

# 2024 Perioperative Cardiovascular Management

A clinical readout translating the  
**AHA/ACC/ACS/ASNC/HRS/SCA/SCCT/SCMR/SVM Clinical  
Practice Guideline** into a point-of-care reference tool

Target Audience: Multidisciplinary Perioperative Teams

Framework: The 7-Step Algorithmic Pathway

# The Clinical Decision Matrix: Decoding the Recommendation Classes

**Class 1 (Strong)** Is recommended. Benefit >>> Risk.

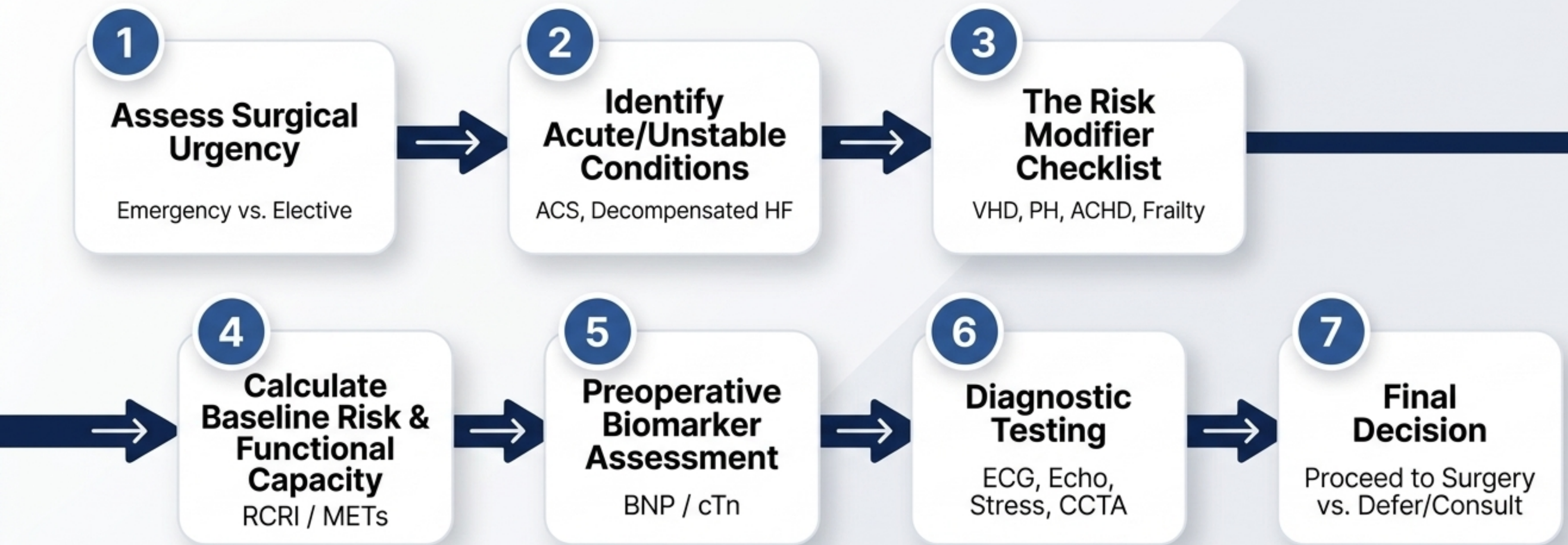
**Class 2a (Moderate)** Is reasonable. Benefit >> Risk.

**Class 2b (Weak)** May/might be considered. Benefit >= Risk.

**Class 3 (Harm/No Benefit)** Is not recommended / Causes harm. Risk > Benefit.

All clinical actions in this dashboard are color-coded to this universal standard. Look for the corresponding colored badges on all medication rules, diagnostic tests, and surgical deferrals.

# The Master Flowchart: The Stepwise Approach to Perioperative Cardiac Assessment



# System Overrides: Emergency Pathways and Acute Intercepts



## Emergency Surgery

**Trigger:** Immediate threat to life or limb (typically <2 hours).

**Class 1 (Strong) Action:** Proceed immediately to surgery. Postpone exhaustive cardiac evaluation.  
Multidisciplinary perioperative management is paramount.



