High-Sensitivity Cardiac Troponin Assays: From Implementation to Resource Utilization and Cost Effectiveness

Article:
Hong-Kee Lee, Cian P McCarthy, Allan S Jaffe, Richard Body, Ahmed Alotaibi, Yader Sandoval, James L Januzzi, Jr..
High-Sensitivity Cardiac Troponin Assays: From Implementation to Resource Utilization and Cost Effectiveness.
J Appl Lab Med 2025; 10(3): 710-730. https://doi.org/10.1093/jalm/jfae161

Guest: Dr. Hong-Kee Lee from the Northshore region of the Endeavor Health system in Evanston, Illinois and the University of Chicago Pritzker School of Medicine.

Randye Kaye: Hello, and welcome to this edition of *JALM* Talk from *The Journal of Applied Laboratory Medicine*, a publication of the Association for Diagnostics & Laboratory Medicine. I'm your host, Randye Kaye.

Chest pain is the second most common reason for adults to present to an emergency department in the United States. It accounts for approximately 8 million visits annually. Cardiac biomarkers, particularly troponins, play a crucial role in identifying the small proportion of individuals actually experiencing an acute myocardial infarction. High-sensitivity cardiac troponin assays are now widely available, and they detect and diagnose acute myocardial infarction more efficiently and accurately than contemporary troponin assays. While implementing new assays in the clinical laboratory may require upfront costs and other resources, high-sensitivity troponin testing may ultimately prove cost-effective by allowing for improved patient outcomes such as reduced length of stay and enabling faster emergency department discharges through earlier rule out.

The May 2025 issue of *JALM* features a review article that discusses the implementation of high-sensitivity cardiac troponin assays and examines whether these assays lead to improvements in resource utilization and cost-effectiveness in clinical practice. The writing group for the article consisted of world-renowned troponin experts from the fields of laboratory medicine, cardiology, and emergency medicine. The writing group was assembled and supported by the Academy of Diagnostics & Laboratory Medicine. Today, we're joined by the article's corresponding author and chair of the writing group, Dr. Hong-Kee Lee. Dr. Lee is the Division Director for Clinical Pathology for the Northshore region of the Endeavor Health system in Evanston, Illinois. She is also a Clinical Professor of Pathology at the University of Chicago Pritzker School of Medicine. Welcome, Dr. Lee.

First, what is high-sensitivity troponin and how is it different from conventional troponin?

Hong-Kee Lee: High-sensitivity troponin assays are able to measure cardiac troponin concentrations in more than 50% of healthy men and women with 10% or less total imprecision at the 99th percentile upper reference limit. Due to the ability to measure low concentrations of troponin, the high-sensitivity troponin assays can be utilized to rapidly rule in or rule out patients with myocardial infarction.

There are two main differences between conventional and high-sensitivity troponin assays. The first difference is the reporting unit. Conventional troponin assays report troponin results in nanogram per ml and low results are in decimals. The high-sensitivity troponin assays report results in nanogram per liter and all results are in whole numbers. During the transition from conventional to high-sensitivity troponin, clinicians need to get used to seeing larger numbers when interpreting results.

The second difference is the reference cutoff value for troponins. For conventional troponin assays, troponin results were reported with a single reference cutoff regardless of sex. However, high-sensitivity troponin assays have sex specific reference cutoff values as the 99th percentile upper reference limit is lower in women than in men.

Randye Kaye: Can you share some practical tips for implementing a high-sensitivity troponin assay?

Hong-Kee Lee: Since the first high-sensitivity troponin assay was approved by FDA in 2017, clinical labs started working on implementing the new assay. This conversion requires extensive planning and collaboration between different medical disciplines. Institutional implementation of high-sensitivity troponin typically requires 6 to 12 months. This includes assembling an interdisciplinary team of clinicians from the lab, cardiology, emergency medicine, internal medicine, and institutional information technology service. Once assembled, the interdisciplinary team will work on selecting a high-sensitivity troponin based rapid diagnostic pathway. A risk score may be incorporated in this pathway.

Outpatient cardiac testing also need to be coordinated so that follow-up care can be timely and patients won't be lost to follow up. Once the planning and logistic coordination are done, clinician and nurse education must take place before the new assay is implemented. It is not recommended to offer both conventional and high-sensitivity troponin assays within the same hospital or hospital system to prevent confusion when interpreting results. Some institutions distribute pocket cards or tip sheets to clinicians to remind them of the diagnostic algorithms. Many institutions use lectures or grand rounds to educate clinicians and nurses. Ongoing training of new staff due to staff turnover is

necessary to ensure smooth care handoffs between ED and inpatient clinicians.

Randye Kaye: Thank you. Can you tell me the pros and the cons of the various algorithms that are used by hospitals to rule in and rule out myocardial infarction?

Hong-Kee Lee: The first diagnostic algorithm that was developed by the European Society of Cardiology was the 0/3 hour algorithm. This algorithm is the closest to the algorithm recommended for serial testing when using conventional troponin assays. For patients presenting at the ED six hours after onset of chest pain, a single high-sensitivity troponin below the reference cutoff value was deemed sufficient to rule out myocardial infarction if the patient was pain free and deemed low risk. For patients presenting at the ED within six hours of symptom onset, a repeat high-sensitivity troponin measurement at three hours is recommended. The difference between the two values will be taken into consideration when triaging the patient.

One of the criticisms of this algorithm was that the speed of triaging patients was not much faster compared to conventional troponin. Shortly after the 0/3-hour algorithm was introduced, several clinical trials reported the use of 0/1-hour and 0/2-hour algorithms. The 0/1-hour algorithm provides faster triage of patients in the ED, but the short turnaround time between blood draw and result reporting may not be feasible for some institutions. The 0/2 algorithm allow more time for blood draw and result turnaround, so it may be more practical for most institutions.

In all of the three algorithms, appropriate delta, which is the difference between the second and the first high-sensitivity troponin results, is very important to rule in or rule out myocardial infarction. Some institutions also choose to incorporate risk scores such as the heart score to the diagnostic algorithms.

Randye Kaye: Thank you. So, my final question is how does implementing high-sensitivity troponin in hospital laboratories improve patient care?

Hong-Kee Lee: When high-sensitivity troponin assays receive 510k clearance by FDA, many people were skeptical that implementing high-sensitivity troponin assays may result in longer ED stay or more hospitalization since more patients may be ruled in or require more cardiac workups. Over time, many randomized clinical trials in Europe, Australia, and U.S. proved that implementation of high-sensitivity troponin actually reduced ED length of stay.

This was due to the fact that more patients could be confidently ruled out and discharged from the ED at a shorter period of time, reducing overcrowding in the ED. For follow-up cardiac testing after ED visit, clinical trials and observational studies showed more diverse results. Some showed a reduction of noninvasive cardiac tests after implementing high-sensitivity troponin and some found no difference compared to conventional troponin.

The economic impact of implementing high-sensitivity troponin is more difficult to determine as published papers from different countries used different comparison methodologies or different currencies.

However, most trials observe more avoidance of adverse outcomes in patients over time when using high-sensitivity troponin. This in turn can result in potential cost savings in the long run.

All in all, early rule-in or rule-out of myocardial infarction using high-sensitivity troponin can lead to long term benefits to individual patients and reduction in health care cost over time.

Randye Kaye: That was Dr. Hong-Kee Lee from Endeavor Health describing the *JALM* article "High-Sensitivity Cardiac Troponin Assays: From Implementation to Resource Utilization and Cost Effectiveness." Thanks for tuning in to this episode of *JALM* Talk. See you next time and don't forget to submit something for us to talk about.