

## *Hospital Peer Review*

**October 2009**

Hospital Peer Review is a monthly newsletter sponsored by the Rural Healthcare Quality Network to alert Critical Access Hospitals regarding findings from the Peer Review Program. Summarized are a few of the key findings and best practices that would be helpful for other critical access hospitals to be knowledgeable about. This newsletter is edited by Myron Bloom, Medical Director and he can be reached at [drmbloom@msn.com](mailto:drmbloom@msn.com).

### **No's May Not Mean Not When the Question is, "Is It ACS?"!**

While three quarters of the patients presenting to the emergency department with symptoms suggestive of myocardial ischemia will be felt not to have acute coronary syndrome [ACS], does the absence of risk factors or the characteristics of the symptoms reliably help to exclude the individual patient from being among the 25% who do have ACS? The answer is "No". Unfortunately, the clinical assessment, electrocardiography, and serum enzymes may only identify a quarter of patients with myocardial ischemia without provocative testing.<sup>1</sup> While many patients with non-cardiac chest pain get admitted to the hospital, unfortunately, up to 5% of patients with ACS are discharged inadvertently from emergency departments putting the patients at a significant risk of death after discharge.<sup>2</sup>

For patients presenting with angina (or anginal equivalent symptoms), two questions need to be answered:

1. what is the likelihood that the patient is having cardiac ischemia and
2. what is the probability of an adverse outcome?

To answer these questions, the patient needs to be classified into one of four categories:

1. a non-cardiac diagnosis,
2. chronic stable angina,
3. possible ACS, or
4. definite ACS, which refers to worsening or severe myocardial ischemia resulting in unstable angina or myocardial infarction.

Assessment of risk factors may help answer the second question about the probability of adverse outcome (is the patient at high risk?), but are of very limited diagnostic utility for the individual patient presenting to the ED with possible ACS (is the patient not at risk?).

The Framingham Risk Factors (age, gender, total and HDL cholesterol, systolic pressure, and smoking) can be used to calculate the 10-year risk of myocardial infarction or death, but offers no help in the ED. The GRACE, PURSUIT, and TIMI risk scoring systems were evaluated by a study from Portugal with follow up at one year of 97% of 674 patients. They were found to have good predictive accuracy for identifying high risk subsets of NSTEMI-ACS patients.<sup>3</sup> The TIMI<sup>4</sup>,

GRACE<sup>5</sup>, and PURSUIT<sup>6</sup>, risk scores are evidence-based methods to assess the risk of in-hospital and short-term mortality. GRACE uses age, heart rate, systolic pressure, creatinine, and Killip heart failure class to calculate the probability of myocardial infarction or death at admission and six months while the PURSUIT score does not include serum creatinine.

The seven points of the TIMI risk score for UA/NSTEMI are: known coronary stenosis of 50% or more, ST segment deviation on presenting electrocardiogram, elevated cardiac serum biomarkers, two anginal events in the prior 24 hours, use of aspirin in the prior week, age over 65, or three or more risk factors for coronary disease (diabetes, smoking, hypertension, HDL cholesterol <40 mg/dL, and family history of premature CAD defined as in a male first-degree relative less than 55, or female first-degree relative less than 65). The rates of mortality, infarction, or revascularization drop from 40% in patients with six or seven points, to 26% with five, 20% with four, 13% with three, 8% with two, but 7% with one and over 2% in patients with none.

Harvard University investigators examined data prospectively collected from 148 adults with chest pain and an equivocal ED evaluation who participated in the ROMICAT study (evaluating CT angiography for ACS) to evaluate the utility of the Goldman, TIMI, and Sanchis scores. ACS was diagnosed in 11% of the patients. The sensitivity for ACS of the Goldman, TIMI, and Sanchis scores was 53%, 35% and 41%, respectively, with the positive predictive values of 20-28% and negative predictive values of 91-92%. ACS was diagnosed in 8-9% of the patients categorized as "low risk" using the three clinical scoring systems. Agreement between the scoring systems was poor to moderate (kappa = 0.18 - 0.43). These findings suggest that available clinical cardiovascular risk stratification scores have a low sensitivity for ACS among ED patients with chest pain, but an inconclusive initial evaluation.<sup>7</sup>

Useful historical predictors of ACS are: prior history of coronary disease, the nature of the anginal symptoms, increasing age, family history, and other risk factors such as smoking, diabetes, lipid abnormalities, hypertension, and (to a lesser degree) male sex. Diabetes and the presence of extra-cardiac (carotid or peripheral) arterial disease are considered coronary equivalents, and as such, are risk factors for coronary artery disease, and have been associated with poorer outcome in ACS; but their absence does not rule it out. Furthermore, statistically, one in 20 infarctions happens in patients under the age of 40.

