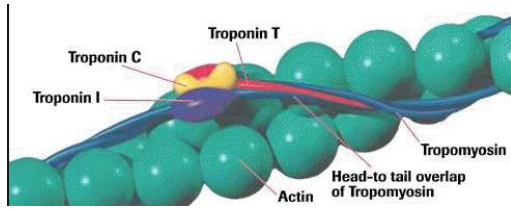


Clinical update no. 541

25 July 2019



Interpreting troponin is not straightforward.

It's essentially a prognostic indicator that is elevated in many clinical situations. In patients with chest pain it is used to indicate whether there is NSTEMI and what further management is indicated.

Fourth Universal Definition of Myocardial Infarction (2018)

The 99th upper centile is used as the criteria to diagnose MI in the right clinical context. There will be a rise and fall, compared to static elevation in other conditions. Beware the timing – the level may have plateaued if there is late sampling after an acute event.

Universal Definition of Myocardial Injury ESC European Society of Cardiology

Criteria for Myocardial Injury

Detection of elevated cardiac troponin (cTn) values above the 99th percentile upper reference limit (URL) is defined as myocardial injury. The injury is considered acute if there is a rise and/or fall of cTn values

Conceptual Illustration of Troponin Kinetics after Acute Myocardial Injury and Infarction ESC European Society of Cardiology

Myocardial Infarction Type 1



Plaque rupture/erosion with

Type 1 MI is related to plaque rupture.

Myocardial Infarction Type 2



Oxygen supply/demand

Type 2 MI is related to O₂ supply/demand

imbalance, with or without stenosis

When troponin I levels are >5 ng/L there is an incidence of adverse outcomes.

Original Investigation

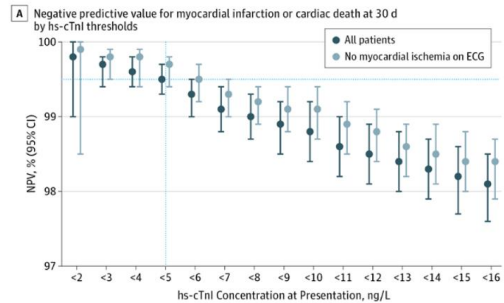
November 21, 2017

Association of High-Sensitivity Cardiac Troponin I Concentration With Cardiac Outcomes in Patients With Suspected Acute Coronary Syndrome

Andrew R. Chapman, MD¹; Kuan Ken Lee, MD¹; David A. McAllister, MD²; et al

Author Affiliations | Article Information

JAMA. 2017;318(19):1913-1924. doi:10.1001/jama.2017.17488



< 5 ng/L

Miss rate 5 per 1000 patients (0.5%)

If interpreting the 99th centile (16 ng/L) as normal then there will be a miss rate above the 0.5% miss if 5 ng/L is used.

Original Investigation

Diagnosis of Myocardial Infarction Using a High-Sensitivity Troponin I 1-Hour Algorithm

JAMA Cardiology Published online June 1, 2016

Table 2. Rule-Out Results Using Troponin I Assay

Troponin I Cutoff Level by Time After Admission	NSTEMI Sensitivity, % (95% CI)	NSTEMI Type 1 NPV, % (95% CI)
≤6 ng/L		
Admission only	92.2 (87.2-95.7)	98.5 (97.0-99.4)
Admission and 1 h	97.6 (94.1-99.4)	99.8 (98.6-100.0) ^a
Admission and 3 h	98.8 (95.8-99.9)	100.0 (98.5-100.0) ^b
≤27 ng/L (99th Percentile)		
Admission and 1 h	77.5 (70.5-83.6)	98.4 (97.2-99.2)
Admission and 3 h	87.6 (81.7-92.2)	99.1 (98.1-99.7)

Rule out:

hs-tpn I of <6 ng/L

Rule in:

A rise of >12 ng/L at 1 hour

In this study the sensitivity for MI of Tpn I up to the 99th centile (26ng/L) was only 77% with a delta 1-hour troponin, though 98.4% if only type 1 MI was considered.

A 5 ng/L threshold had 99.8% sensitivity for type 1 MI with a 1 hour algorithm.

The TIMI Risk Score for Unstable Angina/Non-ST Elevation MI

A Method for Prognostication and Therapeutic Decision Making

Conclusions In patients with UA/NSTEMI the TIMI risk score is a simple prognostication scheme that categorizes a patient's risk of death and ischemic events and provides a basis for therapeutic decision making.

