Evaluation of Risk in Patients with Chest Pain Presenting to the Emergency Department

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Acute myocardial infarction and unstable angina pectoris share a common underlying pathophysiology, based on rupture of an atherosclerotic plaque with subsequent thrombosis, spasm, and myocardial ischemia (1,2). These conditions, which can be grouped under the general heading of “acute coronary syndrome,” carry an increased risk of serious complications, including pulmonary edema, cardiogenic shock, and both tachyarrhythmias and bradyarrhythmias. Although the diagnosis is sometimes obvious, in many cases patients with an acute coronary syndrome are difficult to distinguish from those with noncardiac chest pain. The 4.7 million visits to emergency departments each year (3) for chest pain pose a difficult and high stakes dilemma for clinicians.

Various clinical prediction rules have been developed to assist the clinician in management of patients with chest pain (4–6). The early versions of these rules (7,8) focused on the diagnosis of acute myocardial infarction. There are two major limitations to this focus: first, unstable angina without acute myocardial infarction is also associated with greater risk and also benefits from specific management; and second, the goal of the early versions was to establish diagnosis rather than prognosis. Gauging the patient’s short-term prognosis is actually a more pressing concern than establishing the specific diagnosis, since risk assessment is the key to initial management decisions. High-risk patients need close monitoring and benefit most from specific therapies (such as coronary reperfusion or anticoagulation), whereas low-risk patients do not benefit as much from aggressive management, which may do them more harm than good. Risk assessment should be based initially on readily available clinical data from the history, physical examination, and electrocardiogram. The initial assessment can be refined and updated subsequently based on the clinical course, results of cardiac marker assays (eg, creatine kinase-MB, troponin), and specialized testing, such as echocardiography, perfusion scintigraphy, and coronary angiography.

Goldman and coworkers (4) have developed and tested a clinical prediction rule that predicts the risk of short-term clinical complications among patients with chest pain presenting to the emergency department. The findings on the electrocardiogram (ECG) play a key role in this algorithm, with ST-segment changes, T-wave inversions, or new Q waves all indicating greater risk. Systolic blood pressure below 100 mm Hg or rales above the lung bases also indicate greater risk. ST-segment elevation suggests an acute myocardial infarction and the need to consider immediate reperfusion therapy with angioplasty or thrombolysis. Other ECG changes indicate greater risk, first by increasing the probability of underlying coronary disease, and second, by indicating a greater likelihood of extensive ischemia. Evidence of systolic dysfunction (hypotension, rales) similarly suggests a larger zone of ischemia. Application of this simple decision rule effectively triages patients into one of four risk categories (high, moderate, low, and very low) and suggests the intensity of monitoring needed.

Clinical prediction rules need to be validated in a wide variety of settings, since patient populations may differ (9), and the feasibility of use in real-world settings must also be established. Reilly and associates (10) prospectively tested the Goldman prediction rule in 207 patients with chest pain admitted to Cook County Hospital. They found rather good agreement between the predicted and observed risk of complications, providing some reassurance that this clinical prediction rule can be extended to other hospitals. One important observation in their study was that performance of the prediction rule was significantly improved by a standardized reading of the ECG. Given the importance of the ECG in evaluation of patients with chest pain, this observation suggests that focused training in ECG evaluation for emergency department clinicians or provision of rapid accurate ECG readings (eg, by a computerized system) (11) may improve quality of care.

The study by Reilly and coworkers (10) also identified differences between the recommended triage decisions for chest pain patients and the actual disposition of the patients. In some cases, patients were given a greater intensity of care than recommended based on the need to treat other noncardiac conditions. These decisions are inappropriate and demonstrate a limitation of algorithms based on an evaluation of a single organ system rather than the whole patient. In many other cases, however, there was no apparent reason for the clinicians to have recommended a greater intensity of care than suggested by the algorithm, implying that they may have been mo-
tivated more by liability concerns than medical necessity. If so, physicians may find that an objective risk assessment algorithm used as part of an established institutional clinical guideline or care plan for chest pain patients would allow them to recommend a lower intensity of care when risk was low. A more conservative approach can not only reduce costs, but can also improve outcomes by reducing interventions that carry risk without commensurate benefit. This hypothesis could be tested in a clinical trial of an explicit, objective risk assessment and management protocol.

Better outcomes for hospitalized patients with acute coronary syndrome have contributed substantially to the reduced mortality due to coronary disease (12), and further advances are likely as we gain better understanding of the pathophysiology and therapy of this syndrome (2). Improved risk stratification can improve outcomes and efficiency by promptly identifying high-risk candidates for aggressive care as well as low-risk patients for whom a more tempered approach is best.

REFERENCES