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MARCH 2019 Vol. 30, No. 3; p. 25-36

## INSIDE



RELIAS MEDIA

# Missed STEMI Suit Could Succeed if Plaintiff's Expert Sees No ECG, Troponins, or Cardiology Consult

When a plaintiff attorney's expert reviews the ED medical records on a potential missed ST-elevation myocardial infarction (STEMI) case, certain "smoking guns" immediately become apparent. One is the absence of an ECG.

"ECGs are as ubiquitous as pregnancy tests in most EDs. But some missed MI [myocardial infarction] cases still center around allegations of failure to perform an ECG," says **Anna Berent**, JD, claims counsel for Houston-based Western Litigation.

In one notable case, a 70-year-old man arrived at a rural ED with a fall injury, leg cramps, and back pain. The emergency physician's (EP) differential included muscular skeletal conditions and hypotension, with the patient discharged after an unremarkable CT of the spine and pelvis. Hours later, the man returned to the ED unresponsive, and died shortly after. "The workup was incomplete, and the differential was too narrow," Berent says. "No one quite could tell precisely what caused the patient's death."

No autopsy was performed. However, because of an administrative requirement by a state department of health, cardiac arrest was not accepted as the cause of death. Instead, it was reported as MI. This proved too difficult a hurdle for the ED defense team to overcome. "The plaintiff had the benefit of the doubt, not us," Berent reports. "The fact that there was no cardiac workup really hurt us."

Had there been an ECG, the defense would have known whether the plaintiff really could prove causation. Without the ECG, it was impossible to know one way or the other. "Whether it was an MI or not, the more important question was, *'Is it a departure from the standard of care to not do an ECG?'"* Berent explains.

ECGs are performed in EDs routinely, although with greater frequency at large academic medical centers than small community hospitals, Berent notes. Regardless, plaintiffs (and jurors) view ECGs as easy, inexpensive tests, similar to blood pressure or pregnancy tests. "Was an ECG done, and what did it show? That is the first thing plaintiff attorneys



**Financial Disclosure: Kay Ball**, PhD, RN, CNOR, FAAN (Nurse Planner) is a consultant for Ethicon USA and Mobile Instrument Service and Repair. The following individuals disclose that they have no consultant, stockholder, speaker's bureau, research, or other financial relationships with companies having ties to this field of study: **Arthur R. Derse**, MD, JD, FACEP (Physician Editor), **Stacey Kusterbeck** (Author), **Jonathan Springston** (Editor), **Jesse Saffron** (Editor), and **Terrey L. Hatcher** (Editorial Group Manager).

ED LEGAL LETTER

*ED Legal Letter* (ISSN 1087-7347) is published monthly by Relias LLC, 1010 Sync St., Ste. 100, Morrisville, NC 27560-5468. Periodicals postage paid at Morrisville, NC, and additional mailing offices. POSTMASTER: Send address changes to *ED Legal Letter*, Relias LLC, 1010 Sync St., Ste. 100, Morrisville, NC 27560-5468.

GST Registration Number: R128870672.

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go to, especially if you have a slightly ambiguous case," Berent says.

Since no ECG was performed on the 70-year-old patient, says Berent, "we were really trapped. A simple ECG could have made a difference in the outcome and the work-up."

There are other issues that factor into a plaintiff attorney's decision to pursue a missed STEMI case:

**• Whether cardiology was involved in interpreting an ambiguous ECG.** Distinguishing an old MI from an evolving one can require expertise beyond the EP's. "This equivocation, combined with an atypical presentation, may lead to judgment calls that could be the foundation of medical malpractice suits," Berent warns.

In these types of lawsuits, the relationship between ED providers and cardiology becomes important. Berent explores these issues: What instructions did ED staff receive from the cardiology service? How is the overall relationship with the cardiologists? Are cardiology team members or on-call cardiologists responsive and approachable? Unfortunately, the opposite often is true. "Some cardiology services give ED staff a hard time about admissions and ECG interpretations that may be unwarranted in their opinion," Berent says.

Knowledge of these dynamics can help the ED defense team prepare the EP for deposition. "At first, the EP might seem a little too brazen about interpreting the ECG. But then you realize the interplay between the two services in the hospital is not very friendly," Berent explains. Addressing this problem can prevent future malpractice litigation. "It's not that you are encouraging the emergency physician to skirt responsibility by blaming others, but to explore what can be done better," Berent adds.

Ideally, cardiologists welcome EPs to seek their opinion on hard-to-read ECGs. Some cardiologists make themselves difficult to find or ask for multiple orders to be completed before they agree to evaluate the patient. If so, these cardiologists may find themselves codefendants in litigation. One recent malpractice case centered around the fact the cardiologist gave the EP a difficult time. The EP defendant had made several attempts to contact cardiology. Even when the cardiologist was finally reached, he did not visit the patient. Instead, he told the EP to perform a cardiac ultrasound, which was misinterpreted. In the resulting lawsuit, "everybody got named," Berent notes.