Data for 122,458 patients enrolled in 14 international randomized clinical trials of coronary heart disease was analyzed to determine the prevalence of 4 risk factors (cigarette smoking, diabetes, hyperlipidemia, and hypertension). 76,716 patients with STEMI, 35,527 with unstable angina/NSTEMI, and 10,215 patients undergoing percutaneous coronary intervention were evaluated. Among patients with CHD, at least 1 of the 4 conventional risk factors was present in 84% of women and 80% of men. That means one of five ACS patients had none of the 4 risk factors. Premature CHD was related to cigarette smoking in men, as was cigarette smoking and diabetes in women. Smoking decreased the age at the time of CHD event by nearly a decade in all risk factor combinations.<sup>8</sup>

In a sub-study of the British "Early Vascular Markers of Acute Coronary Syndromes" trial, the presence or absence of five traditional coronary risk factors was documented in 796 patients over the age of 25 presenting to the ED with chest pain of suspected cardiac origin. The 5 risk factors were: a history of

hypertension, hyperlipidemia, diabetes, smoking, and ischemic heart disease in a first-degree relative at age 65 or younger. AMI was diagnosed in 18.6% of the patients, including 12.2% with no risk factor, and between 13.6 - 24.1% of the other groups. The highest prevalence of AMI was in patients with only one risk factor. The researchers found that the presence or absence of risk factors did not have much clinical utility in defining the likelihood of AMI. The same was found on six-month follow-up, except there was a trend toward a worse outcome (death, AMI, or urgent coronary revascularization) with an increasing number of risk factors. They found a poor outcome in about one of six patients without any risk factors, and yet infarction or urgent revascularization did not occur in two-thirds of those with four or five risk factors.<sup>9</sup>

Thus, risk factors may offer some help assessing the probability of adverse outcome but should only cautiously be used to determine whether an individual patient has ACS when they present to the ED. If risk factors do not offer reliable help, what about presenting complaints?

Features that are not characteristic of myocardial ischemia include middle or lower abdominal discomfort, pain that can be localized to a fingertip, pain reproduced by the palpation of the chest wall, or pain that lasts for many hours or just a few seconds. But do they rule it out? Unfortunately not. The classic presentation of mid-sternal chest pain, pressure or heaviness radiating to the neck, jaw or arm which is exacerbated by exertion and made better by nitroglycerin may be classic, but is not typical.

Asked about the nature of chest pain (when present), half of ACS patients may complain of crushing chest pain or pressure, but a quarter will have a mild ache, while another quarter will complain of a sharp or stabbing pain. Two thirds of ACS patients report pain radiating to the arms with slightly more than half to the left, but radiation to the right arm or both arms is more specific. One in six will say it is pleuritic or positional, and a quarter will say it is reproduced by palpation. Of those saying palpation reproduces their pain, one in sixteen will prove to have ACS. A fifth of ACS patients will complain of discomfort in the upper abdomen, while up to a quarter of infarctions are painless. By age, painless infarctions occur in 40% of patients over 65 and two thirds of patients over 85 years of age. So much for pain defining or excluding ACS. How about signs and other symptoms?

