



A NEW STANDARD OF CARE FOR CARDIAC CASES

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Recent advances in detecting damage to heart muscle have created a new standard of care for treating patients in the emergency room for symptoms of heart disease. The standard of four years ago employed a “rule out myocardial infarction” (MI) strategy that was based on insensitive assays by today’s standards. Patients reporting to emergency rooms and complaining of chest pain were often diagnosed with gastrointestinal upset or anxiety attacks and sent home with insufficient consideration of possible heart disease (see our article in TRIAL NEWS, January 1998, A fatal standard of care for heart attack victims). Some of these patients would succumb to a fatal heart attack within days of their emergency room visit.

Today, patients presenting to the emergency room with a variety of symptoms of heart disease are evaluated using more sensitive indicators of damage to heart muscle, and they are stratified into groups with high and low risk of mortality from heart disease. Many hospitals have a chest pain unit (CPU) to evaluate patients at low risk for heart disease. The objective of a CPU is to reduce the inadvertent release of patients with acute coronary syndrome and to reduce the number of healthy patients admitted to the hospital’s coronary care unit (CCU). The CPU may be a physical place in the hospital with a room or bed designated for patients complaining of chest pain or it may be a virtual

unit within the emergency room with a specific protocol for evaluation of chest pain patients and employing pre-assigned healthcare providers.

The ability of healthcare providers to identify a wider group of patients with unstable angina, or acute myocardial infarction at risk of sudden death, has resulted in a new term to designate this group – acute coronary syndrome (ACS). A physician may include ACS in the differential diagnosis if the patient complains of chest pain, sweating, shortness of breath, epigastric pain, pain in the jaw, shoulder, or arm, light-headedness, or nausea. Pain that is positional or reproducible with palpation is less likely to be associated with ACS. The absence of chest pain alone when other symptoms of ACS are present is not good reason to remove ACS from the differential diagnosis.

An attorney whose client has suffered a debilitating heart attack or whose client has lost a loved one after a visit to the emergency room for chest pain should examine the medical records and interview his client or family to determine whether the emergency room physicians performed the currently accepted procedures and tests to diagnose ischemic heart disease. Those procedures and tests include (1) a brief history and physical including an assessment of risk factors for heart disease, (2) interpretation of an electrocardiogram (EKG or ECG), (3) establish IV access, (4) administer

oxygen, (5) give aspirin, and (6) examine laboratory values including assessment of serum levels of biochemical markers for cardiac muscle death. Based on the risk assessment, the physician should administer nitroglycerine, beta blockers, fibrinolytics, thrombolytics, or heparin. If the providers have not done a thorough job of evaluating your client for ischemic heart disease, they may have cheated him/her of a chance to recover to normal health through angioplasty or coronary artery bypass grafting (CABG).

The risk is high that a patient diagnosed with ACS will suffer serious consequences. Cardiovascular disease caused 949,619 deaths in the United States in 1998. Almost half of those deaths (459,841) were caused by coronary (ischemic) heart disease (CHD). CHD is the single largest killer of Americans of either sex, but if caught early, patients with CHD can be returned to normal through coronary artery bypass surgery or through angioplasty. The lifetime risk of developing CHD after age 40 is 49 percent for men and 32 percent for women. American Heart Association. 2001 Heart and Stroke Statistical Update. Dallas, Texas: American Heart Association, 2000.

The most serious risk of coronary heart disease is sudden death caused by heart failure. Ninety percent of sudden death victims have two or more major coronary arteries narrowed by cholesterol plaques (atherosclerosis). The person dies because a clot plugs an

artery already narrowed by cholesterol plaques. The area of the heart supplied by that artery is starved for blood (ischemia) and the heart muscle (myocardium) stops contracting and eventually dies (myocardial infarction). The heart beats faster (tachycardia) to compensate for the lost muscle function and subsequently the rhythmic beat patterns of the heart give way to uncoordinated contractions (ventricular fibrillation) and cardiac arrest (asystole).

The chance that a person in cardiac arrest will survive diminishes by 7 to 10 percent for each passing minute. Given the risk of sudden death, the standard of care requires physicians and nurses in emergency rooms to be well prepared to promptly diagnose and treat patients with symptoms of coronary heart disease.

Recent Advances in Diagnosing Ischemic Heart Disease

Emergency room personnel have new tools to help them identify patients at risk of sudden death. The past few years have witnessed a revolution in the use of protein isoforms found specifically in the heart muscle as sensitive markers for damage. When the heart muscle cells die as the result of ischemia, their contents are released into the blood stream. Muscle proteins are not ordinarily found in the bloodstream and their presence there is a good marker for muscle cell death. Some muscle proteins exist in forms that are unique to heart muscles. The presence of these cardiac specific forms of muscle proteins in the blood is a marker for myocardial infarction. The protein markers include heart specific forms of troponin (cTnT, cTnI), creatine kinase (CK-MB), and myoglobin.

