General Workup Guideline for hsTnT Interpretation:

*Dynamic symptom changes or ongoing clinical concern: recommend 3-hour troponin draw and EKG interval. A delta of +/- 20% (when positive) or +/-5ng/L (lower values) suggests an acute injury pattern*

*Elevated hsTnT in non-ACS patients alone does not necessitate a cardiac workup, clinical impression is paramount*

*Moderate/Severe Hemolysis can falsely lower hsTnT readings by 20% leading to invalid delta calculations*

 *Consider slight variations due to test precision, biological variation, and IV-line dilutional draws*

*Prognostically, elevated troponin increases long-term all-cause mortality risk including non-cardiac causes*

ED Rapid Rule Out for Acute ACS in Low Risk Angina Patients:

(Maximal anginal symptoms 3+ hours from initial troponin draw)

*Patients NOT meeting criteria for rapid rule-out, or those with dynamic symptoms, or those with ongoing clinical concern: recommend 3-hour troponin draw interval. A delta +/- 20% (when 52+) or +/-5ng/L (lower values) suggests an acute injury pattern but does not exclude ACS, subacute or chronic injury*

*Ultimate disposition should be based on clinical judgement and available resources*

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**High-Sensitivity Troponin FAQ**

1. **What is high-sensitivity troponin (hsT)?** *It’s the same troponin that was being measured, but with less variation and high precision at the lower levels of detection.*
2. **Why change?** *Allows clinicians earlier detection of myocardial injury, even small injury.*
3. **How do we interpret hsT*?*** *It will be reported as whole numbers with units of ng/L, rather than decimal points. An old troponin of 0.02 would be reported as 20ng/L. However, the hsT would likely report a different, more accurate number given its precision at lower troponin levels.*
4. **So what’s a positive troponin with hsT?** 52ng/L or higher (as opposed to 0.06ng/mL).
5. **Is hsT a biomarker for ACS?** *No. It’s a biomarker for myocardial injury and clinical context is paramount. See table for cardiac and non-cardiac causes for elevated troponins.*
6. **So is everyone going to have elevated troponin levels now?** *Many patients will have detectable levels of hsT, and this is normal. The published guidelines will help you determine what levels and what changes in troponin are concerning values.*
7. **What benefits can we expect to see from using hsT?** *The ED will be able to risk stratify and disposition chest pain patients faster. Both ED and inpatient can expect to detect NSTEMI or non-ACS myocardial injury events sooner due to precision of the test.*
8. **Will the test take longer to perform or cost more than what is currently used?** *No*
9. **If a repeat hsT is ordered at a certain time, does it matter when it’s drawn?** *Yes! Drawing a repeat hsT too early could give false clinical interpretation and miss the true change in troponin. While the ED may employ a rapid 1-hr time draw on certain low risk patients, most patients would get a 3-hr troponin draw if clinically indicated.*
10. **Can we use hsT on renal patients?** Yes; whereas their baseline hsT may be elevated, a renal patient’s delta hsT will not change significantly unless there is acute myocardial injury.

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**FAQ Elevated High Sensitivity Troponin (hsT in ng/L)**

1. **What’s considered a positive hsT?** *52ng/L or more.*
2. **What is the 99th percentile for the upper limit of normal?** *The FDA reported 14ng/L for women, 22ng/L for men, and 19ng/L overall based on sample analysis of healthy US people. Between this upper limit of normal and 52ng/L is considered indeterminate.*
3. **Why are we using a cutoff of 14ng/L?** This represents the lowest 99th percentile reported for a sample of healthy US people. *The ER is utilizing a 1-hour protocol to rapidly rule out low risk chest pain patients using this cutoff.*
4. **What patients have chronically elevated troponins above the 99th percentile?** *2% of the general population and patients with conditions including stable CAD, CHF, renal disease, LVH, PE, chronic pulmonary hypertension.*
5. **How can I tell acute injury from chronic injury?**  *The hsT changes by 5+ng/L (when hsTnT < 52) or 20% (when hsTnT 52 or greater) signifying an acute myocardial injury.*
6. **How can I tell if an elevated hsT is due to MI versus other causes?** *Clinical context is paramount (history, EKG, physical). Using old values can be helpful.*
7. **How often should I test a patient’s hsT?** *If there is persistent clinical concern, then every 3 hours for 1-2 more sets unless new symptoms develop. hsT peaks 12 hours after myocardial injury.*
8. **Do I need a CK-MB to distinguish renal causes or for more acute cases?**  *No, use hsT.*
9. **My patient has an indeterminate hsT (15-51ng/dL). Now what?** *As always, use clinical judgement. If you are concerned about ongoing injury, obtain a 3-hr delta.*
10. **Should I ignore an elevated hsT if the patient has no cardiac symptoms?** *No. An elevated troponin correlates with increased risk for all-cause mortality including non-cardiac causes within the next 2 years. Optimize long-term medical treatment.*
11. **What’s the PPV of a positive hsT (52 or >=6 change) for acute MI?** 75%. *Others had cardiac-related diseases such as myocarditis & broken-heart syndrome.*
12. **What’s the definition of an acute myocardial infarction?** *Requires cardiac symptoms/EKG changes/positive cardiac testing with positive hsT (52+ or delta 5+).*
13. **Do all patients with elevated troponin require telemetry?** *Do not base telemetry solely on troponin values. Noncardiac causes for elevated troponin often do not require telemetry. Please refer to local hospital telemetry guidelines.*

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**Conditions that May Cause Elevated Troponin Levels1**

**Noncardiac Causes for Elevated Troponins**

* Renal failure
* Sepsis
* Stroke, Subarachnoid hemorrhage
* Pulmonary Embolism, Pulmonary Hypertension
* Severe critical illness
* Burns, Extreme Exertion
* Amyloidosis or other infiltrative diseases

**Cardiac Causes for Elevated Troponins**

* Acute Coronary Syndrome due to coronary disease
* Demand Ischemia Myocardial Injury
* Cardiac Intervention (PCI, CABG, Biopsy), Cardioversion
* CHF, Cardiomyopathy, Broken-heart syndrome
* Myocarditis, Cardiac Contusion from Trauma, Rhabdomyolysis
* Aortic Dissection, Aortic Stenosis, Aortic Regurgitation
* Cardiotoxic drugs
* Tachyarrhythmia (SVT, V-tach, atrial fibrillation)
* Bradyarrhythmia or heart block
1. **Mahajan VS, Jarolim P. Clinician Update: How to Interpret Elevated Cardiac Troponin Levels.**[**Circulation 2011;124:2350-2354.**](http://circ.ahajournals.org/content/124/21/2350.full)