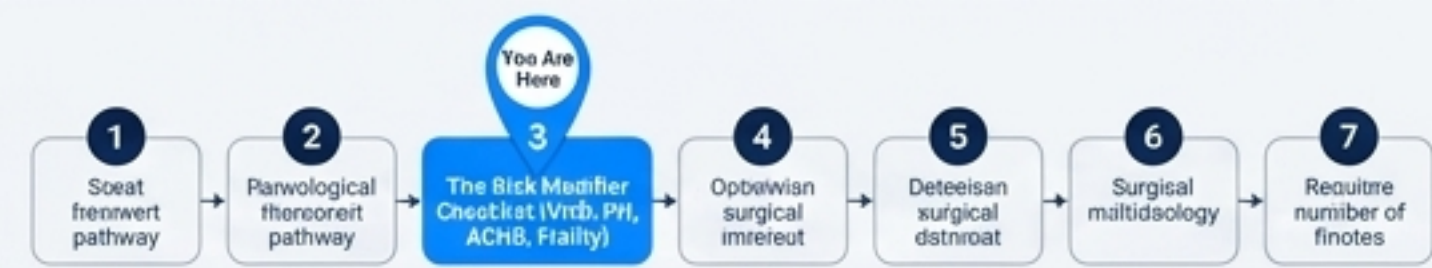
## Acute Conditions

**Trigger:** Acute Coronary Syndrome (ACS), Unstable Arrhythmias, Decompensated Heart Failure.

**Class 1 (Strong) Action:** Defer noncardiac surgery.

**Coronary revascularization as appropriate and deferral of surgery is recommended for ACS patients to reduce perioperative events.**

# The Risk Modifier Checklist: Conditions that Alter the Pathway



If any of these modifiers are present, the patient deviates from the standard low-risk pathway regardless of surgical type, requiring specialized multidisciplinary intervention.



**Modifier 1: Severe Valvular Heart Disease (VHD)**



Triggers Echo / Consult



**Modifier 2: Severe Pulmonary Hypertension (PH)**

Mean PA >40 mmHg or PVR >5 Wood units

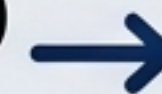


Triggers Specialized PH Center Consult



**Modifier 3: Adult Congenital Heart Disease (ACHD)**

Intermediate/Elevated-risk lesions



Triggers ACHD Specialist Consult



**Modifier 4: Frailty**



Triggers Formal Assessment

# Quantifying Vulnerability: The Frailty Assessment Matrix



## Class 2a

In all patients  $\geq 65$  years, or  $< 64$  with perceived frailty, preoperative assessment using a validated tool can be useful for guiding management.

Frailty represents a **3.7x increased risk** of **30-day mortality**.

Tool Name	Items Assessed	Scoring Threshold
Physical Frailty Phenotype (Fried)	Slowness, low activity, weight loss, exhaustion, weakness	3-5 = Frail
Edmonton Frail Scale	10 items across multiple domains	Sum of scores / 17
FRAIL Scale	Fatigue, stair climb, ambulation, illnesses $> 5$ , weight loss $\geq 5\%$	3-5 = Frail
Clinical Frailty Scale	9 categories by clinical assessment	5-8 indicate mild to very severe frailty

# Calibrating Baseline Risk: The Risk Calculator Matrix



**Context:** Elevated risk is generally defined as a  $\geq 1\%$  risk of a Major Adverse Cardiovascular Event (MACE).

	RCRI (1999)	NSQIP MICA (2011)	Universal NSQIP (2023)	AUB-HAS2 (2019)
Criteria	6 variables (e.g., Ischemic heart disease, HF, Cerebrovascular disease, Creatinine $>2.0$ , Insulin therapy, High-risk surgery)	5 variables (Age, ASA class, function, creatinine, procedure type)	21 comprehensive variables	6 variables including history of heart disease, symptoms, hemoglobin $<12$
Outcome Predicted	Cardiac arrest, MI, VFib, complete heart block, cardiac death	Intraoperative/post-op MI or cardiac arrest within 30 days	Broad (Cardiac arrest, MI, all-cause mortality)	Death, MI, or stroke at 30 days
Elevated Risk Threshold	$> 1$	$> 1\%$	$> 1\%$	Score $\geq 2$