In the end, jurors held the cardiologist, not the EP, responsible for the patient's bad outcome. The defense team asked jurors to explain their reasoning. "They were unequivocal about the fact that the cardiologist was the specialist, and that he should have taken charge and come to see the patient," Berent says.

**• Whether cardiac enzyme testing was performed appropriately.** "In my experience, cardiac enzyme testing has been one of the most

## EXECUTIVE SUMMARY

Missing ECGs, mistimed troponin levels, and lack of cardiology consults help plaintiffs prevail in STEMI litigation. These factors help the ED defense:

- Negative cardiac enzymes for patients discharged with a GI diagnosis;
- Documentation on why STEMI appeared unlikely;
- Cardiology input on indeterminate ECG findings.

important factors in whether a plaintiff pursues a missed MI case," says **L. Evan Cline**, JD, an attorney at Huff Powell & Bailey in Atlanta.

It is not enough for EPs to order the appropriate testing; they also need to make sure that repeat testing is conducted at the correct intervals. The ED chart may show that the second or third troponin was drawn at less than 90 minutes or significantly past 90 minutes. If so, says Cline, "plaintiff's attorneys are quicker to take the case."

**• Whether discharge with a gastrointestinal (GI) diagnosis made sense at the time of the ED visit.** Negative cardiac enzyme testing is "incredibly helpful" in defending cases in which patients presented with chest pain but were discharged with a GI diagnosis, Cline says. "We often see this in missed STEMI cases."

**Beth Norton**, JD, an attorney in the Richmond office of Hancock, Daniel & Johnson, has defended missed STEMI cases in which the plaintiff was misdiagnosed with a GI condition such as reflux esophagitis. Most patients presented with a GI history or GI complaints.

"EPs dismiss MI as a likely diagnosis because the patient's pain was relieved, partially or totally, following the administration of a 'GI cocktail,'" Norton explains.

She recommends that ED providers avoid using the "GI cocktail" as a diagnostic tool, particularly for patients with significant risk factors (hypertension, heavy smoking, diabetes, and/or a significant family history of heart disease).

Further, Norton says, it is important to document the reason (based on objective information such as ECG and cardiac enzyme test results) why the EP believed MI was unlikely, particularly when chest pain is present and persistent.

When in doubt, Norton recommends consulting a cardiologist early in the clinical workup, particularly when there are indeterminate ECG findings. When possible, EPs should obtain more than one ECG before dismissing the likelihood of an MI (and always obtain an old ECG, if available).

Norton says to document the physician's reasoning for declining to consult a cardiologist when chest pain is present or when ECG or cardiac enzyme testing produces anything other than normal results. Do not dismiss MI as a likely diagnosis based primarily on the fact that the patient is young, especially if there are other significant risk factors.

"Do not rule out MI as a possible diagnosis based on a recent negative stress test," Norton adds. ■

## MISSED STEMI CASES BY THE NUMBERS

The CRICO Comparative Benchmarking System (a national malpractice database of the Risk Management Foundation of the Harvard Medical Institutions) includes 28,000 cases from 2013 to 2017 with in-depth clinical coding. Of the 2,558 cases involving the ED setting:

- Total incurred losses (this includes reserves on open cases and payments on closed cases) were $697 million. The average total incurred loss for an ED case was $272,000.
- A total of 139 ED cases involved cardiac events, with total incurred losses of $53 million. The average total incurred loss for each of these cases was $384,000.
- In the 2,558 ED cases, the most prevalent case types included diagnosis-related (1,361) and medical treatment (714) allegations.
- Total incurred losses of diagnostic ED cases are $471 million, with an average of $346,000 for each case. Sixty-one cases involved missed MI, with an average incurred loss per case of $396,000. In contrast, the total incurred losses of the 714 medical treatment-related ED cases were $127 million, with an average total incurred loss per case of $178,000. ■

# Despite Excessive Testing for Low-Risk Chest Pain, EDs Still Miss Some Myocardial Infarctions

There are some fresh recommendations for EDs treating patients with suspected non-ST-elevation acute coronary syndromes (ACS).[1] A new clinical policy from the American College of Emergency Physicians (ACEP) addresses the evaluation and management of these patients.

The policy was needed because of the large numbers of chest pain patients presenting to EDs every day, according to the study's lead author **Christian Tomaszewski**, MD, MS, MBA, FACEP. "Lots of resources are being used unnecessarily on these patients," says Tomaszewski, a professor of clinical emergency medicine and chief medical officer at El Centro Regional Medical Center in San Diego and an attending EP at UC San Diego Health.

