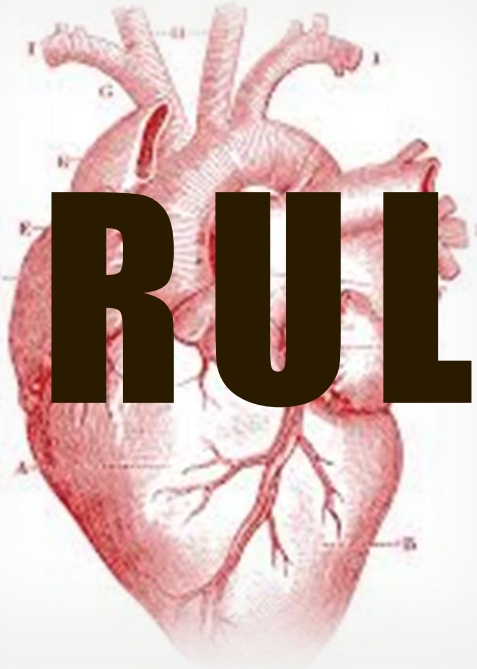
RAPID RULE-OUT:



Dr. Kirsten Jewell CCFP (EM)
November 12, 2025

TRANSFORMING CHEST PAIN EVALUATION IN A RURAL ED WITH HIGH-SENSITIVITY TROPONIN

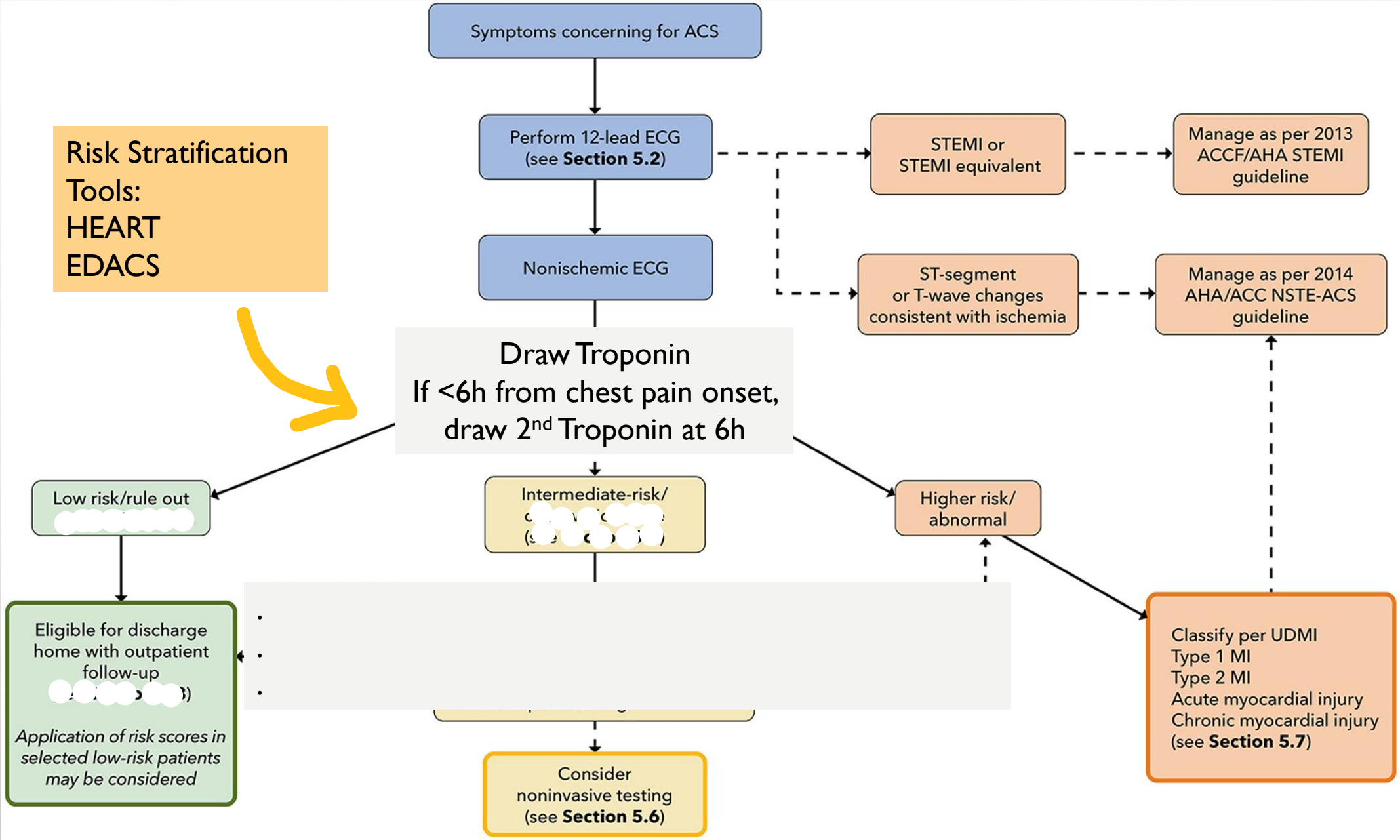
OBJECTIVES

1. Describe the potential **advantages** of high-sensitivity troponin assays over conventional troponin in the emergency department workup of low-risk chest pain
2. Apply **accelerated diagnostic pathways** integrating high-sensitivity troponin, ECG, and clinical risk scores to safely identify low-risk patients suitable for early discharge