JAMA. 2000;284:835-842

www.jama.com

The TIMI score was devised for use in patients with diagnosed UA/MSTEMI to guide further intervention and prognosis. Accelerated diagnostic protocols use it as a risk stratification to work up undifferentiated chest pain, something it was never designed to do. It seems to have some utility though.

The alternate HEART score is also used, though is somewhat subjective. Not all points are equal, e.g. age and cardiac risk factors.



Integrated high-sensitivity troponin I or T at ED presentation dynamic change time between samples

<https://compass-mi.com>



to estimate probability of MI on ED presentation 30-day outcomes.

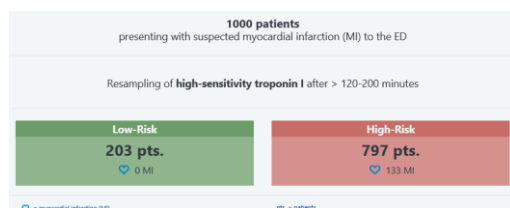
ENGL J MED (2018) 378(24):2218-2226

A recent study pooled data from 15 studies with 22651 patients with an overall rule in rate for AMI of 15% to allow an estimate of diagnostic accuracy and outcomes.

There is an online calculator at <https://compass-mi.com/> which gives outcome data on various thresholds used.

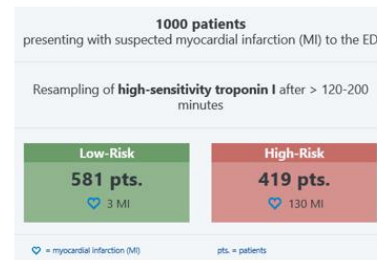
1. Hs-Tn assay you are using	<input checked="" type="radio"/> Hs-TnI (Abbott Architect)	<input type="radio"/> Hs-TnT (Roche Elecsys)
2. Timepoint of 2nd troponin sample	<input checked="" type="radio"/> early (> 45-120 minutes)	<input type="radio"/> late (> 120-200 minutes)
3. Select hs-Tn cutoff of 1st sample	<input type="text" value="2"/>	ng/L
4. Select hs-Tn absolut change from 1st to 2nd sample	<input type="text" value="1"/>	ng/L
Calculate		

Low risk is below the threshold chosen, i.e. <2 ng/L; high risk is above the threshold.

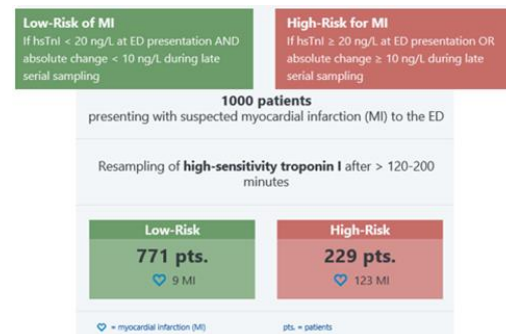


For example if troponins are both < 2 there is no MI or death on 30 day follow up.

1. Hs-Tn assay you are using	<input checked="" type="radio"/> Hs-TnI (Abbott Architect)	<input type="radio"/> Hs-TnT (Roche Elecsys)
2. Timepoint of 2nd troponin sample	<input type="radio"/> early (> 45-120 minutes)	<input checked="" type="radio"/> late (> 120-200 minutes)
3. Select hs-Tn cutoff of 1st sample	<input type="text" value="6"/>	ng/L
4. Select hs-Tn absolut change from 1st to 2nd sample	<input type="text" value="12"/>	ng/L
Calculate		



If above the 6 ng/L and rise of 12 threshold used in the above study, then the MI rule in rate is appreciable. Risk is low but not zero in the grey zone of >6 with a rise <12 ng/L.



If thresholds approaching the 99th centile are use (rounded to allow data entry) then there will be missed MI if relied on to rule out.

PROGNOSIS IN PERSONS WITHOUT MYOCARDIAL INFARCTION

Acute chest pain to ED, MI ruled out

hs-Tpn I > 10 - 14 ng/L

There was also data on elevated troponin with MI ruled out as a cause. Mortality in that group was 4.8% and 8.1% at 1 and 2 years, compared to 1.4 and 3.4% in a matched population. Even if not an AMI, raised troponin is an adverse prognostic marker.

These updates are a review of current literature at the time of writing. They do not replace local treatment protocols and policy. Treating doctors are individually responsible for following standard of care.