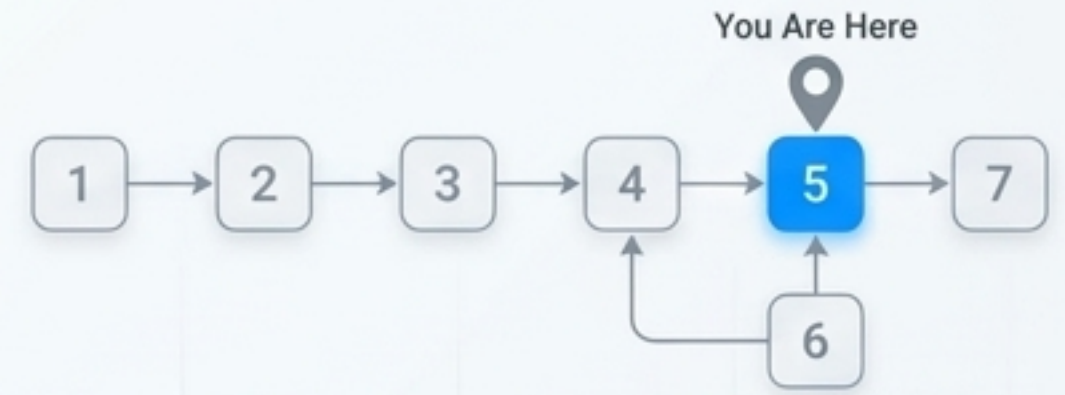
# The Functional Capacity Staircase (DASI)



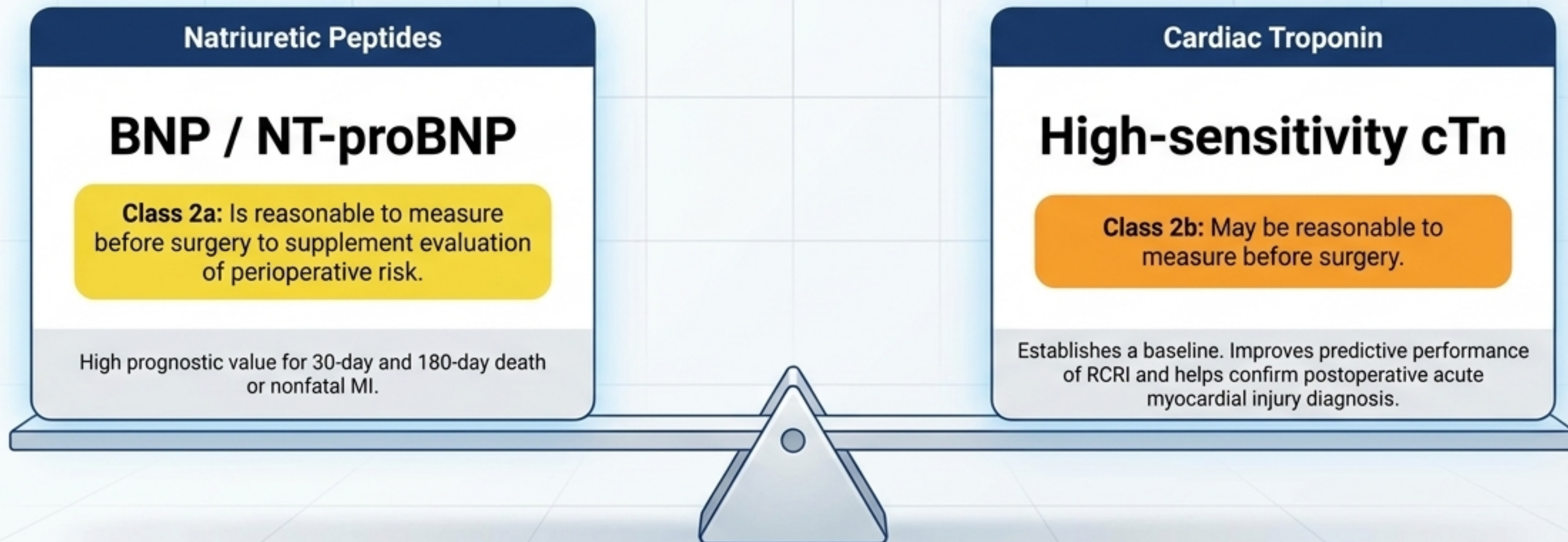
## Class 2a

In patients undergoing elevated-risk NCS, a structured assessment of functional capacity is reasonable to stratify risk.