3. Recognize the complexity of interpreting high-sensitivity troponin results in clinical context, including potential **non-ACS causes** of troponin elevation.
4. Explore in a collaborative discussion the **operational challenges** a rural hospital may face when transitioning from conventional troponin assays to high-sensitivity troponin

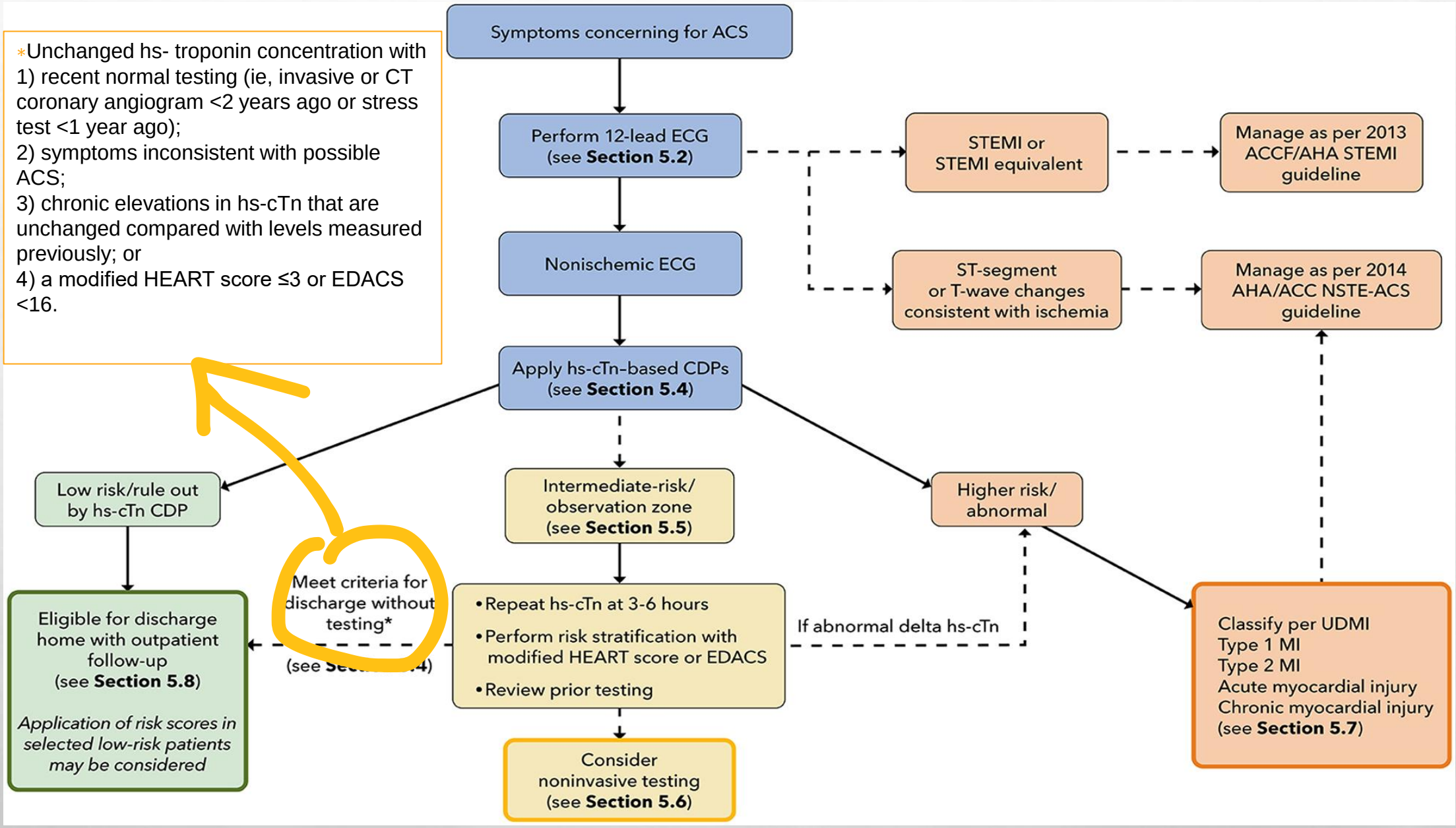
DISCLOSURES

I THINK LIKE AN ER PHYSICIAN

Risk Stratification Tools:
HEART
EDACS



2022 ACC Expert Consensus Decision Pathway



2022 ACC Expert Consensus Decision Pathway

HS-CTN: WHAT IS IT?

