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Documentation of HEART score discordance between emergency physician and cardiologist evaluations of ED patients with chest pain^{☆,★}

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Abstract

Introduction: A triage cardiology program, in which cardiologists provide consultation to the Emergency Department (ED), may safely reduce admissions. For patients with chest pain, the HEART Pathway may obviate the need for cardiology involvement, unless there is a difference between ED and cardiology assessments. Therefore, in a cohort concurrently evaluated by both specialties, we analyzed discordance between ED and cardiology HEART scores.

Methods: We performed a single-center, cross-sectional, retrospective study of adults presenting to the ED with chest pain who had a documented bedside evaluation by a triage cardiologist. Separate ED and cardiology HEART scores were computed based on documentation by the respective physicians. Discrepancies in HEART score between ED physicians and cardiologists were quantified using Cohen κ coefficient.

Results: Thirty-three patients underwent concurrent ED physician and cardiologist evaluation. Twenty-three patients (70%) had discordant HEART scores ($\kappa = 0.13$; 95% confidence interval, -0.02 to 0.32). Discrepancies in the description of patients' chest pain were the most common source of discordance and were present in more than 50% of cases. HEART scores calculated by ED physicians tended to overestimate the scores calculated by cardiologists. When categorized into low-risk or high-risk by the HEART Pathway, more than 25% of patients were classified as high risk by the ED physician, but low risk by the cardiologist.

Conclusion: There is substantial discordance in HEART scores between ED physicians and cardiologists. A triage cardiology system may help refine risk stratification of patients presenting to the ED with chest pain, even when the HEART Pathway tool is used.

[☆]Meetings: None.

[★]Conflicts of interest: Nothing to disclose.

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1. Introduction

Chest pain accounts for 8 to 10 million emergency department (ED) visits each year in the United States [1]. To optimize care delivery to ED patients, more appropriate risk stratification is needed to better allocate resources [2,3]. We recently described our experience in implementing a triage program in which cardiologists provide consultation to the ED. Over a 6-month observation period, 15% to 20% of consulted patients were discharged [4], thus potentially avoiding a large number of admissions.

Soon after the observation period for this study ended, our ED adopted the HEART Pathway as an initial tool for risk-stratifying patients presenting with chest pain [5]. The HEART Pathway is a validated decision aid for identifying patients who are safe for discharge [6]. It provides recommendations for further management based on the HEART score, whereby an increasing number of points is assigned based on the level of risk associated with the patient's description of their chest pain, risk factors for coronary artery disease, electrocardiographic findings, and troponin measurements. The implementation of the HEART Pathway at our institution motivated us to assess its potential impact on our triage cardiology program.

An important initial step in this assessment is to quantify discrepancies between HEART scores calculated from ED and cardiology evaluations of the same patient. If ED and cardiology evaluations produce entirely concordant HEART scores, triage cardiology input may be redundant and unnecessary. However, if there is significant discordance in HEART scores between ED physicians and cardiologists, triage cardiologists could continue to play an important role in the evaluation of ED patients with chest pain.

Because our original dataset was assembled before the introduction of the HEART Pathway into routine practice at our institution, documentation of clinical encounters by ED and triage cardiology personnel, as well as decision making regarding cardiac testing, were unbiased with regard to the HEART score. By retrospectively calculating HEART Scores and Pathway recommendations for patients evaluated concurrently by an emergency physician (EP) and triage cardiologist, we sought to (1) quantify the magnitude and direction of discordance in HEART scores between EPs and cardiologists evaluating the same patient, and (2) evaluate the source(s) of discordance in HEART scores between the 2 specialties.

2. Methods

2.1. Study design and setting

We performed a single-center, cross-sectional, retrospective study of adults presenting to the ED with chest pain who had a documented bedside evaluation by a triage cardiologist. We analyzed concordance in HEART scores based on documentation of concurrent clinical encounters with each patient by the EP and triage cardiologist.

This study was approved by our institution's institutional review board.

The details of our triage cardiology program have been described previously [4]. Briefly, 7 general cardiologists (referred to as triage cardiologists) provide consultation to the ED (by

telephone and/or in person) between 8 AM and 5 PM on nonholiday weekdays. Calls are placed by the EP to a cardiology access center staffed by dedicated cardiac nurses. A nurse routes the call to the triage cardiologist and documents the encounter. As depicted in the flow diagram (Fig. 1), this study focused on the subset of patients presenting with chest pain for whom an in-person consultation was performed and documented by the triage cardiologist.

2.2. Population

We conducted a retrospective medical record review of patients at least 18 years of age who presented to our institution's adult ED between January 1, 2015, and June 30, 2015, with a chief concern of chest pain and for whom (1) the ED physician's concern for acute coronary syndrome prompted contact with the triage cardiology access center, (2) a formal in-person evaluation of the patient by the triage cardiologist was performed before a disposition decision, and (3) the consultation was documented in the patient's electronic medical record. For some patients, the initial in-person consultation by the triage cardiologist (done without any additional information beyond what was available to the ED physician) resulted in a decision for admission. In these cases, the triage cardiology note was written from the perspective of an admission history and physical and thus did not reflect the thought process behind the disposition decision; these patients were excluded from the main analysis. The rationale was to include patients who had documented concurrent ED and cardiology evaluations with similar available clinical data, in addition to equipoise regarding acute coronary syndrome diagnosis and disposition.

