Treatment of ACS – Troponin Protocols

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Disclosure Statement of Financial Interest

I, B. Hadley Wilson, MD DO NOT have a financial interest/arrangement or affiliation with one or more organizations that could be perceived as a real or apparent conflict of interest in the context of the subject of this presentation.
Cardiac-specific troponin (troponin I or T when a contemporary assay is used) levels should be measured at presentation and 3 to 6 hours after symptom onset in all patients who present with symptoms consistent with ACS to identify a rising and/or falling pattern. 

Additional troponin levels should be obtained beyond 6 hours after symptom onset in patients with normal troponins on serial examination when electrocardiographic changes and/or clinical presentation confer an intermediate or high index of suspicion for ACS.

If the time of symptom onset is ambiguous, the time of presentation should be considered the time of onset for assessing troponin values.

With contemporary troponin assays, creatine kinase myocardial isoenzyme (CK-MB) and myoglobin are not useful for diagnosis of ACS.
### Biomarkers: Prognosis

<table>
<thead>
<tr>
<th>Recommendations</th>
<th>COR</th>
<th>LOE</th>
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<tbody>
<tr>
<td>The presence and magnitude of troponin elevations are useful for short- and long-term prognosis.</td>
<td>I</td>
<td>B</td>
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<tr>
<td>It may be reasonable to remeasure troponin once on day 3 or day 4 in patients with MI as an index of infarct size and dynamics of necrosis.</td>
<td>IIb</td>
<td>B</td>
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<tr>
<td>Use of selected newer biomarkers, especially B-type natriuretic peptide, may be reasonable to provide additional prognostic information.</td>
<td>IIb</td>
<td>B</td>
</tr>
</tbody>
</table>

![Heart Diagram](image.png)
Detectable hsTnT in patients with Stable CAD
Low Risk of MI with Undetectable hs-TnT and ECG without Ischemic Changes

$n=14,636$ pts in ED with Chest Pain

<table>
<thead>
<tr>
<th>Events (n)</th>
<th>MI</th>
<th>Death</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>0.17%</td>
<td>0.02%</td>
</tr>
<tr>
<td>2</td>
<td>0.0042</td>
<td>0.0096</td>
</tr>
<tr>
<td>3150</td>
<td>61%</td>
<td>5-14</td>
</tr>
<tr>
<td>2579</td>
<td>18%</td>
<td>&gt;14</td>
</tr>
</tbody>
</table>

Bandstein et al. *J Am Coll Cardiol* 2014; 63: 2569
0 h/1 h Rule-in & rule-out algorithms using high-sensitivity cardiac troponins (hs-cTn) assays in suspected NSTEMI

- Negative predictive value >98% for acute MI
- Positive predictive value 75-80% for acute MI
- Cut-offs for «rule-in» and «rule-out» assay specific
0 h/1 h Rule-in & rule-out algorithms using high-sensitivity cardiac troponins (hs-cTn) assays in suspected NSTEMI

Clinical implications of high-sensitivity cardiac troponin assays (1)

Compared with standard cardiac troponin assays, high-sensitivity assays:

- Have higher negative predictive value for acute MI.
- Reduce the “troponin-blind” interval leading to earlier detection of acute MI.
- Result in a ~4% absolute and ~20% relative increase in the detection of type 1 MI and a corresponding decrease in the diagnosis of unstable angina.
- Are associated with a 2-fold increase in the detection of type 2 MI.
Clinical implications of high-sensitivity cardiac troponin assays (2)

Levels of high-sensitivity cardiac troponin should be interpreted as quantitative markers of cardiomyocyte damage (i.e. the higher the level, the greater the likelihood of MI):

- Elevations beyond 5-fold the upper reference limit have high (>90%) positive predictive value for acute type 1 MI.
- Elevations up to 3-fold the upper reference limit have only limited (50–60%) positive predictive value for acute MI and may be associated with a broad spectrum of conditions.
- It is common to detect circulating levels of cardiac troponin in healthy individuals.

Rising and/or falling cardiac troponin levels differentiate acute from chronic cardiomyocyte damage (the more pronounced the change, the higher the likelihood of acute MI).

Cardiac troponins

<table>
<thead>
<tr>
<th>Recommendations</th>
<th>Class</th>
<th>Level</th>
</tr>
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<tbody>
<tr>
<td>It is recommended to measure cardiac troponins with sensitive or high-sensitivity assays and obtain the results within 60 min.</td>
<td>I</td>
<td>A</td>
</tr>
<tr>
<td>A rapid rule-out protocol at 0 h and 3 h is recommended if high-sensitivity cardiac troponin tests are available.</td>
<td>I</td>
<td>B</td>
</tr>
<tr>
<td>A rapid rule-out and rule-in protocol at 0 h and 1 h is recommended if a high-sensitivity cardiac troponin test with a validated 0 h/1 h algorithm is available. Additional testing after 3–6 h is indicated if the first two troponin measurements are not conclusive and the clinical condition is still suggestive of ACS.</td>
<td>I</td>
<td>B</td>
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Troponin Protocols in ACS:

Conclusions

• Current troponin protocols in use in the US are less sensitive but in accordance with 2014 ACC/AHA Guidelines for diagnosis of NSTE ACS.

• Recently a hs-TnT has been approved for use in the US with a turn-around time of 9 minutes and <10% co-efficient of variation at the 99th percentile upper reference limit (14ng/L).

• hs-Tn protocols have been in use in Europe and elsewhere >7 years with algorithms supporting a broad application for early 0-1 hour rule-out AMI.

• However, exact cutoffs for these assays are unclear and adoption is likely to require coupling with management protocols that guide better interpretation if the benefits for diagnosis are to be realized.