The classic Levine sign of a clenched fist to the chest may be indicative of ischemic pain but diaphoresis is a more reliable indicator. In fact, in a prospective observational study examining four specific gestures, the Levine sign (touching the chest with a clenched fist), the Palm sign (touching the chest with an extended palm), the Arm sign (touching the left arm with the right hand), and the Pointing sign (pointing to a single area of the chest with one or two fingers) in adults presenting with chest pain or discomfort, found the sensitivity for an abnormal troponin level or a positive diagnostic test was only 9% for the Levine sign, 38% for the Palm sign, 16% for the Arm sign and 6% for the Pointing sign. So, patient gestures appear to have only a very limited value in establishing or excluding a diagnosis of myocardial ischemia.<sup>10</sup>

Unexplained new onset shortness of breath or worsened exertional dyspnea is the most common anginal equivalent symptom, especially in older patients. Four out of ten ACS diabetics present with only shortness of breath, others with confusion or vomiting. Almost half of ACS patients report an increase in

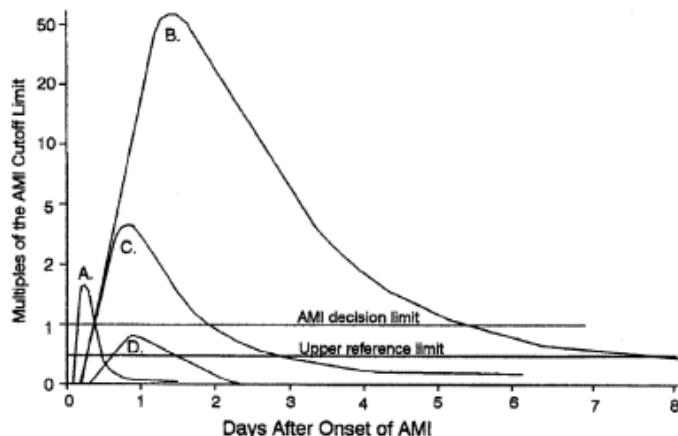
belching. GE reflux and dyspepsia are the most common misdiagnoses, perhaps because one in six infarction patients get some relief with antacids.

While men are at the greatest risk of acute myocardial infarction, women are at greater risk of misdiagnosis, especially when young. One in five female infarction patients deny chest pain; instead they present with neck or back pain, nausea, vomiting, epigastric discomfort, diaphoresis, or shortness of breath. They are more likely to present with neck or back pain or G.I. symptomatology than men.

So what is the cautious ED clinician to do? First, understand that the absence of expected symptoms or findings is simply insufficient to rule out ACS in patients at risk, and further testing is usually necessary. If the patient is under 40, without a history of cocaine abuse or lupus, and has a totally normal ECG and set of enzymes, and has an alternative diagnosis more probable than not, the patient may be discharged to be followed up by his or her physician. All others, for whom a consideration of ACS was entertained, should have 1) either a set of cardiac enzymes drawn 8 to 12 hours after symptoms onset or the change in enzymes drawn several hours apart measured, and 2) two or more carefully read normal unchanging electrocardiograms.

If trying to “rule in” ACS early, measuring the change in enzymes (myoglobin & Troponin or CK-MB) at 90-120 minutes may give an early indication of NSTEMI in progress but may not completely rule it out. To do that, more time must have elapsed from the time of infarction. Obviously, patients who have continuing or recurrent discomfort, have abnormalities on their 12-lead ECG or cardiac enzymes, or develop new or worsening congestive heart failure need to be observed, admitted, or transferred. Patients who have normal, unchanged or non-diagnostic 12-leads and have normal cardiac enzymes are candidates for provocative testing to discriminate between non-ischemic discomfort and ACS once they have been pain free for 12-24 hours, either at the conclusion of an observation stay or within 72 hours as an outpatient (2002 ACC recommendations).

### **ACC/AHA 2002 Guideline Update for the Management of Patients with Unstable Angina and Non-ST-Segment Elevation Myocardial Infarction**



#### **“Rule out Criteria” Recommendations:**

- ❖ **ACC/AHA** - Negative markers at arrival and 6 hours later OR a single negative set at 12 hours after symptom onset
- ❖ **ACEP** - Negative CKMB or Troponin 8-12 hours after symptom onset, or negative myoglobin and CK-MB or Troponin at arrival and 90 minutes later or no change in 2 hours
- ❖ **Clinical Chemistry Society** - Negative markers at greater than 6 hours if low risk and 12 hours if not low risk.