# The Biochemical Teeter-Totter: Biomarkers for Risk Stratification

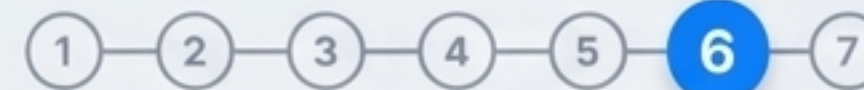


**Target Population:** Patients with known CVD, age  $\geq 65$ , or age  $\geq 45$  with symptoms of CVD undergoing elevated-risk NCS.



# Preoperative Diagnostics: The Modality Selection Matrix

You Are Here



## 12-Lead ECG

### Class 2a

**When to use:** Known CVD, significant arrhythmia, or structural heart disease undergoing elevated-risk surgery.


**Goal:** Establish a baseline.

## Echocardiography (LV Function)

### Class 1

**When to use:** New dyspnea, physical exam findings of HF, or suspected new/worsening ventricular dysfunction.

**Goal:** Guide perioperative hemodynamics.

 Routine echo in stable patients is Class 3 (Red).

## Stress Testing

### Class 2b

**When to use:** Elevated-risk surgery WITH poor/unknown functional capacity (<4 METs).

**Goal:** Evaluate for inducible ischemia.

## CCTA

### Class 2b

**When to use:** Elevated risk WITH poor/unknown functional capacity.

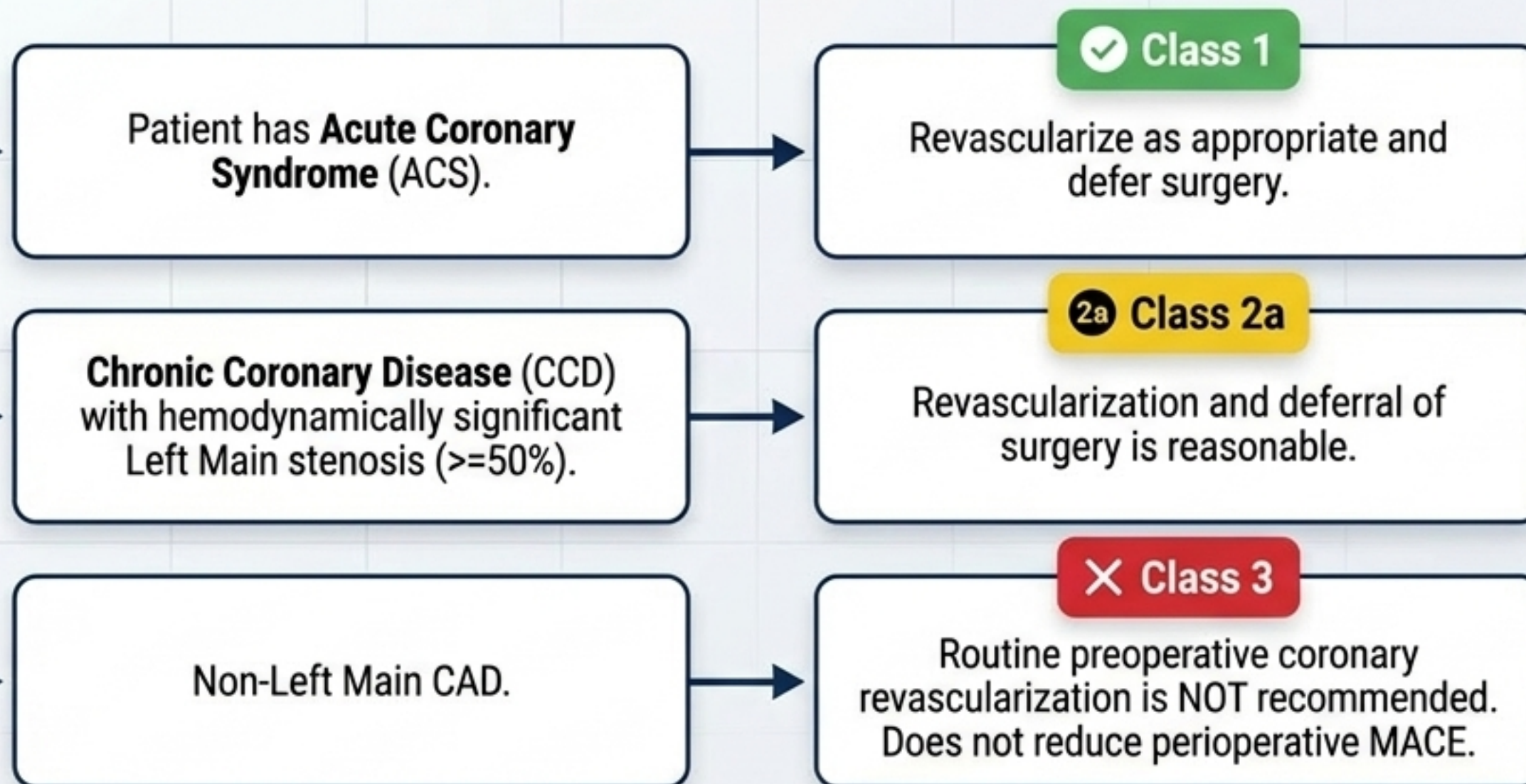
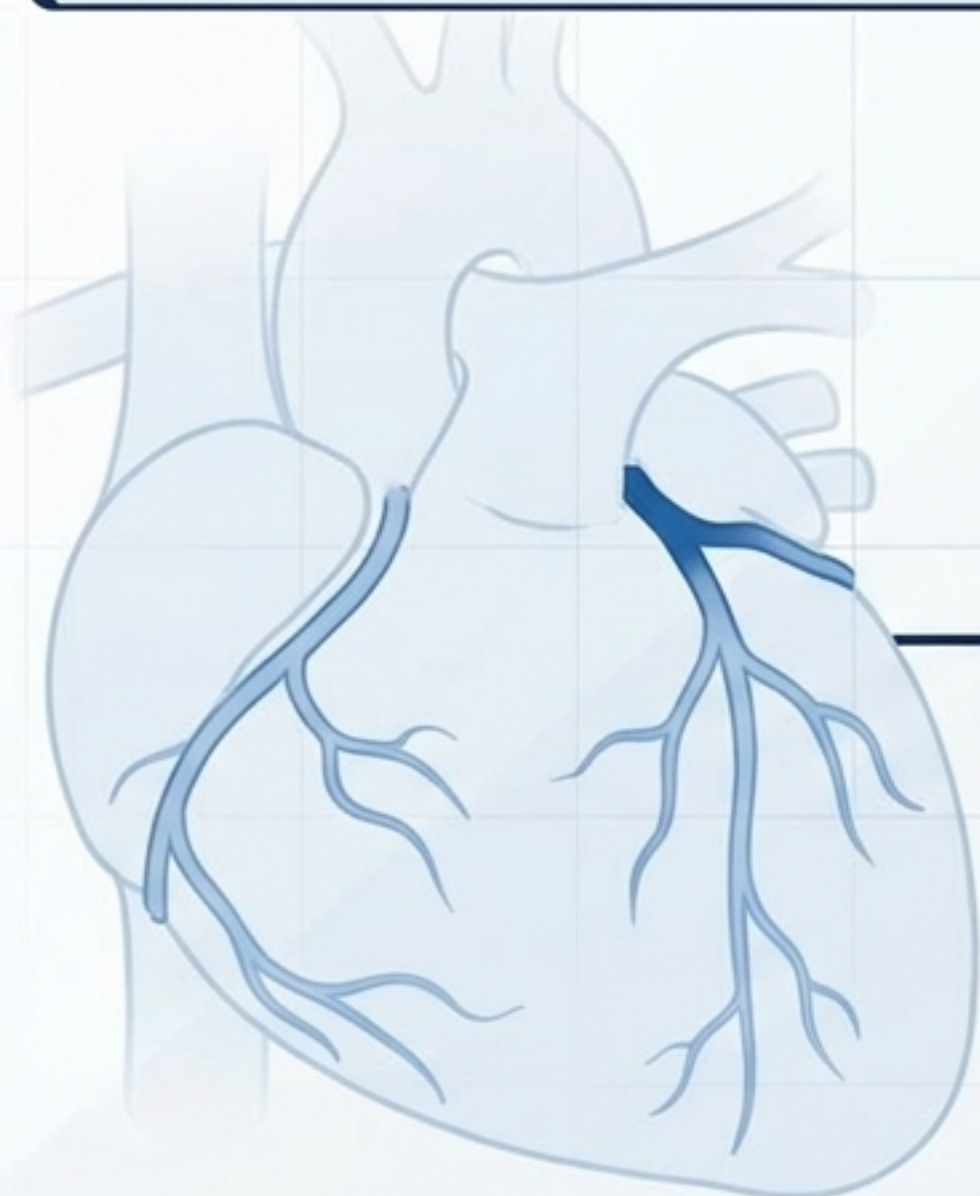
**Goal:** Exclude high-risk coronary anatomy.

