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Invited Commentary | Emergency Medicine

Troponin Testing in the Emergency Department—When 2 Become 1

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Chest pain is among the main reasons for presentation at the emergency department (ED). The challenge for clinicians is not only to identify patients who are likely to have an acute coronary syndrome (ACS) but also to identify low-risk patients who may be safely discharged without a prolonged stay for further investigation. During the past 2 decades, evaluation of patients with chest pain has made a huge transition, especially with the introduction of cardiac troponin measurements and risk stratification tools.

Risk scores, which are generally developed to aid the physician in making a careful and timely decision, have improved significantly over time. From the PURSUIT (Platelet Glycoprotein IIb/IIIa in Unstable Angina: Receptor Suppression Using Integrilin), TIMI (Thrombolysis in Myocardial Infarction), and GRACE (Global Registry of Acute Coronary Events) scores, which were more suitable for use in a coronary care unit, emergency physicians have witnessed the transition to HEART (History, Electrocardiogram, Age, Risk Factors, and Troponin),[1] T-MACS (Troponin-Only Manchester Acute Coronary Syndromes),[3] and ADAPT (2-Hour Accelerated Diagnostic Protocol to Assess Patients With Chest Pain Symptoms Using Contemporary Troponins as the Only Biomarker),[2] which were specifically designed to identify patients with chest pain who are at low risk for an ACS in the ED. In many countries, the HEART score is the most frequently used, sometimes combined with a second troponin assay, as advocated by Mahler et al[4] in HEART Pathway.

Although troponin testing is included with each of these accelerated diagnostic protocols (ADPs), it remains unclear whether 2 troponin measurements are safer than 1. With increasing crowding in EDs, emergency physicians worldwide are searching for ADPs that allow for rapid discharge of patients with low-risk chest pain. Even if serial troponin sampling occurs 1 to 3 hours after the first test, this would still be a significant impediment to ED disposition. Such a strategy means that patients spend hours waiting in the ED for the results of their repeated tests, contributing to crowding. Therefore, the question arises: can a patient be safely discharged after a single troponin test, or is patient safety improved with serial measurements?

Wassie et al[5] address the single vs serial troponin question with a retrospective review of prospectively collected data from a respectable 27 918 patients, almost evenly split between those with a single troponin order (14 459 [51.8%]) and those with serial troponin orders (13 459 [48.2%]). In this study, a contemporary cardiac troponin assay was used (AccuTnI+3 [Beckman Coulter]).

For inclusion, patients needed to have a recorded HEART score in their hospital medical record and an initial troponin measurement below the level of quantification (troponin I, <0.02 ng/mL [to convert to micrograms per liter, multiply by 1.0]). Physicians were counselled on when to order repeated troponin testing based on timing of symptoms and initial HEART score, but the ultimate decision was left to the treating physician. The primary outcome did not show a statistically significant difference in myocardial infarction or cardiac death within 30 days with single vs serial troponin orders (56 [0.4%] vs 52 [0.4%]; adjusted odds ratio, 1.46; 95% CI, 0.96-2.07). The secondary outcome assessed rates of coronary artery bypass grafting and invasive coronary angiography, finding that these rates were lower in the group that received a single troponin test.

These findings appear to support the safe early discharge of patients who have a troponin I concentration of less than 0.02 ng/mL with this assay. Unfortunately, specific data on the HEART score vs outcome per participant are not reported. However, in Table 2 of the study by Wassie et al,[5] the authors reveal that the patients who were discharged after a single blood test had a lower HEART

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score than those who underwent serial testing. Thus, the single troponin group had a lower risk of ACS or major adverse cardiac events (MACEs).

This study cannot allow us to say that all patients with troponin I levels less than 0.02 ng/mL using this assay can be safely discharged after a single test. However, it does provide convincing evidence that when using the HEART score, physician judgement was safe, with a very low incidence of MACE among patients who were discharged after a single blood test.

In recent years, there has been substantial interest in the question of whether discharge after a single troponin measurement is safe. The HEART and T-MACS scores were designed to facilitate safe discharge after a single blood test. Furthermore, with high-sensitivity cardiac troponin (hs-cTn) assays, there is now an abundance of data to suggest that according to the hs-cTn assay used, acute myocardial infarction can be safely ruled out in patients who have a troponin concentration less than the limit of detection[6] or less than the limit of quantification.[7]

There are other data to suggest that the HEART score combined with an hs-cTn measurement can achieve a high negative predictive value (NPV) for MACE. Khand et al[8] studied 1642 patients with a modified HEART score based on a single hs-cTn T measurement on arrival at the ED. They identified 48.4% of patients as low risk for a MACE, with an NPV of 99.9%, concluding that a modified HEART score of 3 or less, with the use of a single hs-cTn T measurement (Elecsys [Roche]), appeared to be the optimum early discharge strategy for suspected ACS.[8]

In the United States, where Wassie et al[5] performed their study, hs-cTn is not yet commonly used. Also, there is significant physician variability in practice and considerable concern regarding the legal implications of a failed diagnosis, with missed myocardial infarction remaining the top reason for medical malpractice actions.[9] Therefore, the HEART Pathway is commonly used, which requires 2 troponin measurements. However, hospitalization and additional cardiac testing also carry a risk. It is a surprising finding in the study by Wassie et al[5] that half of ED clinicians used a single troponin measurement before discharging patients with chest pain. This has not been previously described in a study of this size, in which 30-day outcome data were available. This has major implications regarding current practice in the United States; it can no longer be said that current ED practice involves obtaining serial troponin measurements on all patients with chest pain; of note, of the 13 459 patients with a repeated troponin tests in this study, only 66 (0.5%) had a subsequently positive troponin test.

Incorporating the conclusions of this study into bedside ED practice will allow for more rapid, patient-centered, and safe disposition of patients with chest pain. This, in turn, could help to decrease overcrowding, admission, and additional cardiac testing.

ARTICLE INFORMATION

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