Patients stay in the ED for four to six hours undergoing serial testing of cardiac troponins, wreaking havoc with patient flow. "We still miss up to 1-2% of myocardial infarctions in spite of excessive testing and work-ups of low-risk cases," Tomaszewski reports.

The ACEP committee saw the need for a more accurate, expedited workup for these patients, given the availability of newer troponins. "It will allow quicker turnover of these low-risk patients, with no increase in risk of missed MI," Tomaszewski explains. Evidence-based protocols offer some degree of legal protection for the EP in the rare event a patient is sent home and experiences an MI. "Standardized care will help protect physicians and, in turn, patients when they follow societal agreed-upon practices," Tomaszewski says.

**Solveig Dittmann**, RN, BA, BSN, CPHRM, senior risk specialist at Coverys, offers some reasons for why EPs fail to diagnose STEMI:

- Some patients do not have chest pain but rather "atypical" symptoms like back pain, vertigo, or weakness;
- Some patients do not present with typical risk factors for MI (hypertension, hyperlipidemia);
- Some younger patients are high risk due to medication therapy (this includes HIV patients and those on steroids);
- Some MI patients' symptoms improve with antacids;
- Sometimes, the first ECG can look normal.

Tomaszewski predicts adherence to the recommendations in the ACEP clinical policy is not expected to change the current miss rates. Between 1% and 2% of discharged chest pain patients will experience an MI or die within 30 days. "We cannot pick up every single case because then costs and incidental findings and harm will increase above an acceptable threshold," Tomaszewski notes.

Even "low-risk" chest pain patients can become plaintiffs in malpractice litigation if unexpected outcomes occur. "EDs can mitigate some of this risk by practicing evidence-based medicine and discharging home patients who are truly low risk," says **Adnan Sabic**, MD, an emergency medicine attending at Ascension St. John Hospital and Medical Center in Detroit. St. John's ED providers use the HEART score (History, ECG, Age, Initial Troponin) to risk-stratify patients. Based on the score, low-risk patients are discharged home after two negative troponins in the ED. Medium-to-high scoring patients stay for further workup and management. "Most of us will not miss slam-dunk chest pain cases," Sabic says. "It is those in the middle who can trip us up and cause a major headache." In a review of low-risk chest pain cases, Sabic found these frequent allegations:

- The patient's complaint was not taken seriously; as a result, the appropriate workup was not initiated;
- The patient was not involved in the decision-making process;
- The differential diagnosis was not expanded, resulting in delayed care.

For EPs to refute such allegations, "it is imperative to document all conversations with the patient," Sabic stresses. This should reflect that risks and benefits were discussed and that the patient agreed with the plan of care.

"This can make a difference in mounting a successful defense," Sabic adds. ■

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## COMING IN FUTURE MONTHS

- Hospitals' liability for ED nurse practitioners' negligence
- Metadata is cropping up in ED malpractice claims
- How policy limits affect ED defense tactics
- ED claims and communication-and-resolution programs

# HEART Score Mitigates Risk — But With 'Important Shortcomings'

The HEART score is an excellent predictor of major adverse cardiac events in adult ED patients with chest pain, particularly mortality and MI, and should be the primary clinical decision instrument used for the risk stratification of this patient population, according to the authors of a recent review of 30 studies.[1]

A major concern for EPs evaluating chest pain is acute coronary syndrome (ACS), which carries high morbidity and mortality. "However, even when we rule out ACS, we are sometimes concerned by the patient or the story," says **Shannon Fernando**, MD, MSc, the study's lead author. Sometimes, it is unclear if the ED patient can be safely discharged.

"In the ED, the hardest thing we do is send people home," says Fernando, a resident in the department of emergency medicine and a fellow in the division of critical care at the University of Ottawa. To alleviate fears of a short-term bad outcome, the easiest thing to do is to admit the patient for further testing or arrange outpatient testing on an urgent basis.

"However, there is increasing evidence that this testing, aside from being costly and resource-intensive, can also result in adverse events for the patients," Fernando notes.

EDs commonly use the HEART score to risk-stratify patients "but without strong evidence of how it functions," Fernando says. The study's findings were reassuring in this regard. Researchers found that the sensitivity of a HEART score above 3 for prediction of future major adverse cardiac events was 95.9%. This compared favorably with the sensitivity of a Thrombolysis in Myocardial Infarction (TIMI) score above the low-risk threshold, which was only 87.8%. "This was not surprising to us," Fernando reports.

The findings support existing evidence that the HEART score is superior to the TIMI score in predicting future major adverse cardiac events for ED patients with chest pain. "Therefore, if you are going to use a clinical decision instrument for risk-stratification of ED patients with chest pain, you should preferentially be using the HEART score," Fernando concludes.

Generally, the "acceptable" miss rate for future major adverse cardiac events is recognized as 1% to 2%. If one applies the HEART score indiscriminately among patients with chest pain, roughly 4.1% of patients will be scored as "low-risk" but still go on to experience a major adverse cardiac event, Fernando acknowledges.

