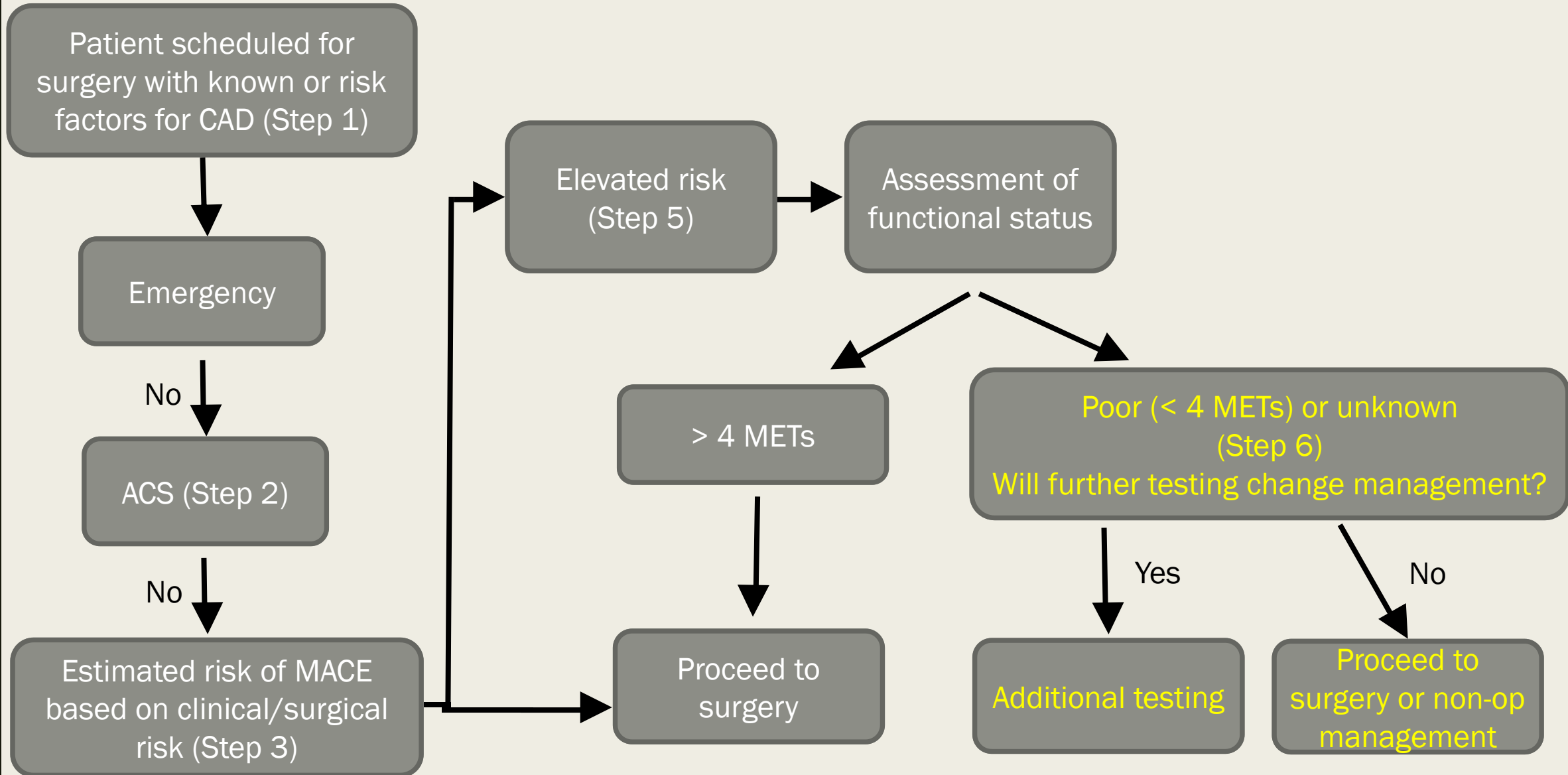
Playing moderately strenuous sports

Excellent

>10

Playing strenuous sports (tennis, basketball)

Cardiac Risk Assessment Algorithm



Diagnositics and management options

- Electrocardiogram
- Echocardiogram
- Stress testing (usually pharmacologic)
- Cardiac catheterization and revascularization
- Medication management

Strength of recommendation

Class of Recommendation	Definition
Class I	Benefit >>> Risk, <i>should be done</i>
Class IIa	Benefit >> Risk, <i>reasonable</i>
Class IIb	Benefit \geq Risk, <i>consider</i>
Class III	Risk > Benefit, <i>not recommended</i>

Level of Evidence	Data Source
Level A	Multiple RCT or meta-analyses
Level B	Single RCT or several non-RCT
Level C	Consensus opinion, case report, “standard of care”

Your patient

Ms. Hawk is a 68 y/o woman with a lung mass scheduled for VATS vs. open lung resection.