- high-sensitivity cardiac troponin, measured in ng/L (instead of ng/mL)
- ability to detect lower cTn concentrations greater sensitivity and precision compared with older-generation assays
- helps differentiate between Unstable Angina and NSTEMI

Higher precision and earlier rise

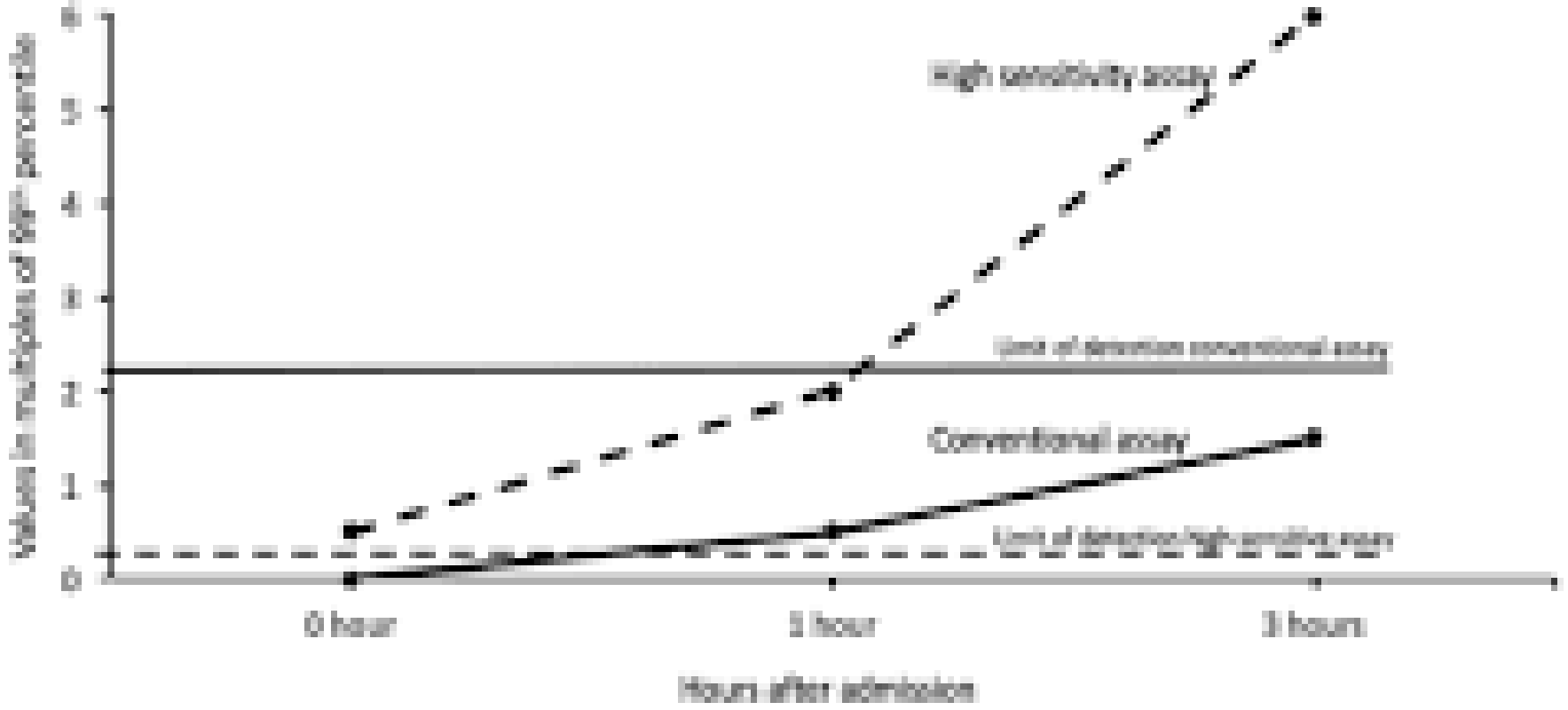
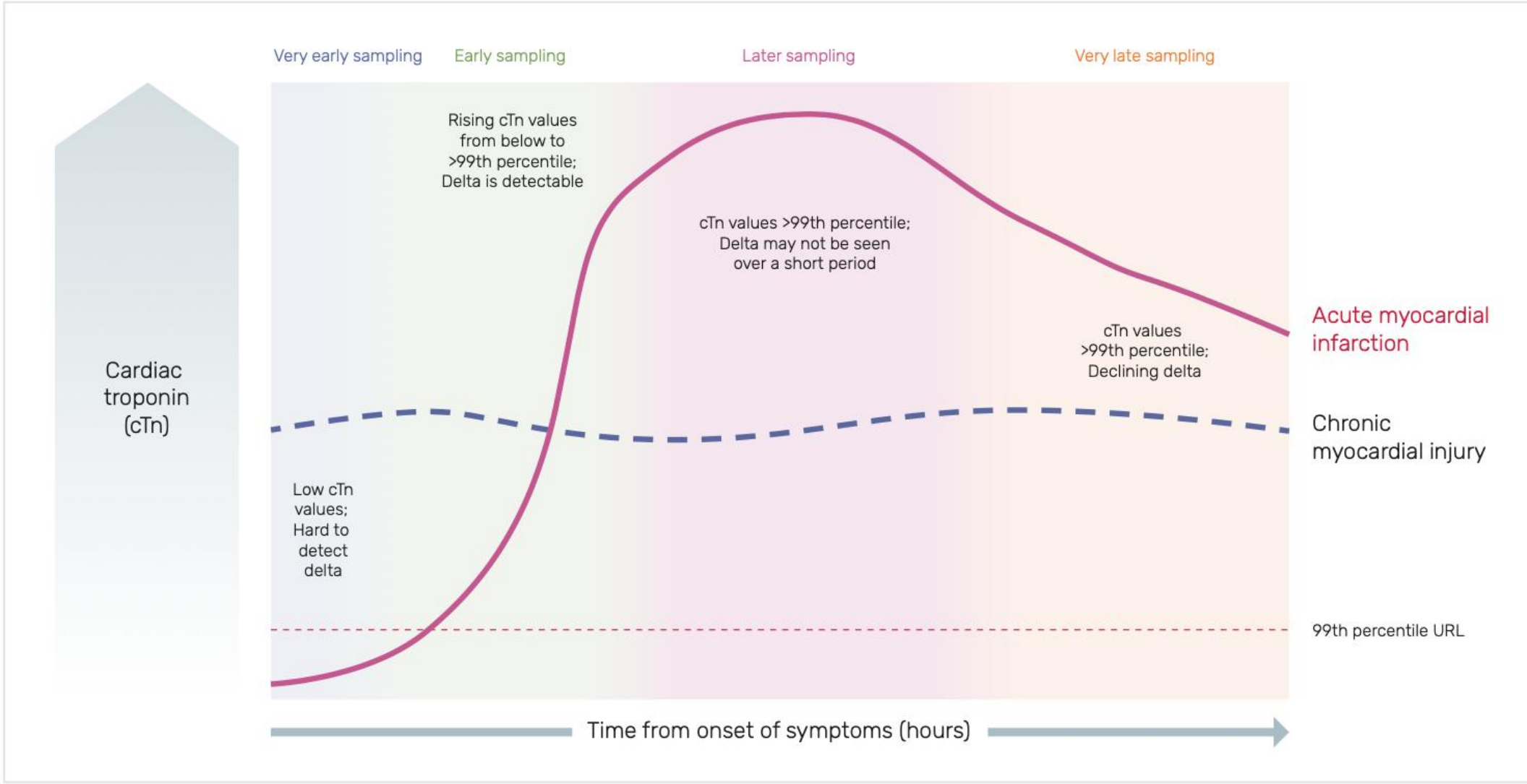