"The HEART score has never been compared extensively with clinical gestalt and therefore may actually be inferior to clinician judgment," he notes. Some evidence suggests that individual clinicians vary in how they score patients. It is also unknown how the HEART score performs in the context of high-sensitivity troponin assays. "Pathways that incorporate the HEART score with a specific troponin assay will likely be more useful for clinicians than simply relying upon the HEART score itself," Fernando offers.

Ultimately, EDs are seeking a better approach than admitting all chest pain patients for observation and testing. The HEART score attempts to reduce the number of patients requiring such testing. "But there are still important shortcomings that clinicians should be aware of before utilizing this tool," Fernando warns.

A low HEART score helps the ED defense team justify the EP's decision to discharge a chest pain patient. "It's not foolproof, and it should not supplant clinical gestalt. But I think juries can understand formulas like this," says **Jesse K. Broocker**, JD, a partner at Atlanta-based Weathington McGrew. It is difficult to argue an EP is negligent if the pathway was applied thoughtfully.

There is not much room for debate about most of the HEART score components. The age, troponins, and risk factors are difficult to argue over since they are fairly objective findings. "Experts can haggle over an ECG read," Broocker notes. "Getting a cardiology overread is always the safe play when in doubt on nonspecific findings." The presenting complaint and patient history, factors in the HEART score, are much more open to interpretation. "This is where plaintiffs can make hay because it is so subjective," Broocker explains. An ED chart noting the absence of "classic"

## CME/CE OBJECTIVES

After completing this activity, participants will be able to:

1. Identify legal issues related to emergency medicine practice;
2. Explain how the legal issues related to emergency medicine practice affect nurses, physicians, legal counsel, management, and patients; and
3. Integrate practical solutions to reduce risk into daily practice.

signs of sweating and shortness of breath as well as describing pain that does not radiate, is reproducible on palpation, and is not related to exertion paints a picture of a history that was not suspicious for ACS. "But plaintiffs will look for those one to two things that *can* be associated with cardiac ischemia," Broocker says. This opens the door to argue that the EP's job is to consider the worst possibilities on the differential. Laying out a full history with great detail can refute this. "Take care not to haphazardly click through the EMR," Broocker adds. "Plaintiff lawyers use clerical mistakes as evidence that the doc was not paying attention." ■

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# Atypical Symptoms, Atypical Patients: Both Increase the Odds of Missed STEMI

The "typical" heart attack patient presents with midline chest pain, sweating, and nausea. Certainly, this was not the case with a young man whose only complaint to ED providers was some dizziness.

"Fortunately, based on our triage system, every dizzy patient gets an ECG. The patient's STEMI was recognized very rapidly," says **Andrew P. Pirotte**, MD, an EP at University of Kansas Hospital and a clinical assistant professor at University of Kansas in Lawrence.

The patient experienced a good outcome. "But the dissimilarity between his complaint and his pathology was striking," Pirotte notes. Other recent STEMI patients exhibited similarly atypical symptoms. "Many geriatric patients have presented with fatigue and weakness and were diagnosed with STEMI," Pirotte adds.

The number of STEMI presentations at U.S. EDs declined approximately 30% between 2006 and 2011, according to the authors of a 2015 study.[1] "Timely diagnosis of STEMI in the ED may be more challenging as a result of these changing demographics," says lead author **Michael Ward**, MD, PhD, MBA, assistant professor in the department of emergency medicine at Vanderbilt University Medical Center. STEMI cases decreased from 300,466 in 2006 to 227,343 in 2011. The researchers suggested this could be because some STEMI patients bypass the ED and go directly to cardiac catheterization. Also, the decline could be attributed to the fact that medical management is reducing the number of STEMI cases seen in EDs.

Notably, the decrease was most pronounced in patients age 65 years and older. This suggests that younger patients, who tend to present with symptoms other than chest pain and shortness of breath, represent a larger proportion of cases seen by EDs. This carries important implications for liability risks, Ward says. Fewer cases mean EPs are less practiced at seeing STEMIs. "This may limit their ability to diagnose such cases in a timely manner," Ward warns. "The cases that do present may be more unusual."

Older STEMI patients also tend to present with atypical symptoms. One malpractice case involved a 75-year-old woman who complained of jaw pain and upper chest tightness.[1] The primary care physician concluded the jaw pain was caused by temporomandibular disorder and prescribed a nonsteroidal anti-inflammatory drug. This case spotlights the importance of avoiding "locking in" on a particular diagnosis before the evaluation is complete, says **Carla M. Ford**, MD, a physician consultant at CRICO, a Boston-based patient safety and medical malpractice company.

