

DATE: March 3, 2021
TO: Lions Gate Hospital Clinical Staff
FROM: Dr. Catherine Cheng, Interim Division Head, Clinical Chemistry, VCH
Dr. Amir Karin, Clinical Chemist, VCH
SUBJECT: High Sensitivity Troponin I To Replace Contemporary Troponin I at LGH

As of March 10, 2021, Lions Gate Hospital will have a new test for cardiac troponin I. The new test is called *High Sensitivity Troponin I* and will replace our current “contemporary” troponin I test.

Summary of Changes

- High sensitivity troponin will be reported in ng/L instead of µg/L which is how our current troponin test is reported. This means that all results will be reported in whole numbers instead of decimals.
- The 99th percentiles will be: females: 51 ng/L, males: 76 ng/L.
- For troponin results done approximately 3 hours apart, interpretive guidance based on the difference between the two results, i.e. the “delta”, will be offered.
- The same high sensitivity troponin I test will be run at Vancouver General Hospital, Lions Gate Hospital, Richmond Hospital, UBC Hospital, Squamish General Hospital, Sechelt Hospital and Powell River General Hospital. For staff at Lions Gate Hospital and Squamish General Hospital, please order “**Troponin I Cardiac High Sensitivity**” on Cerner.
- There is no change to troponin testing at Whistler Health Care Centre, Pemberton Health Centre, Bella Coola General Hospital and R.W. Large Memorial Hospital. These hospitals will continue to use the contemporary troponin I test.

How does the new high sensitivity troponin test differ from the current test?

- High sensitivity troponin is about 5 times more sensitive than our current test. This means it can reliably measure lower troponin values down to 4 ng/L (0.004 µg/L). With this test, dynamic changes in troponin levels can be monitored even when the initial result is less than the 99th percentile.¹
- Since the high sensitivity troponin test can measure very low concentrations, **more than 50% of healthy adults** (i.e. no myocardial injury) will have a detectable troponin result.¹

What will the new test’s reported results look like?

- The concentration unit will now be *nanogram per litre*, denoted as ng/L.² (Figure 1)
- Results will be in whole numbers instead of decimals because of the unit change.

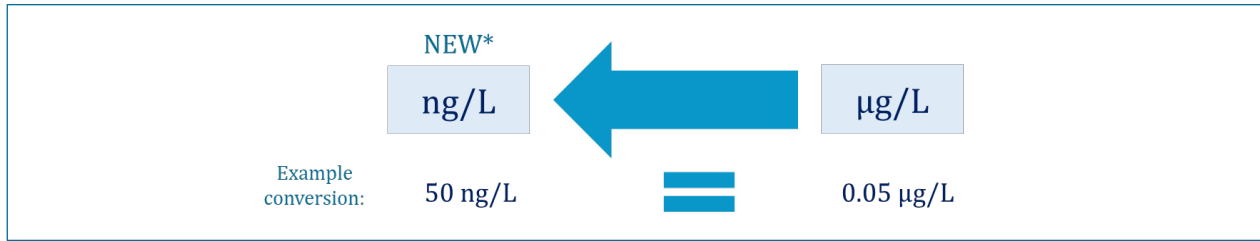


Figure 1. Troponin unit will change to ng/L

- While the results will be roughly 1000 times the old troponin test’s results, the correlation between the two tests is not perfect. This means that the new high sensitivity test has its own 99th percentiles and interpretive cut-offs. Results cannot be compared to the old troponin test or other high sensitivity troponin I tests. They also cannot be compared to the high sensitivity troponin T test done at St. Paul’s Hospital and Mount St. Joseph Hospital.

How are the high sensitivity troponin I results interpreted?

- In patients presenting with signs and symptoms suspicious for acute coronary syndrome, high sensitivity troponin results can be interpreted by comparing them to the sex-stratified 99th percentiles and the magnitude of troponin change with serial troponin measurements to assess the likelihood of acute myocardial injury.²

- 99th Percentiles:**

As this is a new test, the 99th percentiles will be different. See Figure 2 for the new values.³

Note for comparison: The new female and male 99th percentiles would be equivalent to 0.05 µg/L and 0.08 µg/L in the old test’s units.

- Initial troponin cut-offs:**

For the initial troponin the comments in Table 1 can help with interpretation.