Figure 1: Characteristic rise and fall of troponin levels following the onset of symptoms



"FALSE" POSITIVES

- PE
- Pulmonary Hypertension
- CHF
- Myocarditis
- Cardiomyopathy
- Sepsis
- Critical Illness
- CKD
- Stroke/SAH

FALSE ‘NEGATIVES’

Unstable angina

Late presentations of AMI

RAPID RULE-OUT

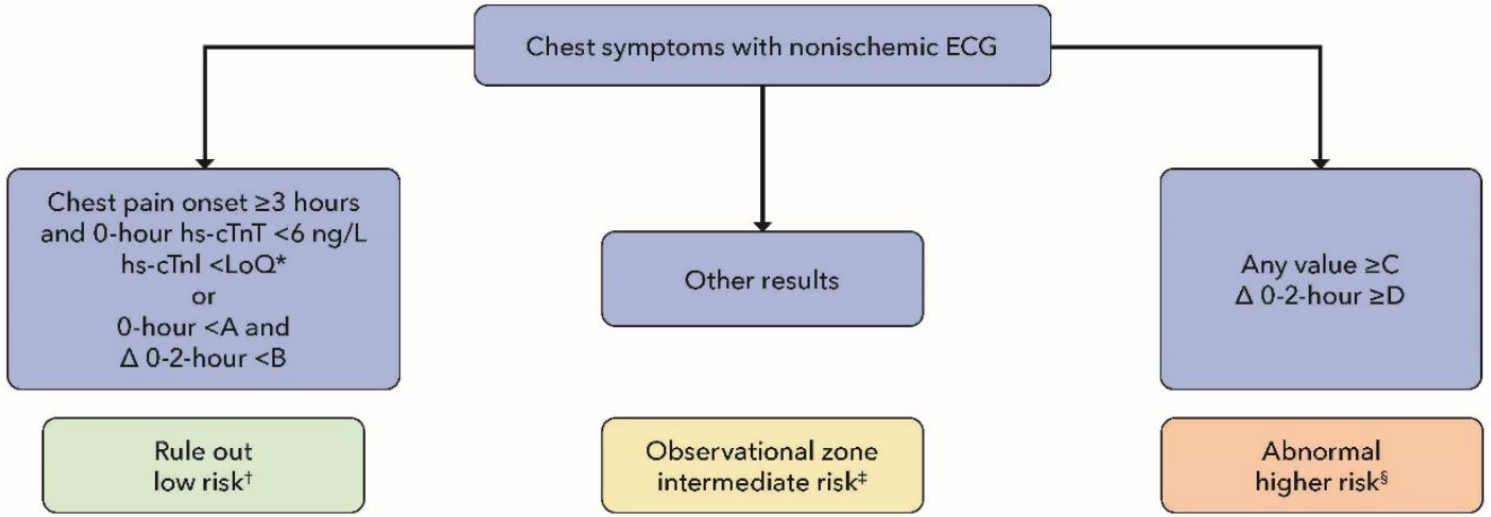
- "Implementation of **accelerated CDPs** has the potential to further **reduce ED length of stay** and **increase the proportion of patients who are eligible for rapid ED discharge** and do not routinely require additional diagnostic testing, **without compromising patient safety**." **-** European Society of Cardiology (ESC) 2020