She has DM, h/o TIA, and HTN. Her functional status is poor.

Do you recommend a pre-operative EKG?

Recommendations for pre-operative EKG

Reasonable

Patients with known CAD, arrhythmia, PVD, CVD, or other structural heart disease (*IIa, B*) or cardiac risk factors (*IIb, B*)

→ *May be useful as pre-operative baseline*

→ *EKG within 12 months of surgery okay*

No Benefit

Asymptomatic patients undergoing low-risk procedures (*III, B*)

Your patient

Ms. Hawk would not want surgery if it is too high risk. She adds that her exercise tolerance has worsened in last 3 months. Physical exam demonstrates a 3/6 systolic murmur heard best at the RUSB. EKG has non-specific ST-T changes.

What is your next step in management?

Recommendations for pre-operative echocardiogram

Obtain

When moderate to severe valvular stenosis or regurgitation is suspected or change in symptoms or exam if known valve disease (*I, C*)

Reasonable

Patients with dyspnea of unknown etiology or known CHF with change in symptoms (*IIa, C*)

No Benefit

Routine preoperative evaluation (*III, B*)

Recommendations for pre-operative stress testing

If it will **change management**, then:

Consider

- Stress testing with imaging in patients with <4 METs or unknown functional capacity (*IIb,C*)
- Exercise testing in patients with unknown functional capacity (*IIb,B*)

No Benefit

Routine evaluation or functional capacity > 4 METs (*III, B*)

Stress testing results

- Moderate to large reversible defects → ↑ risk of perioperative MI and/or cardiac death
- Negative testing has high negative predictive value¹
- Presence of an old MI on rest imaging → poor predictive value

2017 Canadian CV Society Guidelines

- “We recommend **against** performing preoperative pharmacological stress echo to enhance perioperative cardiac risk estimation (Strong Recommendation; Low-Quality Evidence).”
- “We recommend **against** performing preoperative pharmacological stress radionuclide imaging (Strong Recommendation; Moderate-Quality Evidence)”

Pre-operative stress testing

Diagnostic study in symptomatic patients

VS.