# Coronary Artery Disease: The Revascularization Rules

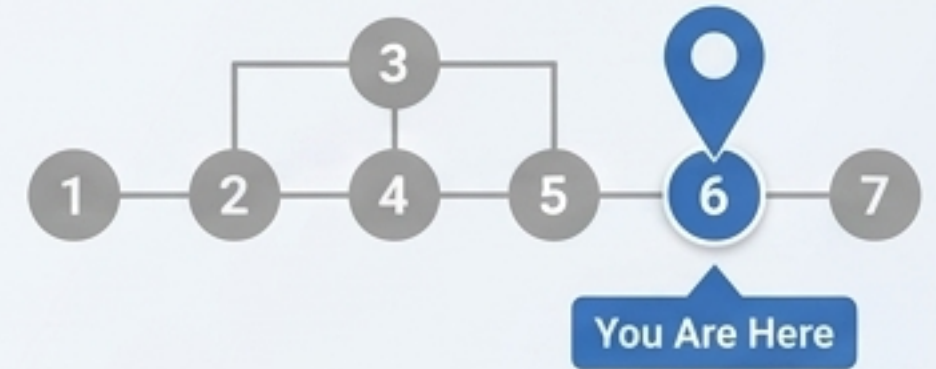
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**The Core Principle:** The goal of preoperative testing is not to identify undiagnosed CAD, but to identify patients for whom revascularization actually improves clinical outcomes (e.g., Left Main disease).



# Perioperative Pharmacology: The Stop/Go Medication Timeline



## SGLT2 inhibitors (SGLT2i)

**MUST BE WITHHELD 3 to 4 days prior.**



Should be withheld... to reduce the risk of perioperative metabolic acidosis / euglycemic ketoacidosis.



## ACEi / ARBs

**Caution advised.** Continuing may increase intraoperative hypotension risk; holding may increase postoperative mortality risk. Restart as soon as clinically reasonable post-op.



## Continuous / Do Not Stop

**Beta Blockers / Calcium Channel Blockers:** Continue in patients chronically taking them to avoid rebound hypertension or tachycardia.

**Guideline-Directed Medical Therapy (GDMT) for Heart Failure:** Continue in the perioperative period to reduce risk of worsening HF.

Day -4 to -3

Day 0 /  
Morning of  
Surgery

Day 0:  
Surgery

Day 0:  
Surgery

# Managing Cardiomyopathies: Heart Failure & HCM



## Heart Failure (HFrEF)



**Risk Profile: 3-fold greater risk** for perioperative death compared to CAD alone.

### Action:

Optimize GDMT prior to elevated-risk surgery.

If NYHA III-IV and clinically decompensated, postpone elective surgery and consult cardiology.

## Hypertrophic Cardiomyopathy (HCM)



**The Danger:** Dynamic Left Ventricular Outflow Tract (LVOT) obstruction triggered by anesthesia or hemodynamics.

### × Class 3

Factors that **aggravate dynamic outflow obstructions** (positive inotropes, tachycardia, reduced preload) are **HARMFUL** and should be avoided.

### Intraoperative Directives:

- Maintain sinus rhythm.
- Prioritize IV fluids and alpha-agonists (phenylephrine/vasopressin) over beta-agonists if hypotension develops.

# Complex Hemodynamics: Pulmonary Hypertension & ACHD



## Pulmonary Hypertension (PH)



**Risk:** 43% increased odds of death, MI, or stroke; 2-fold higher risk of cardiogenic shock.

✓ **Class 1**

**Continue targeted PAH medical therapies** in the perioperative period.

⚠ **Class 2a**

For severe PH, consultation with a specialized PH center is reasonable to guide intraoperative and post-op care.