RAPID RULE-OUT CDP

2022 ACC Expert Consensus Decision Pathway

Approach	Criteria for Rule Out	Advantages	Disadvantages
0-h (single draw)	cTnI <5ng/L if pain started 3+ hrs ago	25-50% of low risk patients immediately rule out 99.5% NPV for 30d MACE (death or MI)	Not suitable for use if patients presenting early
0/1-h rule out	Baseline (0-h) <6 and delta values at 1h <2-4	60% of patients ruled out for MI; NPV >99.5%	25% assigned to intermediate risk zone Timing of blood draw important
0/2-h rule out	Baseline (0-h) < 6 and delta values at 2h <2-7	More practical timing Better for early presenters	25% assigned to intermediate risk zone Timing of blood draw important Longer ED LOS for delta

Figure B. Modified European Society of Cardiology 0/2-Hour CDPs for Ruling Out MI



Assay	LoQ*	A	B	C	D
Roche Elecys hs-cTnT	6	14	4	52	10
Abbott Architect hs-cTnI	4	6	2	64	15
Beckman Coulter Access hs-cTnI	3	5	5	50	20
Siemens ADVIA Centaur hs-cTnI	3	8	7	120	12

HIGH-STEACS PATHWAY

MI is ruled out if:

- hs-cTnI <5 ng/L (if >3 h from symptom onset) or
- if delta 0/3-h hs-cTn is <3 ng/L and remains below sex-specific 99th%ile

Advantages:

Validated in RCT
Uses sex-specific 99th %ile
71% discharged
100% sensitivity and NPV

Disadvantages:

Longer LOS for patients in intermediate zone than in 0/1 or 0/2-h
Fewer patients discharged than with 0/1 or 0/2h algorithms

RULE-IN OR "ABNORMAL"

- Any value >50-100 OR
- Delta 0/1-h > 5-15
- Delta 0/2-h >10-20

- PPV 75%
  - (in European cohorts where rate of MI >15%); may be 20-50% in less-selected population of ED patients

OBSERVATIONAL ZONES

- Intermediate risk values
- Additional hs-cTn measurement at 3-6 hours
- Can risk stratify based on previous testing or HEART score/EDACS

