Review Article

The HEART score: A guide to its application in the emergency department

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ABSTRACT

Chest pain is one of the most common, potentially serious presenting complaints for adult emergency department (ED) visits. The challenge of acute coronary syndrome (ACS) identification with appropriate disposition is quite significant. Many of these patients are low risk and can be managed non-urgently in the outpatient environment; other patients, however, are intermediate to high risk for ACS and should be managed more aggressively, likely with inpatient admission and cardiology consultation. The HEART score, a recently derived clinical decision rule aimed at the identification of risk in the undifferentiated chest pain patient, is potentially quite useful as an adjunct to physician medical decision-making. The HEART score identifies patients at low, intermediate, and high risk for short-term adverse outcome resulting from ACS. As is true of all such clinical decision rules, the physician should consider the information provided the HEART score yet exercise clinical judgment in the ultimate determination of management strategy in the adult chest pain patient suspected of ACS.

1. Introduction

Chest pain is one of the most common, potentially serious presenting complaints for adult emergency department (ED) visits.[1] A significant proportion of these patients undergo advanced medical evaluation during these visits, resulting in longer and more costly ED stays; during this period, the percentage of these ED presentations with resulting diagnosis of acute coronary syndrome (ACS) decreased.[1]

For many years, physicians have sought tools, ranging from specific diagnostic tests to entire strategies of evaluation, to appropriately risk stratify patients suspected of experiencing ACS; these efforts are aimed at preventing major adverse cardiac events (MACE) while reducing unnecessary testing and hospitalizations. A majority of physicians deem a miss rate of <1% for MACE as acceptable in screening tools.[2] Patients, on the other hand, feel that a higher risk of missing an ACS presentation is acceptable with considering the management strategy.

2. Development of the HEART score

The HEART score was developed in the Netherlands in 2008 by Six, Backus and Kelder as a rapid risk stratification tool for patients with chest pain according to their short-term risk MACE (defined as acute myocardial infarction [AMI], need for percutaneous coronary intervention [PCI] or coronary artery bypass graft [CABG], and death within 6 weeks) to help identify low-risk patients, suitable for earlier ED discharge within 30 days of index ED visit.[3] This decision tool is considered rather valuable for several reasons, including its ease of application, ready availability of the variables under consideration, the focus on short-term outcome, appropriate for ED management, and the identification of three discrete subpopulations (low-, moderate-, and high-risk) of ED chest pain patients suspected of ACS.

Suspected ACS patients are evaluated with a standard ED focused history and evaluation. Based upon five different variables, a score is summed for the patient under evaluation, including history (H), 12-lead electrocardiogram (ECG; E), age (A), risk factors (R), and troponin (T). Scoring ranges from 0 to 2 in each of these five categories, with the lowest possible score of 0 and the highest possible score of 10. Low-risk patients (a score 3 or less) were found to have a low (1.7%) MACE rate.[3–5] These low-risk patients were categorized as appropriate and safe for ED discharge without

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additional cardiac evaluation or inpatient admission; conversely, a higher score was associated with an increased MACE rate and warranted more additional evaluation and/or intervention.[3] In these two higher score categories, two distinct subpopulations were noted, including the following MACE rates: moderate-risk, with a score of 4–6, MACE rate of approximately 12–17% and the potential consideration of observation and further testing; and high-risk, with score of 7–10, MACE rate of approximately 50–65%, and the consideration of urgent or emergent intervention.[3–5] Refer to Table 1 for a depiction of the HEART score, its five categories of variables, and scoring.

Prior risk stratification tools include the GRACE and TIMI scores; these scoring systems, however, were derived for high risk patients examining the need for invasive therapy rather than the evaluation of individuals with undifferentiated chest pain.[3–8] These scores can be complex to calculate with many laboratory variables, making them more cumbersome to use in the ED setting. Additionally, when compared to the GRACE and TIMI scoring systems, the HEART score demonstrated an enhanced ability to distinguish patients at low risk for MACE with a lower rate of missed MACE, while exhibiting greater accuracy in risk stratification.[3–7]