## Adult Congenital Heart Disease (ACHD)



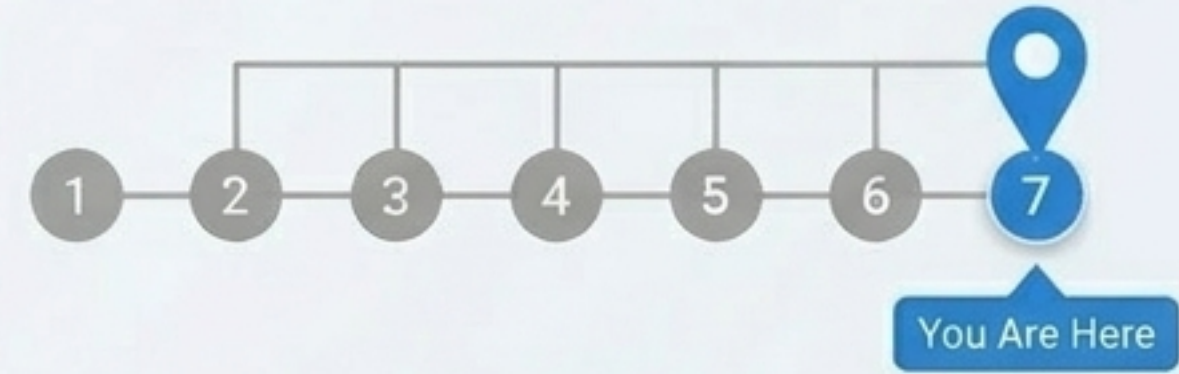
**Risk:** Unique physiological challenges related to fluid balance, blood pressure, and shunt management.

✓ **Class 1**

For **intermediate-to-elevated risk lesions**, **preoperative consultation** with an ACHD specialist is recommended.

**Intermediate/Elevated Examples:** Unrepaired shunts, single-ventricle (Fontan), severe valvular dysfunction, cyanotic CHD.

# Intraoperative Navigation: The Hemodynamic Safe Zone



## The Red Zone:

MAP < 60-65 mmHg  
**OR** Systolic BP (SBP)  
< 90 mmHg

## The Green Zone:

MAP  $\geq$  65 mmHg  
**AND** SBP  $\geq$  90 mmHg



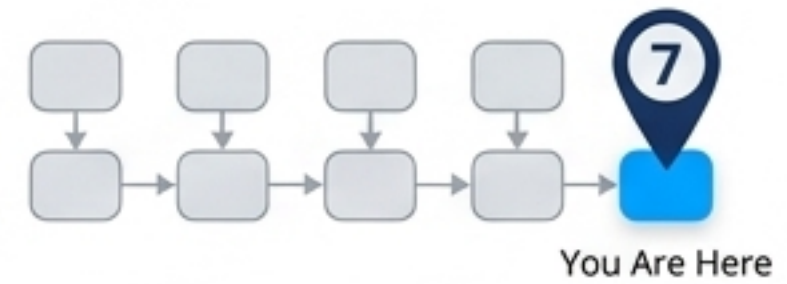
✓ Class 1

Maintaining an intraoperative **MAP  $\geq$  60 to 65 mmHg** or **SBP  $\geq$  90 mmHg** is recommended to reduce the risk of myocardial injury injury.

## ⚠ The Threat

Intraoperative hypotension maintained for ~15 minutes is independently associated with postoperative **myocardial injury**, acute kidney injury, and mortality.