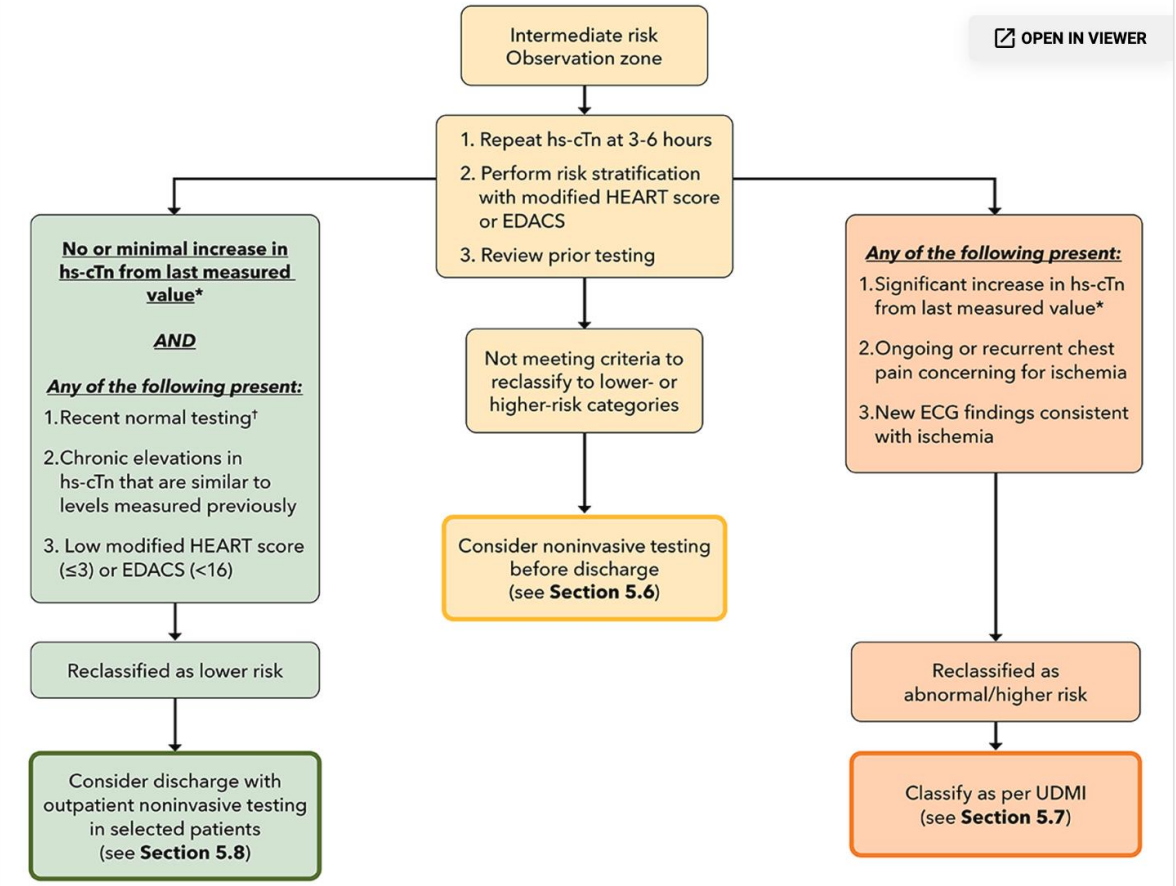


Figure 5 Algorithm for Intermediate-Risk Patients

∗Evidence-based criteria do not exist to define change thresholds for hs-cTn at the 3- to 6-hour timepoint. As reviewed in Section 5.2, although a 20% relative change from the baseline measurement has been proposed to define significant change, this threshold lacks specificity at low hs-cTn values in part due to assay imprecision. Thus, at lower hs-cTn values near the sex-specific 99th percentile URL values, absolute changes should be

HEART SCORE

- Applies to patients with undifferentiated CP
- Predicts 6 week risk of MACE
- Low (0-3 points <1.7% risk of MACE)
- Moderate (4-6 points, 12-16% risk of MACE)
- High (>6 points, >50% risk of MACE)
- Requires single troponin on arrival *validated with 'regular' trop, but use with hs-troponin reduces low-risk classification and MACE rate

