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A Methodological Appraisal of the HEART Score and Its Variants Response

To the Editor:

We appreciate the interest Green and Schriger[1] have taken in chest pain risk stratification. Prior to the use of the HEART score and HEART Pathway, most US emergency departments (EDs) admitted up to 80% of their patients with chest pain.[2] The HEART score and Pathway revolutionized chest pain care by providing a safe method of early discharge. It may be easy to forget, or for those new to emergency medicine to not even realize, how far we have come in a short period of time and how this progress was made. The HEART Pathway randomized controlled trial published in 2015 was the first randomized trial to prospectively discharge low-risk patients without stress testing.[3] Given this history, our team respectfully wants to offer some points of clarification to Green and Schriger's[1] discussion of the HEART score. Further, we want to assure emergency physicians that the safety and efficacy of the HEART score and Pathway have been validated in thousands of patients around the world.

Green and Schriger's[1] analysis of the HEART score and its variants conflicts with established standardized reporting guidelines, which guide the methodology of emergency medicine chest pain studies.[4] For example, they suggest that 6-week and 30-day outcomes do not matter to emergency physicians, but it has been established that emergency physicians are held accountable for near-term missed events and that 30-day outcomes are recommended by guidelines.[4] Further, they argue that patient selection for HEART studies was too broad, suggesting instead that the population should consist only of "challenging" patients. We offer that studying such a narrow and difficult-to-define population would introduce selection bias. They criticize that sex is not a HEART score variable, but scores that include sex or race have been shown to worsen disparities. They also critique the HEART Pathway for underpowered analyses despite a prospective study with more than 8,000 patients.[5] Finally, the authors offer no effective alternative to the HEART score and seem to suggest that we use gestalt despite overwhelming evidence of its lack of safety. They bring up the Emergency Department Assessment of Chest Pain Score but fail to mention mixed results when attempts have been made to validate it in a US setting.

To be clear, no risk score is perfect. It is well known that the HEART score was not statistically derived, is subjective, has low interrater reliability and logical inconsistencies, and has a miss rate above what many physicians consider acceptable. These shortcomings were the impetus for the HEART Pathway, which uses an objective history, removes logical inconsistencies, uses serial troponins, and integrates into the electronic record as a decision support tool, yielding a sensitivity of 98.3% and a negative predictive value of 99.6% for 30-day death and myocardial infarction.[5] Conducting emergency medicine research is challenging and imperfect. In the future, risk stratification strategies may move beyond the HEART score and its variants. We believe that methodological appraisals of future tools will be balanced, including strengths and weaknesses. The ED management of chest pain has come a long way. It is important that as we strive for even safer and more efficient strategies, we do so collegially.

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Do Not Throw Out the Baby With the Bathwater

To the Editor:

We read with great interest the article by Green and Schriger[1] reviewing the methodological aspects of the HEART score. This manuscript provides a wide review of the risk assessment model and emphasizes some of its weaknesses.

The authors have highlighted a lack of sensitivity of the HEART score less than 4 to rule out a major adverse cardiovascular event leading to an unacceptable rate of missed diagnoses. Indeed, the pooled sensitivities of the HEART score were 96% to 97%, with the lower bounds of the 95% confidence intervals of 93% to 94%, "ie, compatible with missing 6% to 7% of major adverse cardiovascular events."[1] The definitions of "miss-rate" and "miss threshold" used in this paper may be confusing for emergency physicians. What emergency physicians need for decisionmaking is the residual risk of the patient in front of them, knowing the result of the test, which corresponds to the negative predictive value (NPV) and the false negative rate. In this purpose, the 1% to 2% rate of "acceptable" errors is commonly understood as the false negative rate (1–NPV) rather than the rate of missed diagnoses among the patients with the disease (1–sensitivity). The false negative rate is widely used for the validation of diagnostic scores and strategies such as the latest accelerated diagnostic protocols for acute coronary syndrome.[2] Considering a worst-case scenario in a high-risk population with a 30-day major adverse cardiovascular event prevalence of 15%, with a sensitivity and specificity of 96% and 42%, respectively, the false negative rate of the HEART score would be 1.6%.[3] Moreover, most recent studies have reported a way lower 30-day prevalence of acute myocardial infarction or death in unselected emergency department patients in the United States (0.6%), corresponding to a 100% NPV and a false negative rate near 0%.[4] In the latest meta-analysis including more than 25,000 patients, the lower bound of the 95% confidence interval of the NPV for the 30-day rate of major adverse cardiovascular event was 98%, leading to a false negative rate lower than the "acceptable 2% threshold."[3] Finally, the safety of the HEART score is supported by a high-quality randomized trial, having confirmed the noninferiority of a HEART score–based strategy compared with usual care.[5]

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