Five days later, the woman presented to the ED with nausea and vomiting and was diagnosed with MI, which progressed into cardiogenic shock. The patient subsequently died. The patient's cardiac risk factors and previous ECGs showing evidence of myocardial damage became issues in the malpractice lawsuit. So did the patient's pain level, which was out of proportion to the physical findings. "Pain that seems excessive relative to findings is often due to a vascular problem," Ford notes.

Researchers recently analyzed a risk scoring system built using five identified predictors of atypical AMI symptoms (age 75 years or older, diabetes mellitus, history of AMI, female gender, and absence of hyperlipidemia).[2] Researchers concluded the scoring system can raise awareness of atypical AMI presentation and promote symptom recognition.

In another study, researchers identified missed diagnoses in 0.9% of all patients who came to EDs with chest pain or cardiac conditions, were discharged, and were subsequently admitted for AMI within a week.[3] Younger patients and African-American patients had higher odds

of missed diagnosis. "The younger population and the older population vary pretty dramatically in their presentation," Pirotte says. "In many cases I've had, patients had no chest pain whatsoever."

Pirotte says that ECGs, "as a noninvasive, low-cost, very rapid test, should be obtained very promptly." That is especially true for patients with risk factors but nonspecific symptoms.

"We get ECGs on many patients now who don't have chest pain. The risk/benefit ratio is very high when you need a time-sensitive diagnosis recognized," Pirotte says. One obvious obstacle to prompt ECGs is that EPs cannot get into the room soon enough to order them. "Better from a risk management standpoint is a triage protocol," Pirotte offers.

If a patient presents with specific symptoms, triage nurses obtain the ECG and show the results to the EP. For all patients who undergo ECG testing, should someone also measure the troponin levels in these patients? "My practice is essentially yes," Pirotte says. "I think that combination of studies is a very safe and meaningful practice." To reduce the risk of a lawsuit, or to make one more defensible, Pirotte recommends two charting practices:

• **Give a clear picture of what the patient looks like right before discharge.** Many ED charts are too sparse on this point. EPs simply state *"no active distress; alert and oriented"* when a chest pain patient goes home after a normal workup. This is not enough to defend a lawsuit once a bad outcome happens.

"It doesn't speak to how a patient looks," Pirotte explains. Much more defensible comments: *"The patient looks excellent clinically, is cheerful and laughing with grandkids, ate lunch, and is asymptomatic at the time of the evaluation."*

"That paints a picture of a well person who's not having active symptoms," Pirotte says.

• **Complete the chart within a few hours of the shift instead of several days later.** If the patient does experience a cardiac event and the original ED chart is not yet completed, "that is very hard to defend," Pirotte warns.

On the other hand, an ED chart showing the patient's well-appearing status at the time of the first ED visit is helpful. This is because it supports the defense argument that the patient was not experiencing the cardiac event at that point.

"Whereas, if you are retrospectively charting after they've returned to the ED, that brings up a lot of questions," Pirotte says. ■

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# Failure to Involve Cardiology Common Allegation in Missed STEMI

A 21-year-old college student arrived at a New York ED complaining of severe chest pain radiating to her arms. The patient's respiration was impaired, and she was experiencing nausea and vomiting. The ECG was normal.

The young woman was sent home with a diagnosis of GI illness and anxiety, but the worrisome symptoms persisted. Several hours later, she called an ambulance and was brought back to the same ED. An ECG taken on the way to the ED showed severe abnormalities. The patient was evaluated by a cardiovascular nurse practitioner, who contacted the on-call cardiologist. "The patient had an MI and suffered severe heart damage necessitating a heart transplant," says **Paul D. Squire**, JD, an attorney at Kaufman Borgeest & Ryan.

The physician assistant (PA) who performed the initial assessment was sued. The central focus of the lawsuit, which settled out of court, was that the PA did not consult with a cardiologist during the first ED visit.

"There was a long delay until that happened, and then it was too late," Squire says. To mitigate risk of missed STEMI in the ED, Squire says two things are needed: "Better training to symptoms and early involvement with specialists."

Involving cardiology in the STEMI decision-making process can be legally protective for EPs. "What ED practitioners need to be wary of is doing it halfway," warns **Frederick M. Cummings**, JD, an attorney in the Phoenix office of Dickinson Wright.

Sometimes, EPs forgo formality and ask a cardiologist colleague if they can run something by him or her. The consultant does not see the patient or the medical records and hears only a verbal rundown from the EP. In this case, says Cummings, "you are probably getting an incomplete assessment that you probably cannot reasonably rely on."

Additionally, the EP likely subjects the cardiologist to legal exposure. Depending on state law, the consultant engaging in an informal consult can be construed as assuming a duty of care. This is problematic since the consultant is making recommendations based on limited information, something plaintiff attorneys will point out quickly. If a formal consult including evaluation by the consultant does not happen, the consultant then points the finger at the EP. "When the case goes south, you can bet that there is *something* in the ED chart where the cardiologist says, *'If I had only known that, my advice would have been different,'"* Cummings offers.