HEART

HEART score for chest pain patients

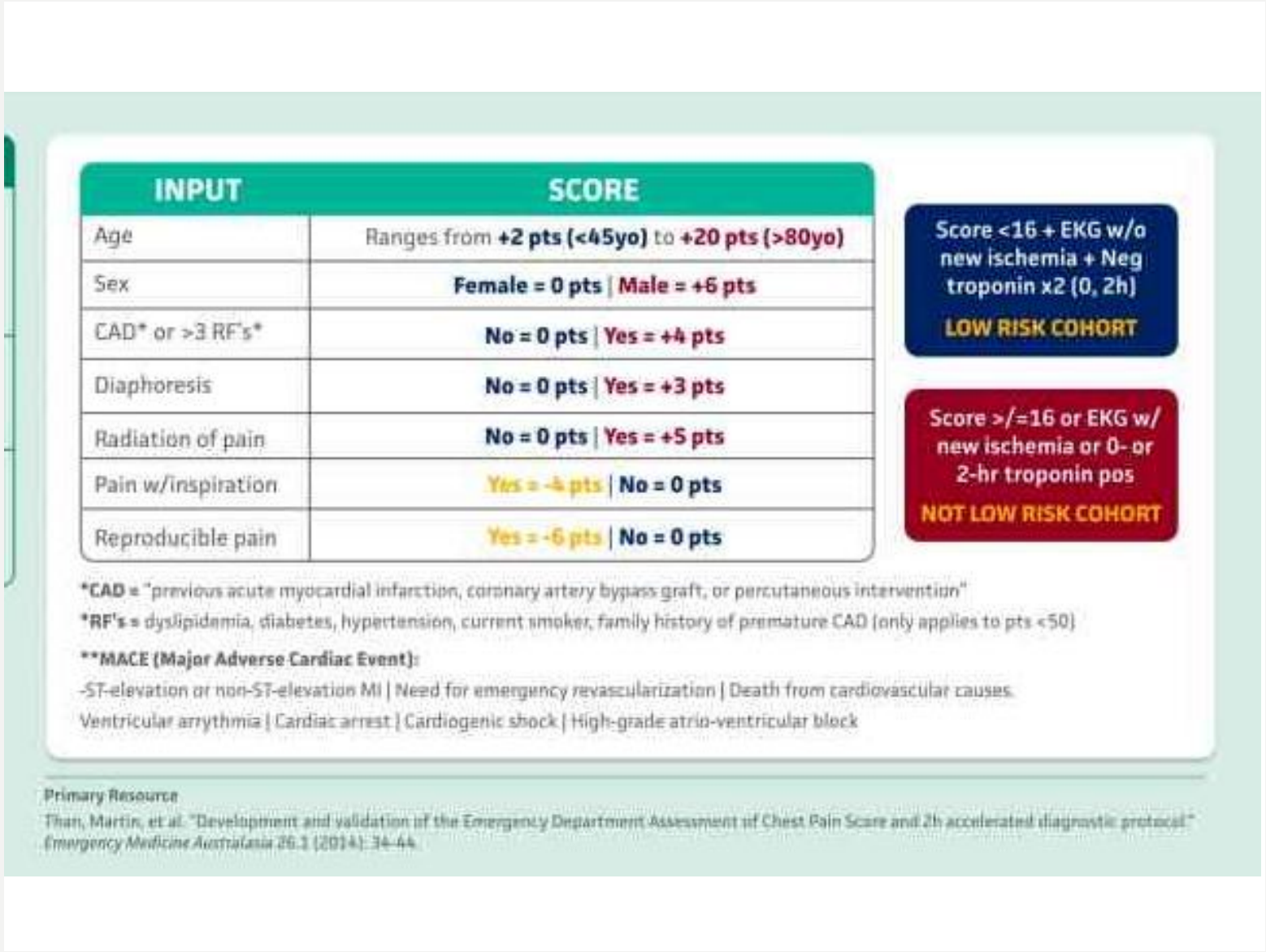
History (Anamnesis)	Highly suspicious	2	
	Moderately suspicious	1	
	Slightly suspicious	0	
ECG	Significant ST-deviation	2	
	Non-specific repolarisation disturbance / LBBB / PM	1	
	Normal	0	
Age	≥ 65 years	2	
	45 – 65 years	1	
	≤ 45 years	0	
Risk factors	≥ 3 risk factors *or* history of atherosclerotic disease	2	
	1 or 2 risk factors	1	
	No risk factors known	0	
Troponin	≥ 3x normal limit	2	
	1-3x normal limit	1	
	≤ normal limit	0	
		Total	

Risk factors for atherosclerotic disease:

Hypercholesterolemia	Cigarette smoking
Hypertension	Positive family history
Diabetes Mellitus	Obesity (BMI>30)

EDACS

- EKG and Trop not a part of EDACS risk stratification but are a part of the EDACS-ADP (0 and 2 hours)
- Broad definition of concerning cardiac symptom (more than just chest pain) >5min duration



INPUT	SCORE
Age	Ranges from **+2 pts (<45yo)** to **+20 pts (>80yo)**
Sex	**Female = 0 pts** | **Male = +6 pts**
CAD* or >3 RF's*	**No = 0 pts** | **Yes = +4 pts**
Diaphoresis	**No = 0 pts** | **Yes = +3 pts**
Radiation of pain	**No = 0 pts** | **Yes = +5 pts**
Pain w/inspiration	**Yes = -4 pts** | **No = 0 pts**
Reproducible pain	**Yes = -6 pts** | **No = 0 pts**

***CAD** = "previous acute myocardial infarction, coronary artery bypass graft, or percutaneous intervention"

***RF's** = dyslipidemia, diabetes, hypertension, current smoker, family history of premature CAD (only applies to pts <50)