# Postoperative Surveillance: MINS and Hemodynamic Stability



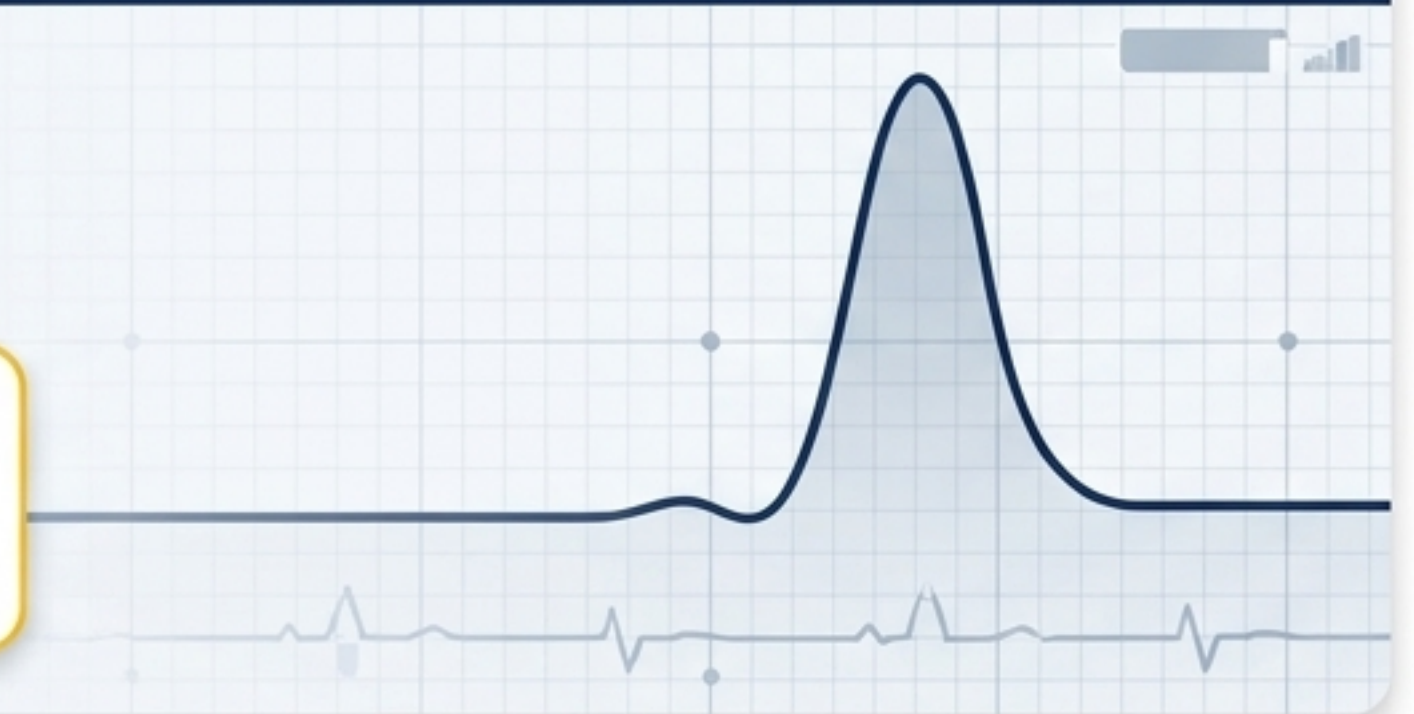
## Defining the Threat (MINS)

**What it is:** Myocardial Injury after Noncardiac Surgery.  
A newly identified disease process with real consequences, often asymptomatic.



Class 2b

**Action:** Consider postoperative troponin surveillance in patients with elevated-risk profiles to detect subclinical ischemia.



## Postoperative Blood Pressure Control



Class 1

Treatment of hypotension (MAP <60-65 or SBP <90 mmHg) in the postoperative period is recommended to limit cardiovascular, cerebrovascular, and renal events.



Class 1

Restart chronic oral antihypertensive medications as soon as clinically reasonable to avoid complications from post-op rebound hypertension.

# Synthesizing the Pathway: The Complete Perioperative Journey



**Intercept & Stratify**  
(Weeks Before)

- Check for ACS/ Emergency bypasses.
- Filter through the High-Risk Modifiers (VHD, PH, Frailty, ACHD).
- Calculate baseline risk (e.g., RCRI >1).



**Function & Diagnostics**  
(Days Before)

- Assess METs Ladder (<4 METs = Danger).
- Balance Biomarker Teeter-Totter (BNP > baseline).
- Select judicious diagnostics (Avoid routine stress tests).



**Pharmacological Prep**  
(Day -4 to Day 0)

- Apply Stop/Go timeline (Halt SGLT2i, continue Beta Blockers).



**Intra/Post-Op**  
(Day 0+)

- Maintain BP Safe Zone (MAP >65).
- Surveil for MINS.