Troponin is a protein made up of three subunits, two of which exist in cardiac-specific forms. A minor concentration elevation of one of these cardiac troponin subunits has been reported to predict increased risk for death or recurrent ischemic events.

The test for serum levels of troponin presents many advantages over other diagnostic tools for acute cardiac syndrome. First, the presence of even microscopic areas of cell death can be detected. The physician can detect the very earliest effects of ischemic heart disease and treat the patient before significant damage is done to the patient's heart muscle.

Second, troponin is released slowly over a much longer time period than other markers of cell death. In one study, almost half of the cardiac troponin positive patients tested positive at admission, with 78% and 100% testing positive at four and eight hours, respectively. This broad window for detecting troponin increases the probability that a physician will detect heart disease.

Third, test kits for cardiac troponin are available that can be used in medical facilities that do not have large central laboratories. These kits are called point of care tests. The accuracy of results from point of care test kits has been reported to compare favorably to results obtained with central laboratory tests. Small or isolated clinics and hospitals have no excuse for failing to employ the troponin test.

Facilities with central laboratories can also take advantage of point of care tests to speed results. The point of care test can provide results in as little as 15 minutes compared to the two to three hours it takes to get results from

a large central laboratory. Speed is of the essence when a patient may need emergency catheterization to avoid a fatal heart attack.

A second marker for heart muscle cell death is creatine kinase that is an enzyme found in all muscles. Heart muscle contains a specific isoform of creatine kinase that is designated as CK-MB. Normal serum has a higher background concentration of CK-MB than it does of troponin and CK-MB is released over a narrower time period following heart muscle cell death than troponin. CK-MB is no longer the gold standard for evaluating patients possibly suffering from myocardial injury, and exclusion of an acute myocardial infarction (AMI) is not satisfactory initial risk stratification of a patient with acute coronary syndrome.

The new markers for myocardial injury have not displaced the first steps in risk stratification that we describe previously (TRIAL NEWS, January, 1998). However, there is renewed emphasis on detailed interpretation of the initial EKG as an important step in evaluating a patient possibly suffering from acute coronary syndrome. New research indicates that certain features of an EKG are strong predictors of future bad outcomes. Those features include ST segment elevation or depression and T wave inversion. An EKG must be taken early when ACS is in the differential diagnosis, but more importantly, it must be interpreted immediately. Most EKGs will have a computer interpretation automatically printed on the printout. Although the computer may over-interpret the EKG and is seldom used by itself as a basis for diagnosis, the computer interpretation can be a red flag that mandates the provider to seek a prompt interpretation



by a cardiologist. In this day and age of fax machines, digital image scanners, and e-mail attachments, even small health-care facilities should have a cardiologist available to evaluate an EKG.

An attorney evaluating the medical records in a new case involving sudden death should look for the following information:

(1) What were the patient's physical symptoms and history?

In our 1998 TRIAL NEWS article, we identified the initial symptomatology of angina and the patient's age as valuable predictive tools for assessing risk of bad outcomes from heart disease. The same is true today. A patient with typical angina (chest pain that reproducibly is induced by exercise and relieved by rest), and who is more than 40 years old has a very high probability that one or more of his coronary arteries are seriously narrowed. A patient with typical angina should be evaluated for coronary heart disease immediately.

If a patient in an emergency room has the symptoms of typical angina, he is a serious candidate for catheterization regardless of his risk factors. However, risk factors are an important tool for attorneys in portraying whether a health-care provider was reasonably prudent in sending the victim home. Victims of sudden death often have multiple risk factors for ACS. For example, asking the defendant health-care provider if she knew at the time she sent the victim home that the victim was 50 years old, hypertensive, a smoker, had a family history of coronary disease, had previously complained of fatigue, was overweight, and lead a sedentary life style in addition to his immediate complaints of chest pain induced by exercise, will create a

real question about the reasonableness and prudence of the provider's care.

Risk factors are also important because health-care providers often concentrate unreasonably on the absence of a single risk factor. For example the victim may have been a smoker with a family history of sudden death who complained of fatigue and was overweight, but the health-care provider might focus on the fact that he was only 30 years old. While it is true that the risk of coronary heart disease increases after age 40, the absence of a single risk factor alone, or for that matter the absence of all risk factors, is no justification by itself for sending an ACS patient home.

(2) Was an EKG taken and immediately interpreted?

