

Cardiac Biomarkers—Are We Testing Wisely?

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Cardiac biomarker testing, along with a thorough patient history, physical exam, and an electrocardiogram, is required for the diagnosis of patients with suspected acute coronary syndrome (ACS). For nearly 3 decades, 2 cardiac biomarkers, troponin (I or T) and creatine kinase-MB fraction (CK-MB), have been ordered together to evaluate ACS patients out of concern that utilizing a single biomarker might be less diagnostically accurate than using 2 biomarkers. However, subsequent studies have shown that troponin is far more sensitive and specific for myocardial injury than CK-MB.^{1,2} Troponin testing offers important prognostic information irrespective of whether the CK-MB is normal or abnormal.^{3,4} In 2015, the American Society of Clinical Pathology released a Choosing Wisely[®] recommendation against ordering CK-MB (or myoglobin) for the diagnosis of acute myocardial infarction (AMI).⁵ This reflects an emerging consensus that CK-MB testing represents low-value care while troponin testing alone is the appropriate diagnostic strategy for ACS patients.

Remarkably, we know very little about patterns of cardiac biomarker utilization in clinical practice. In this issue of the *Journal of Hospital Medicine*, Prochaska et al.⁶ provide a valuable snapshot of troponin and CK-MB utilization at 91 U.S. academic medical centers (AMCs) for 18 months prior to and following the release of the 2015 Choosing Wisely[®] recommendation. From a retrospective review of 106,954 inpatient discharges with a principal diagnosis of AMI, they report a 29.2% rate of troponin-only testing in 2013 with a gradual increase over 3 years to 53.5% in 2016. Interestingly, the study's baseline troponin-only utilization rate is consistent with a 2013 College of American Pathologists survey, which estimated that 23% of U.S. clinical laboratories no longer process CK-MB (and therefore run troponins alone).⁷

Did the 2015 Choosing Wisely[®] recommendation have an impact on providers choosing cardiac biomarkers wisely? The authors answer this question in a novel way by stratifying hospitals into performance tertiles for each study quarter and then further classifying them into groups that were consistently high, middle, and low performers throughout

the study period. Using an interrupted time series design, they identify 26 hospitals who improved their troponin-only testing performance tertile during the study period and examine their average quarterly rate of change. As illustrated in Figure 3, they report a sharp increase in the rate of change of troponin-only testing shortly after the release of the 2015 Choosing Wisely[®] recommendation. The authors reasonably conclude that the Choosing Wisely[®] campaign “appeared to facilitate accelerated adoption of troponin-only testing” among these hospitals.

However, we should interpret these results with caution. The authors highlight several limitations, including the absence of causality common in observational studies and insufficient time to follow-up to capture the full (or transient) impact of the intervention. There are factors external to the Choosing Wisely[®] campaign that may have influenced cardiac biomarker testing patterns observed. Examples include variation in hospital leadership, financial drivers, and local culture that promote high-value care. We also note that (1) there are several published interventions to improve troponin-only ordering that predate the Choosing Wisely[®] campaign^{8,9}; (2) a prominent cardiology guideline endorsed the use of troponin as a preferred cardiac biomarker in 2012¹⁰; and (3) a widely cited opinion by prominent researchers called for the elimination of CK-MB from clinical practice in 2008.¹¹ These publications suggest there was already an awareness of and efforts underway to improve cardiac enzyme testing contributing to the results described by Prochaska et al.

Limitations notwithstanding, we commend Prochaska et al. for conducting the first-known description of patient-level trend rates of troponin and CK-MB testing. Finally, it is worth noting that where there is accomplishment, there is also opportunity. At the end of the study period, nearly 50% of institutions had yet to adopt a troponin-only strategy. While there has been an overall trend towards improvement, this number remains high. We may conjecture as to possible explanations: Providers may be unconvinced that a single troponin is sufficient in the diagnosis of ACS (ie, lack of knowledge or debate over the interpretation of available science), stakeholders may be slow to de-adopt practices using appropriate systems levers (eg, laboratories delisting CK-MB processing), and incentives may be lacking to motivate AMCs. The results of this study should be used as a burning platform to those who wish to “test wisely” in cardiac biomarker use.

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