The EP is vulnerable to a persuasive legal argument. "The plaintiff can say, *'You did know enough to get somebody else involved, but didn't know enough to get them involved like they should have been. You withheld vital information, maybe unknowingly,'"* Cummings explains.

The EP defendant now faces two parties to the litigation placing blame: the patient or family and the codefendant cardiologist. "When the EP testifies about all the information conveyed to the cardiologist, the obvious question becomes, *'Why didn't you just ask the cardiologist to see the patient?'"* Cummings says.

The plaintiff attorney also can ask the cardiologist a simple question to which he or she already knows the answer: *"Would you agree that a bedside evaluation would have told you more than just a verbal report?"*

"Every time, the cardiologist will tell you, *'You bet,'"* Cummings says. "There are no shortcuts." ■

# Noncompliance With STEMI Guidelines Problematic in ED Claims

When it comes to obtaining an early ECG, there is a high degree of variability across EDs, according to the results of a recent study.[1] "Our study reveals vulnerabilities in the systems designed to identify a patient with STEMI quickly," says **Christopher Baugh**, MD, MBA, a co-author on the study and vice chair of clinical affairs in the department of emergency medicine at Brigham and Women's Hospital in Boston.

Rapid identification of a STEMI is the first step in timely reperfusion, which is tied to better patient outcomes. "Patients who have delayed ECG and recognition of STEMI with poor outcomes represent an area of malpractice risk for emergency physicians," Baugh notes.

Researchers studied STEMI screening at seven EDs and found a 29.2% difference in the missed case rate (the patients who did not undergo an ECG within 15 minutes of arrival but were diagnosed with STEMI) between the highest and lowest-performing EDs. The overall missed case rate for all seven EDs was 12.8%. The lowest and highest rates were 3.4% and 32.6%, respectively. The mean difference in door-to-ECG times for captured and missed patients was 31 minutes, with a range of 14-80 minutes of additional myocardial ischemia time for missed cases. "Our work identifies an important area for operations leadership in every emergency department to review their own workflows and performance," Baugh offers. This ensures EDs are doing everything possible to meet the 10-minute "arrival to ECG interpretation" benchmark.

In another study, researchers asked 158 ED nurses about compliance with MI guidelines from the American College of Cardiology/American Heart Association.[2] No goals were met "all of the time" by all the nurse participants. "All of the time" responses ranged from 52% (for giving analgesics) to 87% (for asking about chest pain). Eighty-one percent of participants had a goal of obtaining an ECG within 10 minutes of arrival, but only 27% of participants met all of the goals "all of the time." The researchers recommend tailored educational interventions to improve compliance. To minimize delays in obtaining ECGs, Baugh advises that EDs consider all patient arrival methods, flex up staffing to accommodate surges in patient arrivals, establish a "clear and inclusive" 10-minute ECG policy, provide adequate staff and space to perform ECGs rapidly immediately adjacent to all ED entry points, and create a flexible mechanism to allow EPs to rapidly view and screen for STEMI. "If there are multiple physicians on duty, push tracings to the most available physician," Baugh suggests. Also, EDs should provide continuing education

on STEMI and STEMI-equivalent recognition on ECGs.

Baugh says the bottom line is that EDs must do "everything they can to implement a robust system aimed at meeting the 10-minute arrival to ECG interpretation benchmark for patients at risk." ■

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# New Technology Aims to Identify Patients for Safe Discharge

Most ED patients' chest pain is not cardiac-related. "But it requires that we do our due diligence and be somewhat conservative in our management," says **Robert B. Takla**, MD, MBA, FACEP, medical director and chief of the Emergency Center at Ascension St. John Hospital in Detroit.

The ED recently trialed magnetocardiography, a noninvasive diagnostic tool that measures the heart's magnetic activity, to determine if it could identify which patients can be discharged safely more quickly and accurately than current practice.

"We were able to get some pretty good preliminary data on negative predictive value and also on specificity," Takla reports.

Early data on 101 patients of low-to-intermediate risk between August 2017 and February 2018 showed a negative predictive value of 95.5% and a specificity of 94.4%.[1] "This is way better than you would find with the current standard of care, which is a noninvasive stress test, and even a nuclear stress test, which maybe gets into the low 90s," Takla explains.

A diagnostic test with higher specificity and negative predictive value than usual care means EDs are less likely to discharge STEMI patients. "Using magnetocardiography in this case will increase our confidence in being able to discharge patients home safely and further decrease our potential liability," Takla says.

For EPs making a decision about whether it is safe to discharge a chest pain patient, specificity in negative predictive value, if sufficiently high, is "extremely valuable," Takla says. Positive predictive value and sensitivity are important from a different perspective. "Many patients have to go to the cardiac cath lab not because they have a STEMI but because they have acute coronary syndrome, or the cardiologist feels that the patient is at high risk for disease," Takla explains.