Taking and interpreting an EKG is standard of care. The purpose of taking an EKG is so that a cardiologist can interpret it and decide whether the patient is experiencing ischemic heart disease or has suffered a myocardial infarction.

A normal result on an EKG, by itself, should not cause the health-care providers to send an ACS patient home. Ischemic events are often episodic. If an EKG is taken between episodes of ischemia, it may be normal. The simple rule is that an EKG that is positive for heart disease is extremely important and an EKG that is negative should not be relied on as the sole reason to release an ACS patient. The same rule applies to an EKG taken in the context of an exercise treadmill test (ETT). However, a physician can include a normal EKG in conjunction with other diagnostic tools to conclude that a patient has a low risk of mortality from heart disease.

(3) Were serum levels of troponin taken?

The new more sensitive test for cardiac troponin has revolutionized the evaluation of patient risk of coronary heart disease. In our 1998 TRIAL NEWS article, we cited a National Institutes of Health study that concluded that tests for muscle enzymes in the blood were of little value for evaluation of patients in the emergency room suffering acute chest pain.

In contrast, today, the standard of care for detection of myocardial infarction is the cardiac troponin test. A patient with elevated cardiac troponin levels should be considered to have coronary heart disease until proven otherwise regardless of whether his symptoms of chest pain are atypical and his EKG is normal.

(4) Was the patient evaluated systematically over a period of several hours for the purposes of stratifying his risk of a future bad outcome, or was he simply evaluated for "rule out MI" and sent home?

Risk stratification is the standard of care. It is no longer appropriate to "rule out myocardial infarction" and then send the patient home. Troponin levels and an EKG should be taken when the patient first arrives at the emergency room and at 4 and 8 hours after arrival.

(5) Based on the risk stratification, were appropriate follow up tests or treatments done?

ACS patients often suffer chest pain episodes that become more frequent and worsen as the patient nears a heart attack. A physician may interrupt the progression of pain episodes by treating the patient with nitroglycerine to reduce pain and to lower blood pressure or



with morphine to reduce pain. Heparin can be given to inhibit the formation of blood clots that could cause myocardial infarction. Thrombolytics may be given to destroy blood clots and possibly re-establish blood flow to ischemic areas of the heart muscle.

Physicians should employ several advanced tests to stratify ACS patients into high and low risk groups. Serial EKGs and serial troponin levels are the standard of care for ACS patients. An attorney should expect to see exercise treadmill tests, with or without imaging, and, if the patient is placed in a high risk group, he should be evaluated for artery disease by angiography .

The exercise treadmill test is still employed because it is inexpensive, and a positive result indicating coronary heart disease is very reliable. The value of exercise treadmill testing is still debated because it may not add very much to the prognostic value of a simple EKG and because it misses significant numbers of patients with coronary heart disease. However, because of the value of a positive result, exercise treadmill testing remains the standard of care.

Blood flow over the surface of the heart may be observed by imaging the radioactive tracer, technetium 99m, while the patient is either resting or performing an exercise treadmill test. Imaging with technetium is not a stand-alone test because it misses too many patients with coronary heart disease and because its success is highly dependent on the skill of the physician in performing and interpreting the tests. But technetium imaging adds to the sensitivity of an exercise treadmill test and has been shown to be cost-effective in further stratifying low risk ACS patients.

Angiography remains the gold standard for diagnosing coronary heart disease. Patients with EKG, troponin, or exercise treadmill tests that indicate coronary heart disease as well as patients with typical angina should be evaluated by angiography.

CONCLUSION

The standard of care for evaluating patients with possible coronary artery disease is evolving and changing. Almost every month there is a new research article in a medical journal describing changes in evaluating and treating such patients. Unfortunately, there is often a “time gap” between the emergence of new techniques or procedures and their adoption as a routine by emergency care or primary care physicians.

In reviewing a potential case involving death or injury from delay in diagnosing coronary disease, the attorney must keep in mind that the standard of care is not that which is frequently or even commonly done in the medical community. The medical negligence statute, RCW 70.70.040(1), requires proof that the physician did not “exercise the degree of skill, care and learning expected of a reasonably prudent [physician], in the State of Washington, acting in the same or similar circumstances. The Washington Supreme Court held in Harris v. Groth, 99 Wn.2d 438 (1983), that the “expectations” are those of society, not those of the medical community. What other physicians do may be evidence of the standard of care, but it is not dispositive (See WPI 105.1).

If a provider is assuming the role of evaluating patients with possible coronary artery disease, it is a reasonable societal expectation that the provider be aware of the current and accepted

procedures for doing so. If he is not, the patient who entrusts his care to him may suffer the consequences.

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