Plot of the appearance of cardiac markers in blood vs. time after onset of symptoms. Peak A, early release of myoglobin or CK-MB isoforms after AMI, Peak B, cardiac troponin after AMI. Peak C, CK-MB after AMI. Peak D, cardiac troponin after UA. Data are plotted on a relative scale, where 1.0 is set at the AMI cutoff concentration.

National Academy of Clinical Biochemistry, Washington, DC. Standards of laboratory practice: recommendations for use of cardiac markers in coronary artery disease. November 5, 1999

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- <sup>1</sup> Pope JH, Ruthazer R, Beshansky JR, et. al. Clinical Features of Emergency Department Patients Presenting with Symptoms Suggestive of Acute Cardiac Ischemia: A Multicenter Study. *Journal of Thrombosis and Thrombolysis*. July 1998;6(1):63-74.
- <sup>2</sup> Pope JH, Aufderheide TP, Ruthazer R, et. al. Missed Diagnoses of Acute Cardiac Ischemia in the Emergency Department. *The New England Journal of Medicine*. April 20, 2000;342(16):1163-1170.
- <sup>3</sup> Golcalves PA, Ferreira J, Aguiar C, et. al. TIMI, PURSUIT, and GRACE Risk Scores: Sustained Prognostic Value and Interaction with Revascularization in NSTEMI-ACS. *European Heart Journal*. 2005;26(9):865-872.
- <sup>4</sup> Antman EM, Cohen M, Bernink PJLM, et. al. The TIMI Risk Score for Unstable Angina/Non-ST Elevation MI: A Method for Prognostication and Therapeutic Decision Making. *JAMA*. August 16, 2000;284(7):835-842.
- <sup>5</sup> Granger CB, Goldberg RJ, Dabbous O, et. al. Predictors of Hospital Mortality in the Global Registry of Acute Coronary Events. *Archives of Internal Medicine*. October 27, 2003;163(19):2345-2353.
- <sup>6</sup> Inhibition of Platelet Glycoprotein IIb/IIIa with Eptifibatid in Patients with Acute Coronary Syndromes. The PURSUIT Trial Investigators. Platelet Glycoprotein IIb/IIIa in Unstable Angina: Receptor Suppression Using Integrilin Therapy. *The New England Journal of Medicine*. August 1998;339(7):436-443
- <sup>7</sup> Manini AF, Dannemann N, Brown DF, et. al. Limitations of Risk Score Models in Patients with Acute Chest Pain. *American Journal of Emergency Medicine*. January 2009;27(1):43-48.
- <sup>8</sup> Khot UN, Khot MB, Bajzer CT, et. al. Prevalence of Conventional Risk Factors in Patients with Coronary Heart Disease. *JAMA*. August 2003;290(7):898-904.
- <sup>9</sup> Body R, McDowell G, Carley S, et. al. Do Risk Factors for Chronic Heart Disease Help Diagnose Acute Myocardial Infarction in the Emergency Department. *Resuscitation*. October 2008;79(1):41-45.
- <sup>10</sup> Marcus G, Cohen J, Varosy P, et. al. The Utility of Gestures in Patients with Chest Discomfort. *The American Journal of Medicine*. January 2007;120(1):83-89.

**Other Sources:**

The Framingham risk score:

<http://hp2010.nhlbi.nih.net/atplIII/calculator.asp?usertype=prof>

GRACE - Global Registry of Acute Coronary Events:

[http://www.outcomes-umassmed.org/grace/acs\\_risk/acs\\_risk\\_content.html](http://www.outcomes-umassmed.org/grace/acs_risk/acs_risk_content.html)

Detsky and Goldman risk calculators:

<http://www.vasgbi.com/riskdetsky.htm>

Sanchis Risk Score Conclusions:

A negative troponin result does not assure a good prognosis for patients coming to the emergency room with chest pain. Early exercise testing and clinical data should be carefully evaluated for risk stratification.

<http://heart.bmj.com/cgi/content/abstract/91/8/1013>

TIMI for STEMI:

<http://circ.ahajournals.org/cgi/content/abstract/102/17/2031>

TIMI scores for STEMI and UA/NSTEMI (Thrombolysis in Myocardial Infarction) and many other useful calculations may be found at:

<http://www.MDCalc.com>