5th Generation (High Sensitivity) Cardiac Troponin T

by Jeff Pearson, MD, Medical Director of Laboratories

The Bronson Laboratory system will be converting from 4th generation standard troponin to 5th generation (high sensitivity) troponin on November 5, 2018.

5th generation troponin will facilitate more rapid and accurate classification of chest pain and will ultimately be more cost effective.

The following information will assist you in making the transition.

• Units change from ng/mL to ng/L. Whole numbers are easier to read and trend: e.g. 0.03 ng/mL will be 30 ng/L.
• The 99th percentile cutoff for men and women is different:
  ▶ 14 ng/L for women
  ▶ 22 ng/L for men
• The lower limit of detection is 6 ng/L
• Published literature for chest pain patients indicates:
  ▶ 20% reduction in length of stay
  ▶ 20% reduction in cost
• When serial testing is required, the interval should be 0 and 2 hours. Occasionally a patient may not rule out after 2 hours and a third troponin value 2 hours later may clarify the diagnosis.
• Parallel studies performed in our lab have shown cases where the 4th Gen troponin is negative, but the 5th Gen is a low level positive. Some scenarios include chronic kidney disease, atrial fibrillation and congestive heart failure. It is crucial to check for a delta between the 0 and 2 hour values.
• The attached algorithm was developed with input from Cardiology, Emergency Department and Hospital Medicine physicians. Please review it carefully.

Two main concerns brought up during discussions with providers.

1. Is 5th Gen troponin “overly sensitive”?

No, it is extremely accurate for cardiac injury. However, it can detect elevated troponin due to multiple causes of cardiac injury. See figure 1 below

In all cases, the clinician must use a spectrum of findings to diagnose myocardial infarction. For low level positives, the delta, or lack thereof, between the 1st and 2nd values is essential to proper interpretation. See figure 2 below

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2. Will 5th Gen troponin result in more procedures?
The number of stress tests should decrease because of the excellent negative predictive value. Published literature indicates the number of myocardial infarcts diagnosed is roughly the same and that the number of angioplasties should not change significantly. Overall, length of stay and costs should decrease. See figures below


Bronson Troponin Testing Algorithm

**Detectable level of troponin (but within normal)**

- **Zero hour < 99th Percentile**
  - 99th percentile: Female 14ng/L, Male 22ng/L
  - Pain onset greater than 6 hours
  - Pain onset less than 6 hours
  - Two hour RETEST
  - HEART Score**
    - HEART 0-3
      - Discharge: Outpatient workup
      - Consider non-cardiac workup
    - HEART greater than or equal to 4
      - Shared Decision making: 1) Discharge with close follow up (within 72 hours) 2) Observation: confirmatory testing
  - Change at 2 hours < 8ng/L
  - Change at 2 hours ≥ 8ng/L

**Elevated level of troponin**

- **Zero hour >99th percentile but <100ng/L**
  - 99th percentile: Female 14ng/L, Male 22ng/L
  - Two hour RETEST
  - Change at 2 hours < 8ng/L
  - Change at 2 hours ≥ 8ng/L
  - Shared Decision making: Observation: confirmatory testing
  - Workup Differential Diagnoses

**Diagnostic high level of troponin**

- **Zero hour >100 ng/L**
  - Admission/Cardiology Consult

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*ng/L = Nanogram/Liter
**Please see attached document
HEART Score

### History

<table>
<thead>
<tr>
<th>Slightly suspicious</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moderately suspicious</td>
<td>+1</td>
</tr>
<tr>
<td>Highly suspicious</td>
<td>+2</td>
</tr>
</tbody>
</table>

#### EKG

1 point: No ST depression but LBBB, LVH, repolarization changes (e.g., digoxin).
2 points: ST depression/elevation not due to LBBB, LVH, or digoxin.

<table>
<thead>
<tr>
<th>Normal</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-specific repolarization disturbance</td>
<td>+1</td>
</tr>
<tr>
<td>Significant ST depression</td>
<td>+2</td>
</tr>
</tbody>
</table>

### Age

| <45 | 0 |
| 45-64 | +1 |
| >65 | +2 |

### Risk Factors

Risk factors: HTN, hypercholesterolemia, DM, obesity (BMI > 30 kg/m²), smoking (current or smoking cessation ≤ 3 mo), positive family history (parent or sibling with CVD before age 65); atherosclerotic disease: prior MI, PCI/CABG, CVA/TIA, or peripheral arterial disease.

<table>
<thead>
<tr>
<th>No known risk factors</th>
<th>0</th>
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</thead>
<tbody>
<tr>
<td>1-2 risk factors</td>
<td>+1</td>
</tr>
<tr>
<td>≥ 3 risk factors or history of atherosclerotic disease</td>
<td>+2</td>
</tr>
</tbody>
</table>

### Initial troponin

Use local assays and corresponding cutoffs.

<table>
<thead>
<tr>
<th>≤ normal limit</th>
<th>0</th>
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<tbody>
<tr>
<td>1-3x normal limit</td>
<td>+1</td>
</tr>
<tr>
<td>&gt;3x normal limit</td>
<td>+2</td>
</tr>
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