Some chest pain patients produce a normal ECG reading but still require repeat cardiac troponin levels. Even if these are negative, acute coronary syndrome cannot always be ruled out with an intermediate HEART score. Currently, these patients are placed in the hospital's 31-bed observation unit and a stress test is ordered. This takes hours to complete. If ordered after 5:00 p.m., the test is not performed until the following day.

In contrast, the new device tells ED providers more quickly and accurately if the chest pain is cardiac-related. "We can now get two sets of enzymes and do this 90-second scan and may have a better negative predictive value and better overall specificity than with the current standard of care. I don't have to keep them overnight," Takla reports. Currently, the ED is involved in a multicenter trial to determine the tool's accuracy with high-risk patients — those more likely to have coronary artery disease.

"If this is truly as good as the preliminary data suggest, we have not only saved time and money but also unnecessary waits and radiation," Takla says.

If the patient receives an intervention such as a stent, ED providers also scan him or her afterward to compare the magnetic scan with the gold standard of cardiac catheterization. "We are going to see how well it correlates with patients that have a high likelihood of disease prevalence," Takla notes.

Even if subsequent research confirms the preliminary findings, it will take time for the test to become common practice in EDs.

"Unfortunately, there is always a lag time between evidence-based medicine and adoption of standard of care," Takla laments. ■

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# STEMI May Be in ED Waiting Room: 'Devastating' Consequences

Was an MI patient sent to the waiting room? It is highly possible an ED nurse failed to convey important information, as multiple malpractice cases make clear.

"Nurses in the emergency department are in a critical position to enhance the diagnostic process in recognizing and treating cardiovascular disease," says **Penny Greenberg**, MS, RN, CPPS, senior program director for patient safety services at CRICO Strategies.

A recent analysis of medical claims and lawsuits in the national Comparative Benchmarking System dataset found that in 155 diagnostic-related error cases from 2007 to 2016, nursing was identified as the primary responsible service. Of these cases, 28 involved cardiovascular disease.[1] More than half of the misdiagnoses of cardiovascular disease resulted in a patient death, according to the analysis. Diagnostic errors are "the deadliest and most harmful of medical errors," says **Kelly Gleason**, RN, PhD, the study's lead author and an assistant professor at Johns Hopkins School of Nursing. ED nurses must be prepared and trained to play a role in the diagnostic process. "If we do not fully own that role, the consequences can be devastating," Gleason warns. It is perceived commonly that nurses scope of practice laws limit them from fully engaging in diagnosis. "In fact, state scope of practice laws contain little language guiding what nurses can or cannot do related to medical diagnosis," Gleason explains. The fact that ED nurses are named as the primarily responsible service in many diagnosis-related malpractice claims "demonstrates that nurses are recognized as having a responsibility in the diagnostic process," Gleason adds. A recent successful malpractice lawsuit hinged on an inaccurate assumption made by an ED nurse. The case involved an 83-year-old woman who was brought to the ED with obvious stroke symptoms. The triage nurse noted confusion, garbled speech, and facial droop. Due to an incorrect assumption that the patient was not a candidate for thrombolytics, the nurse directed the patient to the waiting room. Despite new onset of right-sided paralysis, the patient waited more than an hour for evaluation by an EP.

Upon admission, an MRI showed acute posterior temporal lobe and basal ganglia infarctions. The patient sued the triage nurse, claiming that a delay in diagnosis and treatment of an acute stroke led to permanent neurologic damage. The case settled.

Here are risk-reducing "lessons learned" for EDs, which also are applicable to delayed STEMI diagnosis and treatment:

- The nurse failed to recognize and alert EPs of an evolving stroke, reflecting a knowledge deficit;
- The nurse based the triage score, in part, on the current ED resources. "Triage designations should be independent of the current state of the department," Greenberg says;
- The patient's daughter perceived the ED staff to be unconcerned about her mother's condition. The absence of anyone checking on her mother in the ED waiting area put the burden on the daughter to alert ED personnel of clinical changes. "Further delays after her mother suffered another stroke in the waiting area, because there were 'many other sicker patients,' certainly could be perceived as callous," Greenberg notes;
- ED staff made written and verbal comments blaming other providers. In the ED chart, an EP noted that the patient's near-total right-sided paralysis could have been avoided by a timely evaluation. Additionally, an ED nurse reportedly told the family that the bad outcome could have been avoided. Such concerns should be addressed in other forums, Greenberg says: "Sparring in the chart or in front of families can increase patient confusion and the risk of a malpractice lawsuit."