2.3. Data collection

A data dictionary was created before data collection and reviewed by the investigators. Data abstraction was completed by one investigator (WKW) using a structured data form. A second investigator (MY) duplicated data abstraction for subjects in whom there was ambiguity in categorizing any HEART score component. Consensus between the 2 reviewers was reached for each of these data points after additional review [5].

Elements of the HEART Score and Pathway were retrospectively abstracted from the resident and/or attending EP notes and the triage cardiologist note. For each patient, the timing of the electrocardiogram (ECG) and initial troponin results was such that those data were available to both the ED physician and cardiologist before a disposition was determined. Data deemed not available to the clinicians at the time of evaluation (ie, information contained in subsequent amendments to the original note) were not collected. The HEART Score and HEART Pathway risk classification, including the categorization of historical features as "low-risk" or "high-risk," were determined for each patient as previously described. [5]. For cases with a mix of low-risk and high-risk features, the level of "suspicion" was assigned as follows: documentation of at least 2 more high-risk features than low-risk features was classified as "highly suspicious" (2 points) and documentation of at least 2 more low-risk features than high-risk features was classified as "slightly suspicious" (0 points). An equivocal number of high- and low-risk features (ie, the number of high- and low-risk features differed by 1 or less) was documented as moderately suspicious (1 point). Other components of the Score were explicitly documented, and no

further interpretation was necessary. Data elements that were recorded as “missing” and those recorded as “not present” were treated similarly.

As in our prior report [4], patients were classified as having cardiovascular disease if a history of any of the following was documented in their medical record: coronary artery disease, myocardial infarction, arrhythmia, systolic/diastolic heart failure, valvular surgery, or congenital heart disease.

2.4. Analysis

For demographics and clinical characteristics, data for continuous variables were reported as mean $\pm$ SD and for categorical variables as frequency and percentage. Comparisons between continuous variables were made using the 2-tailed Student *t* test, and comparisons between categorical variables were made using Fisher χ^2 test. *P* .05 were considered statistically significant.

We calculated 2 HEART scores for each patient—one using data collected from the EP’s documentation (EP-HEART) and one using the cardiologist’s documentation (CARD-HEART). Then we calculated the difference between the scores by subtracting the EP’s heart score from the cardiologist’s score (DELTA-HEART = CARD-HEART – EP-HEART). A negative DELTA-HEART indicated the cardiologist’s score was lower than the EP’s score.

Confidence intervals (95% CIs) for percentages were computed using the binomial exact method. Agreement between HEART scores derived from EP and cardiologist assessments were evaluated with Cohen κ coefficient. Confidence intervals around κ were calculated using the bootstrap method with 1000 replications. All analyses were completed in Stata 12 IC (Stata Corp, College Station, TX).

3. Results

Between January 1 and June 30, 2015, the triage cardiology access center received 394 calls requesting input; 232 of these were regarding distinct ED patients presenting with chest pain (Fig. 1). Of these patients, 47 were seen in person by the triage cardiologist and a consultation note was documented for 33. These 33 patients comprised the main analysis group. Of this group, 28 patients (85%) were eventually discharged, including 15 (54%) of 28 without further testing and 13 (46%) of 28 after further cardiac testing (ie, formal surface echocardiogram, stress echocardiogram, nuclear perfusion scan, coronary computed tomographic angiography, or cardiac catheterization). In comparison, of the 199 patients for whom a formal in-person triage cardiology consultation was not performed (185/199; 93%) or performed but not documented (14/199; 7%), 26 (13%) were discharged from the ED.

Cohort characteristics are displayed in Table 2. There were no differences in age, sex, ethnicity, or prevalence of diabetes between the analysis group and the other patients presenting with chest pain. The analysis group, most of which was discharged from the ED, did have a much lower prevalence of cardiovascular disease than the other chest pain patients, consistent with our prior work [4].

Fig. 2 illustrates the distribution of discordance between HEART scores as derived from contemporaneous evaluation by EPs and cardiologists. As the EP HEART score increases, negative delta-HEART scores predominate, indicating that high HEART scores calculated by EPs tended to overestimate the scores calculated by cardiologists.