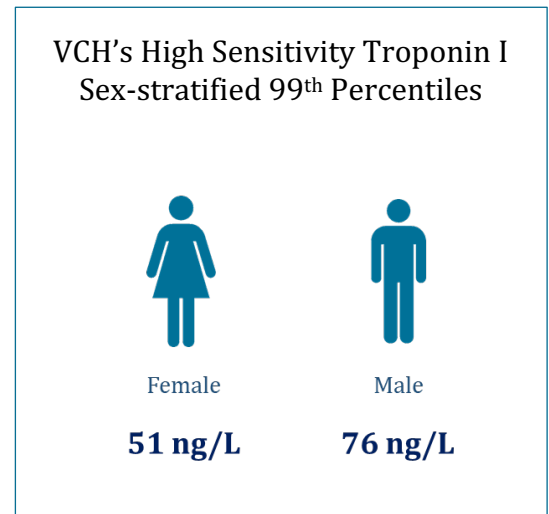


Figure 2. 99th percentiles for the new troponin assay

Table 1. Interpretive guidance for the initial troponin result †

< 5 ng/L	Acute myocardial injury is unlikely if > 3 hours have passed since the onset of symptoms.
5-139 ng/L	Acute myocardial injury is possible. Consider repeat troponin in 3 hours and evaluate delta (see below).
> 139 ng/L	Acute or chronic myocardial injury is likely. This may be secondary to cardiac or non-cardiac causes such as myocardial infarction, heart failure, arrhythmia, pulmonary embolism, sepsis, critical illness, etc.

- **Delta Cut-offs:**

For any subsequent troponins that are ordered, the difference between that result and the previous result is referred to as the “**delta**” shown with the Δ symbol (Figure 3).

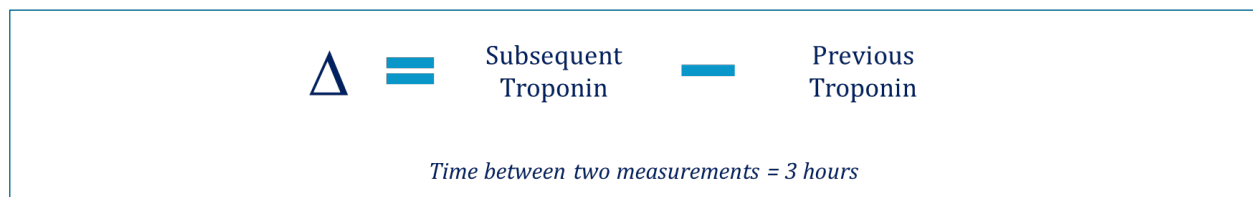


Figure 3. Calculation of delta values

Example:

Initial troponin value for a patient is 65 ng/L. 3 hours later the subsequent troponin is 68 ng/L. The delta value is $\Delta = 68 \text{ ng/L} - 65 \text{ ng/L} = 3 \text{ ng/L}$.

When the repeat troponins are performed about 3 hours apart, the reported result will include interpretive guidance for the delta values. The magnitude of the delta combined with the troponin results can help assess the likelihood of acute myocardial injury. (Table 2)

Table 2. Interpretive guidance for delta values[†]

$\Delta < 5 \text{ ng/L}$ AND both troponins $< 99^{\text{th}}$ percentile	Acute myocardial injury is unlikely
$\Delta = 5\text{-}24 \text{ ng/L}$ OR $\Delta < 5 \text{ ng/L}$ and either troponin result is above the 99^{th} percentile.	Acute myocardial injury possible. <i>*NOTE: In these cases, a repeat troponin or other investigations may be helpful*</i>
$\Delta > 24 \text{ ng/L}$ Regardless of 99^{th} percentile	Acute myocardial injury is likely.

- There are a multitude of causes for an acute or chronic elevation in troponin levels. Some of these have been listed in Table 3 for your reference.⁴
- Occasionally, analytical interference due to various causes may lead to an unexplained but persistent elevation in troponin values (high troponin but negligible delta). If you are concerned about such troponin results that are inconsistent with the clinical picture, please contact the laboratory and we will investigate as necessary.

Table 3. Causes of acute and chronic rise in troponin⁴

Acute Elevation in Troponin	
Cardiac	Non-cardiac
<ul style="list-style-type: none"> ○ Thrombotic acute coronary syndrome ○ Spontaneous coronary artery dissection ○ Acute heart failure ○ Myocarditis/Pericarditis ○ Aortic dissection (Stanford A) ○ Cardiac Procedures ○ Defibrillator shocks ○ Heart Transplantation ○ Cardiotoxic drugs ○ Cardiac contusion following blunt chest wall trauma 	<ul style="list-style-type: none"> ○ Pulmonary embolism ○ Septic shock ○ Critically ill patients ○ Strenuous exercise ○ Rhabdomyolysis
Chronic Elevation in Troponin	
Cardiac	Non-cardiac
<ul style="list-style-type: none"> ○ Chronic ischemic heart disease ○ Chronic heart failure ○ Left ventricular hypertrophy ○ Cardiac infiltrative disorders such as amyloidosis and sarcoidosis 	<ul style="list-style-type: none"> ○ End-stage renal disease

- A summary of the interpretive guidance is presented as an appendix to this memo. Should you have any questions or concerns regarding the transition to High Sensitivity Troponin I testing, please contact the biochemist on-call.

