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BEST CLINICAL PRACTICE: CURRENT CONTROVERSIES IN THE EVALUATION OF LOW-RISK CHEST PAIN WITH RISK STRATIFICATION AIDS. PART 2

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☐ **Abstract—Background: Chest pain accounts for 10% of emergency department (ED) visits annually, and many of these patients are admitted because of potentially life-threatening conditions. A substantial percentage of patients with chest pain are at low risk for a major cardiac adverse event (MACE). Objective: We investigated controversies in the evaluation of patients with low-risk chest pain, including clinical scores, decision pathways, and shared decision-making. Discussion: ED patients with chest pain who have negative biomarker results and nonischemic electrocardiograms are at low risk for MACE. With the large number of chest pain patients evaluated in the ED, several risk scores and pathways are in use based on history, electrocardiographic results, and biomarker results. The Thrombolysis in Myocardial Infarction and Global Registry of Acute Coronary Events scores are older rules with validation; however, they do not have adequate sensitivity or are not easy to use in the ED. The Vancouver chest pain and North American chest pain rules may be used for patients with undifferentiated chest pain in the ED. The Manchester Acute Coronary Syndromes rule uses eight factors, several of which are not available in the United States. The history, electrocardiography, age, risk factors, and troponin (HEART) score and pathway are easy to use, have high sensitivity and negative predictive values, and have better discriminatory capability for categorization. The use of pathways with shared decision-making involves the patient in management, shortens the duration of stay, and decreases risk to both the patient and the provider. Conclusions: Risk stratification of ED patients with chest pain has evolved, and there are many tools available. The HEART pathway, designed for ED use, has several attributes that provide safe and efficient care for patients with chest pain.** © 2016 Elsevier Inc. All rights reserved.

☐ **Keywords—chest pain; decision aid; GRACE; HEART; low risk; TIMI**

INTRODUCTION

Chest pain is a common condition evaluated in the emergency department (ED), with close to 10% of ED visits related to this complaint. Chest pain can be caused by conditions as benign as musculoskeletal etiology and serious as life-threatening aortic dissection, pulmonary embolism, and myocardial infarction (MI) (1–6). The majority of patients do not receive a diagnosis of acute coronary syndrome (ACS); however, missing the diagnosis of ACS can result in patient morbidity and mortality, as well as litigation (2,7–10). This accounts for a large admission rate, because approximately 25% of patients are admitted because of chest pain and the perceived need for additional evaluation (1–6). Unfortunately, patients with ACS do not always present with typical chest pain, especially elderly patients,

women, and patients with diabetes (11,12). This fear and difficulty often results in a prolonged and costly workup for ED patients with chest pain in addition to higher rates of admission (1–6,13).

As discussed in Part 1, the high rate of admission is caused by the fear of missed MI or ACS. The oft-quoted Pope et al. study found a misdiagnosis rate that approached 0.2%, but many have misquoted a rate of 2% to 4% (2). In 2015, Weinstock et al. documented a rate of 0.18% with negative biomarker results and nonischemic electrocardiography (ECG) results (14). Missed MI is associated with significant morbidity and mortality, but it does not reach the proportions once thought (14). The American Heart Association (AHA) currently endorses noninvasive cardiac imaging for further evaluation of low- to intermediate-risk patients ≤72 h after discharge (6). As discussed in Part 1, evidence is lacking that stress testing and coronary computed tomography angiography (CCTA) scans further decrease this risk.

With the large number of patients presenting to the ED with chest pain, many researchers have sought objective tools to categorize patients into separate risk levels, potentially determining patients who are appropriate for discharge or who need additional evaluation. The ideal decision tool for risk stratification would have optimal sensitivity and specificity to identify chest pain patients who are appropriate for discharge. At the same time, this rule would possess a low miss rate for major cardiac adverse events (MACEs) and provide a short duration of stay in the ED. This acceptable miss rate approximates 1% to 2%, but this is controversial (15). Kline et al. noted that a 2% miss rate for patients with pulmonary embolism should be acceptable when based on testing threshold—this testing threshold means that the risk of harm with further testing equals or outweighs the chance of diagnosing ACS (16). Many decision aids use a miss rate of <1% to 2%.

The past decade has seen a vast growth in the clinical rules and pathways for the disposition of patient who are at low risk for ACS. This review will evaluate the evidence behind commonly used decision aids and pathways used in the ED.

DISCUSSION

Clinical Scores

Several clinical decision aids and pathways have been developed with the intent of risk stratification for patients with chest pain. The objective of these aids is to place patients into risk categories based on a combination of separate factors, allowing for proper selection for discharge, further testing, or intervention. A sensible, safe, and consistent pathway can assist with appropriate disposition while minimizing patient harm. The first decision aid, or clinical score, was published in 1982 by Goldman et al. using a computer-based algorithm (17). This pathway did not address the disposition of the low-risk patient but rather the diagnosis of MI and need for cardiac care unit admission (17). Later studies have sought an aid to appropriately risk stratify patients who are appropriate for discharge. This review will examine several of the most commonly used decision aids.

Thrombolysis in Myocardial Infarction score. The Thrombolysis in Myocardial Infarction (TIMI) score was first used in the 1990s and published in 2000, followed by validation in 2006 (18,19). The populations evaluated included those at high risk for unstable angina and non–ST-elevated MI (18). This score incorporates several elements based on a 7-point scale: age ≥65 years, ≥3 coronary artery disease (CAD) risk factors, known CAD with stenosis ≥50%, aspirin use in the past 7 days, severe angina defined by ≥ 2 episodes in the previous 24 h, ECG ST changes ≥0.5 mm, and a positive cardiac marker (18–21). Scores of 0 to 1 point result in a 4.7% risk of ACS, while scores of 6 to 7 are associated with a 40.9% risk (18–22). The score is shown in Table 1. Validation in separate cohorts shows similar rates of increasing risk for cardiac outcomes with increasing TIMI score (19–22).

Sanchis et al. proposed a risk score based on the original TIMI score with troponin, with a primary outcome of death or acute MI (AMI) within 1 year (23). Based on this study, a small subset of the evaluated population (17%) can be categorized as very low-risk based on a score of 0. However, patients categorized as low risk have a 1-year adverse event rate of 3.1% (23).

Several flaws affect the use of this decision aid. A score of 0 does not risk stratify below 1%, and a score of 0 is not common, as discovered in several accelerated diagnostic protocols, where 10% to 20% of patients can be stratified as low risk based on scores of 0 to 1 (18–23). Aspirin use alone provides a score of 1. This decision aid was not derived for patients with undifferentiated chest pain who present to the ED, but rather to determine which patients would benefit from early invasive therapy. In 2005, Chase et al. evaluated TIMI in an ED population of patients with undifferentiated chest pain (19). The cohort consisted of 1458 patients with 136 adverse events. In the study, eight (1.2%) adverse events occurred over 30 days, with a mortality rate of 0.2%. When excluding revascularizations as an adverse event, this decreased further (19). Pollack et al. found a 2% MACE rate at 30 days with a TIMI score of 0 (20). Hess et al. found insufficient sensitivity with TIMI use in 17,265 patients (24). Unlike other decision aids and scores, the TIMI score does not stratify patients