3. Development of the HEART pathway

Since the inception of the HEART score, it has been validated in many trials, both retrospective and prospective.[4–6,9–12] Yet some clinicians are hesitant to discharge low-risk patients without further testing, prolonged observation, and/or hospital admission.[13] A common criticism was the use of a single troponin determination rather than serial testing.[14] In response to this valid concern, the HEART Pathway was developed, combing the HEART score with an additional troponin measurement at 3 h.[14] In this pathway, patients were initially divided into low-risk (troponin HEART score ≤ 3) or high-risk (troponin HEART score >3) categories rather than low, intermediate, and high levels of clinical concern. The patients were then followed with repeat troponin determination at 3 h. If low-risk initial category and negative repeat troponin determination then, similar to the HEART score, the patient is a candidate for early discharge. If high-risk category with negative repeat troponin determination, it is recommended for the patient to be admitted to an observation or inpatient unit for further evaluation. If the patient is high-risk with positive repeat troponin determination, the

pathway recommends cardiology consultation, hospital admission, and further testing.[14] The HEART Pathway has also been noted to have a higher sensitivity and greater negative predictive value for MACE as compared with the HEART score itself.[7,14] Refer to Fig. 1 for a depiction of the HEART Pathway.

We will now discuss each of the components of the HEART score individually to further examine the criteria in addition to identifying various considerations when utilizing the HEART score.

4. History

As is true of all 5 categories in this decision tool, the patient history is denoted by the "H" and refers to the description of the patient's chest pain and related presentation details. The history description is divided into three levels, including nonspecific, mixed nonspecific and specific and specific elements with corresponding scores of 0, 1, and 2. The nonspecific elements were initially defined as "… the absence of specific elements in terms of pattern of chest pain, onset and duration, relation with exercise, stress or cold, localization of pain, concomitant symptoms, and the reaction to sublingual nitrates."[3] This HEART score category is the most subjective, creating the opportunity for inter-rater variability depending on which historical elements were elicited and in what way.[15,16] Looking to reduce this subjectivity and related
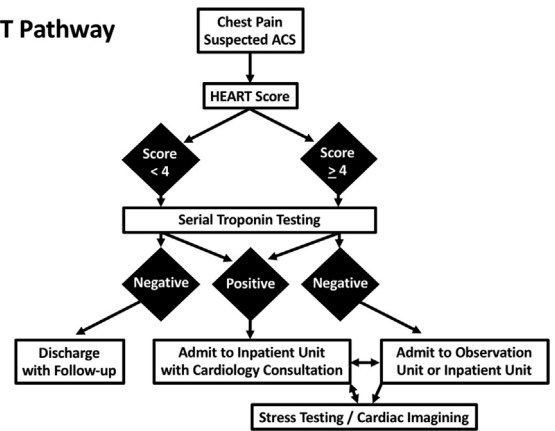

Fig. 1. The HEART pathway.[14]

Table 1
The HEART score.[3–6]

Variable	Score of 0	Score of 1	Score of 2
History	nonspecific history for ACS, a history that is not consistent with chest pain concerning for ACS	mixed historic elements, a history that contains traditional & non-traditional elements of typical ACS presentation	specific history for ACS, a history with traditional features of ACS
Electrocardiogram	entirely normal ECG	abnormal ECG, with repolarization abnormalities[a] yet lacking significant ST depression	abnormal ECG, with significant ST deviation (depression ± elevation), either new or not known to be old (i.e., no prior ECG available for comparison)
Age (years)	age less than 45 years	age between 45 & 64 years	age 65 years or older
Risk Factors[b]	no risk factors	1 to 2 risk factors	3 or more risk factors OR documented cardiac or systemic atherosclerotic vascular disease[c]
Troponin[d]	troponin < discriminative level ± AccuTroponin I < 0.04 ng/ml	troponin elevated 1–3 times discriminative level ± AccuTroponin I 0.04–0.12 ng/ml	troponin elevated > 3 times discriminative level ± AccuTroponin I > 0.12 ng/ml

Total HEART Score: risk category & recommended management strategy.
0-3: low risk, potential candidate for early discharge.
4-6: moderate risk, potential candidate for observation & further evaluation.
7-10: high risk, candidate for urgent or emergent intervention.
  [a] BBB, LVH, digoxin effect, implanted right-ventricular pacemaker, past MI, +/− unchanged repolarization abnormalities.
  [b] DM, tobacco smoker, HTN, hypercholesterolemia, obesity, +/− family history of CAD.
  [c] peripheral arterial disease, MI, past coronary revascularization procedure, +/− stroke.
  [d] It is recommended to use the local hospital standards for troponin abnormality determination.