Overall, 10 patients (30%; 95% CI, 16–49) had concordant HEART scores as calculated by the EP and cardiologist ($\kappa = 0.13$; 95% CI, -0.02 to 0.32 ; Table 1). Nineteen patients (58%; 95% CI, 39–75) had a lower score calculated by the cardiologist and 4 patients (12%; 95% CI, 3–28) had a higher score calculated by the cardiologist. The history component of the HEART score showed the least agreement between the EP and cardiologist (45% agreement; $\kappa = 0.13$; 95% CI, -0.1 to 0.40), whereas ECG interpretation (76% agreement; $\kappa = 0.51$; 95% CI, 0.21 – 0.78) and risk factor assessment (85% agreement; $\kappa = 0.72$; 95% CI, 0.48 – 0.90) showed greater agreement. Age and troponin were autopopulated fields in the electronic medical record and always concordant.

Analyzing the HEART Pathway algorithm in a dichotomous manner (HEART score ≤ 3 is low risk, >3 is high risk), EPs and cardiologists classified 23 (70%) patients the same ($\kappa = 0.24$; 95% CI, -0.06 to 0.53). Of the 10 discordantly classified patients, 9 were classified as high risk by the EP and as low risk by the cardiologist.

4. Discussion

This study demonstrates substantial discordance between HEART scores based on concurrent EP and cardiologist evaluation of patients presenting to the ED with chest pain. The cardiology evaluation generally yielded assignment to a lower-risk category and resulted in reclassification from high-to low-risk in the HEART Pathway for more than 25% of patients. The source of discordance was found primarily within the history component of the Score, which captured the patients' description of their chest pain.

As shown in the flow diagram (Fig. 1), most patients with documented bedside evaluations by a triage cardiologist were discharged from the ED. This finding may be, in part, attributable to a form of "selection bias" by the triage cardiologists. They are likely more inclined to provide formal consultation on patients for whom they suspect that discharge from the ED is ultimately feasible. Mechanisms by which the triage cardiologist helps facilitate discharge require further investigation, but reclassification of patients after cardiology evaluation to a lower-risk category, perhaps one that enables further cardiac testing in the ED, seems at least partially contributory.

With relatively few patients to evaluate in a given shift [4], triage cardiologists may be able to spend additional time identifying the critical elements of the narrative that inform their interpretation of the patient's risk. However, this explanation remains speculative, as time spent interviewing patients by EPs and cardiologists was not tracked.

This study has several limitations. The cohort size is small, owing to the relatively low frequency of in-person evaluations by the triage cardiologists. The skewed distribution of patients across risk categories (few patients had low HEART scores) may limit generalizability, but it is unlikely that cardiology input will add value for patients with

unambiguously low-risk chest pain. The ED is likely able to achieve a disposition in this population without triage cardiology input (ie, a form of “referral bias”). Because neither the ED physicians nor the cardiologists were documenting their findings with the goal of prospectively calculating a HEART score, it is possible that some of the discordance, particularly in the history, could be due to incomplete documentation of the HEART score components rather than a true discrepancy. It was not always clear from available documentation whether the follow-up troponin results were available at the time of cardiology evaluation. However, this potential ambiguity in timing would not be expected to directly impact discordance as only the initial troponin factors into the calculation of the HEART score. Perhaps most importantly, complete and systematic follow-up for discharged patients was not available, thus limiting our ability to report meaningfully on the safety of discharges as a function of discrepancies in risk categories. More robust (ie, prospective) collection of safety outcomes will be necessary for future work in this area.

In summary, our findings suggest the potential benefits of a triage cardiology program in settings where the HEART Pathway is used. The timely input of a cardiologist may refine the initial ED risk assessment and selection of provocative testing, with the goal of facilitating ED discharge. Further investigation with a larger, prospective, and outcomes-driven study is warranted.

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Fig. 1.

Study flow diagram. The cohort used in the main analysis is highlighted. Further information regarding disposition and the use of additional cardiac testing in the ED is also provided. TC, triage cardiologist.

Fig. 2.

Comparison of HEART scores between EPs and cardiologists. At higher EP HEART scores, the cardiology HEART score is generally lower than the EP HEART score.

Comparison of HEART scores and HEART score components as derived from EP and cardiologist evaluation of the same patients

Table 1

	HEART score component			ECG	Risk factors
	Full HEART score	History			
Same score, n (%)	10 (30.3)	15 (46.9)		25 (75.8)	28 (84.9)
Cardiologist lower, n (%)	19 (57.6)	15 (45.5)		6 (18.8)	4 (12.5)
Cardiologist higher, n (%)	4 (12.1)	3 (9.4)		2 (6.3)	1 (3.1)
κ (95% CI)	0.13 (−0.02 to 0.32)	0.13 (−0.1 to 0.40)		0.51 (0.21 to 0.78)	0.72 (0.48 to 0.90)

Table 2

Demographic and clinical characteristics of the cohort

	Analysis group (n = 33)	Other chest pain patients (n = 199)	P
Age (y)	59 ± 13	61 ± 14	.47
Gender (% female)	52	36	.08
Ethnicity (%white)	76	70	.49
Cardiovascular disease (%)	49	77	<.01
Current smoker (%)	9	26	.03
Diabetes (%)	39	34	.56

Bold font denote *P* values < 0.05.