****MACE (Major Adverse Cardiac Event)**:

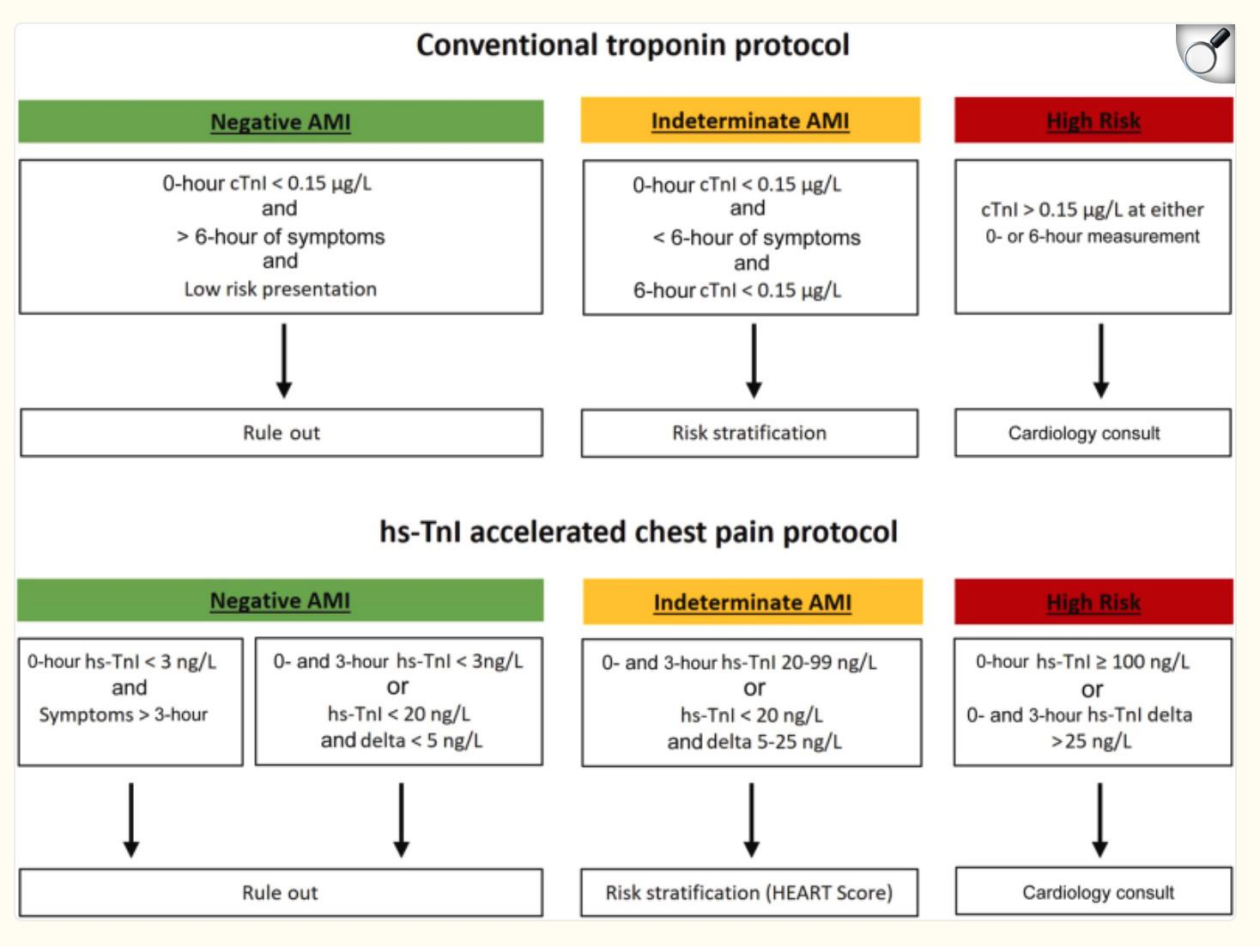
-ST-elevation or non-ST-elevation MI | Need for emergency revascularization | Death from cardiovascular causes. Ventricular arrythmia | Cardiac arrest | Cardiogenic shock | High-grade atrio-ventricular block

Primary Resource

Than, Martin, et al. "Development and validation of the Emergency Department Assessment of Chest Pain Score and 2h accelerated diagnostic protocol." *Emergency Medicine Australasia* 26.1 (2014): 34-44.

WHAT WOULD HAPPEN?

- Prospective Cohort Study
- Edmonton, Alberta
- 2015—2021
- Switched to hs-cTnI in 2020
- 3h ADP
- primary outcome: ED LOS



Implementation of a High-sensitivity Troponin Assay for Adult Patients Who Present to the Emergency Department With Chest Pain: The Role of Clinical Decision Support. CJC open. 2004.

WHAT WOULD HAPPEN?

Primary outcome: ED LOS

- significant **30-minute** reduction in ED LOS for all patients who presented with chest pain
- 89 min shorter in patients discharged after serial trop

Secondary outcomes:

- **Disposition:** increase in discharge from ED 73-78%
- **Consultation:** occurred in 21.2% of patient presentations in the c-TnI group and 18.5% in the hs-TnI group (P = 0.03).
- **MACE** (no difference)

Implementation of a High-sensitivity Troponin Assay for Adult Patients Who Present to the Emergency Department With Chest Pain: The Role of Clinical Decision Support. CJC open. 2004.

MORE DATA

Systematic Review and Meta-Analysis (2024)

- Thirty-seven articles involving 404,566 patients met the inclusion criteria, including five randomized controlled trials (RCTs) and 32 observational studies.

A significant reduction in total ED LOS was reported in 22 observational studies and four RCTs. Emergency departments with longer baseline ED LOS showed significantly larger reductions in LOS after ADP implementation.

- *this decreased LOS is seen even in the absence of any change in troponin assay type*

Hill J, Essel NOM, Yang EH, Dennett L, Rowe BH. Effectiveness of accelerated diagnostic protocols for reducing emergency department length of stay in patients presenting with chest pain: A systematic review and meta-analysis. PLoS One. 2024 Oct 22;19(10):e0309767

THOUGHTS?

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