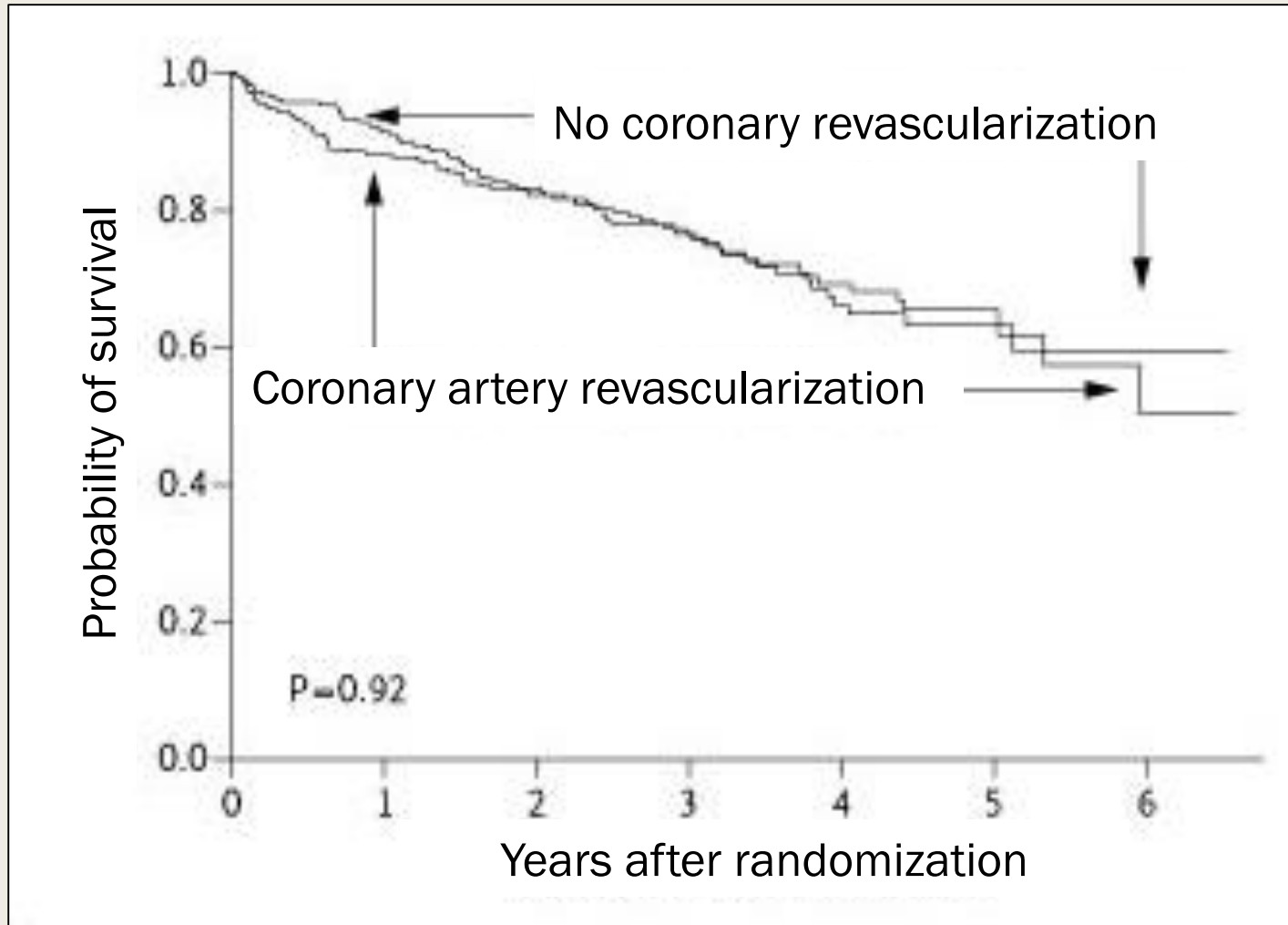
Screening test in asymptomatic patients

Your patient

Dobutamine stress echo + inducible ischemia in mid-to-distal posterolateral and mid-anteroseptal regions.
No severe valvular disease.

What is your next step in management?

Pre-operative cardiac revascularization



Surgical delay:
54 days vs. 18 days
 $p < 0.001$

Pre-operative cardiac revascularization

- Pre-operative revascularization should be performed only in patients with a pre-existing indication for revascularization
- Coronary revascularization not recommended to exclusively decrease perioperative cardiac events (*III,B*)

Your patient

- Refer to Cardiology
- Medical management of CAD – beta-blocker, ASA, statin
- Some considerations:
 - Address goals of care
 - Will delay from PCI or CABG increase risk of surgical condition?
 - Can surgery be done safely with anti-platelet therapy?

Timing of surgery after cardiac intervention

Intervention	Minimum delay in surgery
Balloon angioplasty	14 days
Bare Metal Stent (BMS)	30 days
Drug Eluting Stent (DES)	6 months ¹ (consider at 3-6 months if risk of delayed surgery > stent thrombosis)

Warrants discussion between patient, cardiologist, and surgeon regarding risks of in-stent thrombosis and bleeding

Pre-operative cardiac assessment prior to urgent surgery

- History, physical exam, and functional status are the most important!
- Looking for:
 - Acute coronary syndrome
 - Severe and/or symptomatic valvular disease
 - Volume overload
 - Unstable arrhythmia (SVT, RVR, high-grade block, etc)
 - Hypertensive urgency
 - Cardiac device management
- Medication reconciliation

Questions to ask before ordering testing for urgent surgery

- Will testing change management?
- Will surgery be cancelled (risks>benefits)?
- Can surgery be delayed?
- Will timely treatment of cardiac issue change perioperative outcomes?
- Will results change intra-op or post-op monitoring or disposition (acute care, ICU)?

If ordering testing, **anticipate** results and have a plan!

QUESTIONS?

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