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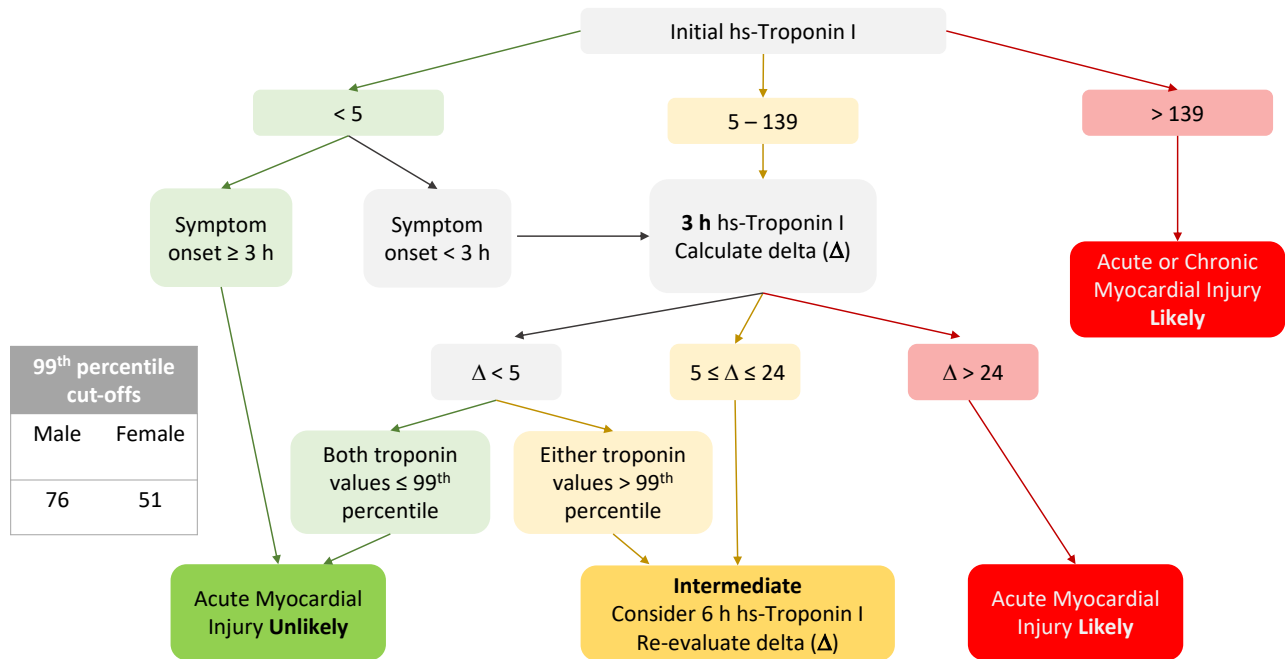
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[†] The cut-offs provided with this guidance for the High Sensitivity Troponin I assay on the Siemens Dimension Vista systems are adapted from the protocol used by L'institut Universitaire de Cardiologie et de Pneumologie de Québec who utilize the same assay and platform. While the validation study at the said hospital is not published, a retrospective comparison using data available from >500 VGH patients demonstrated that the implementation of these cut-offs is as safe as our current troponin assay.

^{1,2,3,4} Please see references in the appendix to this memo.

Appendix:

Interpretive Guidance for High Sensitivity Troponin I at Vancouver Coastal Health (Siemens hs-Troponin I, unit: ng/L)



References:

1. Apple FS, Collinson PO, IFCC Task Force on Clinical Applications of Cardiac Biomarkers. Analytical characteristics of high-sensitivity cardiac troponin assays. *Clinical chemistry*. 2012 Jan 1;58(1):54-61.
2. Wu AH, Christenson RH, Greene DN, Jaffe AS, Kavsak PA, Ordonez-Llanos J, Apple FS. Clinical laboratory practice recommendations for the use of cardiac troponin in acute coronary syndrome: expert opinion from the Academy of the American Association for Clinical Chemistry and the Task Force on Clinical Applications of Cardiac Bio-Markers of the International Federation of Clinical Chemistry and Laboratory Medicine. *Clinical chemistry*. 2018 Apr 1;64(4):645-55.
3. Siemens Healthcare Diagnostics Inc., Dimension Vista High Sensitivity Troponin I (TNIH) Reagent Instructions for User. 2018 Mar 15.
4. Sara JD, Holmes Jr DR, Jaffe AS. Fundamental concepts of effective troponin use: important principles for internists. *The American journal of medicine*. 2015 Feb 1;128(2):111-9.