In malpractice claims that name ED nurses, a frequently seen contributing factor is communication with providers. "ED nurses' role in transferring important information is paramount," Greenberg says. The authors of another recent study examined communication-related medical malpractice.[2] Thirty-two percent of all nursing cases involved a communication failure. "The majority of these cases expose gaps in verbal and documented communication with other providers about the patient's condition," Greenberg notes. During a recent malpractice case, it became apparent that the EP was never notified of an 81-year-old man's ECG changes and high cardiac troponin levels. "The nurses did not communicate status changes to the provider," Gleason says.

This can happen for many reasons. ED nurses may be swamped with tasks on a busy night shift or do not understand what information necessitates immediate reporting to the EP. Other times, ED nurses do report concerns, but they go unheeded. An ED nurse might report a patient's sudden drowsiness, only to be told by the EP that it is due to recently administered pain medication. Both EPs and ED nurses "need to get on the same page about

what information the physician wants to best guide decisions," Gleason says.

Regardless of the reason for poor communication between ED nurses and EPs, says Gleason, "if we think of it through the lens of keeping our patients safe, then it is logical for nurses to prioritize participating in the diagnostic process." ■

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# Was It a Missed STEMI or Just Too Early to Identify?

Some "missed" STEMI malpractice lawsuits obscure the fact that nothing was missed at all, at least not at the time of the ED visit.

"We rely on the ECG in combination with symptoms to make the diagnosis of STEMI in the emergency department. The ECG is dynamic," explains **Bryn Mumma**, MD, an EP at UC Davis Medical Center and assistant professor in the department of emergency medicine at UC Davis School of Medicine.

A STEMI pattern may develop minutes, hours, or days after a patient's initial presentation. When this occurs, the case appears to be a "missed STEMI," even though the STEMI pattern was *not* present on the initial ECG.

The ED chart can mislead expert reviewers on this point, with perceptions colored by the patient's eventual diagnosis. Repeat ECGs give a more complete picture. Mumma says ECGs should be repeated "when the clinical presentation is concerning for STEMI or when the initial ECG is abnormal but not diagnostic of STEMI."

"Missed STEMI" is not necessarily a legal accusation. It also comes up in internal quality improvement efforts. "These patients often do not meet the metric of 90-minute door-to-balloon time, but it's because they didn't have a STEMI at the 'door,'" Mumma explains. Anyone with crushing chest pain is very likely to undergo a quick ECG, while someone with epigastric pain could wait for hours. "The patient's presentation is a factor that contributes to delayed recognition of STEMI," Mumma notes.

Similarly, an older patient with a history of cardiovascular disease is more likely to undergo a timely ECG than a younger patient without risk factors. "We've all heard that 'time is muscle' in STEMI, and minutes matter," Mumma says.

To rapidly identify and treat STEMI, Mumma says prehospital providers should perform 12-lead ECGs, transport patients directly to a STEMI receiving center when feasible, and provide early notification. This allows activation of the cardiac catheterization lab team prior to the patient's arrival at the hospital, shortening the overall time to treatment.

Further, referral hospitals and receiving centers should create clear, streamlined processes for the rapid transfer of STEMI patients from the referral hospital to the cardiac catheterization lab in the STEMI receiving center.[1] "Repeating the ECG and showing that it is unchanged may also be helpful because patients with STEMI usually have evolving ECG changes," Mumma says. ■

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# CME/CE QUESTIONS

1. **Which piece of documentation would make a plaintiff attorney more likely to pursue a missed STEMI case, according to L. Evan Cline, JD?**
   a. Documentation showing a patient without chest pain received an ECG.
   b. Documentation showing the EP asked a cardiologist for help interpreting an ambiguous ECG.
   c. Documentation showing the EP dismissed myocardial infarction as a likely diagnosis because the patient's pain was relieved by a "GI cocktail."
   d. Documentation showing a patient discharged with a gastrointestinal diagnosis had negative cardiac enzymes.

2. **In a recent study regarding risk stratification tools in the ED, the authors found:**
   a. the HEART score is an excellent predictor of major adverse cardiac events in adult ED patients with chest pain.
   b. the TIMI score is preferable due to much greater sensitivity.
   c. there is now solid evidence showing the HEART score is superior to clinical judgment.
   d. the HEART score mixed poorly with high-sensitivity troponin assays.

3. **Which is an expected outcome of following evidence-based protocols for chest pain, according to Christian Tomaszewski, MD, MS, MBA, FACEP?**
   a. A miss rate less than 1%
   b. Admitting more low-risk patients
   c. Longer waits for low-risk patients
   d. Quicker turnover of low-risk patients with no increase in risk of missed myocardial infarction

4. **Which constitutes the legal standard of care for STEMI patients?**
   a. Hospital protocols on management and diagnosis
   b. ED guidelines specifying timeframes for ECGs for suspected STEMI
   c. What a similarly situated reasonable healthcare provider would do in a similar situation
   d. Recent peer-reviewed research