

# Saving lives more efficiently: Cardiac arrest study may help EMS and ERs

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When someone's heart suddenly stops beating – a condition called cardiac arrest -- there's a lot that bystanders and ambulance crews can do to get it started again. But if the victim doesn't respond, when should such efforts stop?

And when should emergency crews rapidly transport a patient to a hospital with lights and sirens on, potentially endangering the lives of paramedics and other motorists and pedestrians — even though the care provided by the emergency crew is the same as what can be provided in the emergency department?

Currently, there's no one "right" answer to these questions, which arise in the majority of the cardiac arrests that strike 166,000 Americans each year — and kill 93 percent of them. As a result, emergency medical services crews and hospital ER teams spend countless hours and healthcare resources on patients who have no chance of making it home alive – at the expense of other patients who need an ambulance or have spent hours in an ER waiting room.

Now, a new study in the *Journal of the American Medical Association* shows that a single standard guideline could help EMS and ER teams determine which cardiac arrest victims might benefit from a trip to the hospital, while at the same time reducing futile efforts on patients who have no chance of surviving a cardiac arrest.

The study shows that EMS teams can use either a simple five- or three-

part rule to determine when they should discontinue efforts to revive cardiac arrest patients on the scene where their heart stopped beating. The same rule will also tell them when they should keep trying to resuscitate the patient while transporting him or her to the nearest ER. The three-part rule may be sufficient to identify 99.8 percent of those who need to be transported to the hospital for further care, the researchers say.

The study was performed by a team from the University of Michigan Health System, Emory University and the Henry Ford Health System, using data from 5,505 cardiac arrest patients treated in eight metropolitan areas around the U.S. It did not include patients who suffered a cardiac arrest after a non-heart incident such as drowning. It was funded by the Centers for Disease Control and Prevention.

Comilla Sasson, M.D., M.S., is the study's lead author and a Robert Wood Johnson Clinical Scholar at the U-M Medical School. An emergency physician herself, she began the study after many frustrating experiences in a Chicago ER where she had to stop caring for other critically ill patients whenever a cardiac arrest patient came in the door – no matter how futile it might be to try to bring the patient back, and no matter how time-sensitive the needs of the other patients in the ER.

Now at the U-M Department of Emergency Medicine, Sasson teamed up with an Emory University group that has been tracking cardiac arrest response.

The Emory effort, called CARES, helps EMS crews and hospitals find ways to improve care.

"Many cardiac arrest patients are successfully resuscitated at the scene, with the help of automated external defibrillators and CPR, and the hospital is the right destination for them," Sasson says. "The question has

been what to do about patients who fail to respond, despite the best efforts of an EMS team. This study confirms previous findings, and shows that a standard rule could ensure that the right patients get to the hospital while allowing us to use scarce resources wisely."

Sasson notes that many advanced EMS crews now have nearly all the tools and training that ERs have for reviving cardiac arrest patients, including artificial airways, heart-starting injectable drugs and more. Many have radio contact with an emergency doctor at the local medical control authority. In addition, automated external defibrillators (AEDs) are now available in many public places for bystanders to use to restart a stopped heart, in the crucial minutes before an EMS team arrives.

But even still, some patients just don't respond, or their heartbeats are too erratic for the AED to determine that a shock can be delivered. Then, the question for the EMS crew is whether it's worth the risk to the patient, the crew, and nearby motorists and pedestrians to race to the hospital with sirens blaring and lights flashing, and then to tie up the ER team to try to revive the patient.

In the new study, EMS crews pronounced 947 (17 percent) of the 5,505 patients dead at the scene between late 2005 and early 2008. The other 4,558 were transported to one of 111 hospitals by one of 19 EMS agencies. But only 7.1 percent of those transported patients survived long enough to be discharged from the hospital alive.

Sasson and her colleagues, including Bryan McNally, M.D., MPH, and Arthur Kellermann, M.D., MPH of Emory's Department of Emergency Medicine, analyzed the medical records from all 5,505 patients. They ran statistical analyses to determine which patients would have been transported, or survived, if EMS crews had applied the three-part or five-part rule, both of which were developed by a Canadian team as part of the Ontario Prehospital Advanced Life Support study.

The three-part rule, called a 'basic life support' or BLS rule, calls for EMS teams to end their resuscitation efforts if a cardiac arrest occurred before EMS arrived, if no defibrillator was used (for instance, because there was none for a bystander to use, the EMS crew didn't have one, or an AED did not detect a shockable rhythm), and if the team can't get the patient's blood to begin circulating again. All three must apply for resuscitation efforts to be stopped.

If ambulance and fire crews had applied the three-part rule, about 47 percent of all the cardiac arrest patients in the study would not have met the criteria to be transported by ambulance to the hospital. This means that 2,592 patients would have been pronounced dead at the scene – potentially saving 1,645 trips to the ER, compared with what actually happened.

The five-part rule, called the 'advanced life support' or ALS rule, adds two more criteria to the list: the cardiac arrest had no witnesses at all, and no bystander attempted to perform CPR. If this more conservative rule had been applied to the 5,505 cardiac arrest victims in the study, 1,192 patients would have been declared dead at the scene, saving 245 trips to the ER.

Then, the researchers looked at what actually happened after the patients made it to the hospital, and compared it with what might have happened if the two rules had been applied.

Only 70 patients who would have been declared dead under the BLS rule survived the ER treatment and were admitted to the hospital. But only five were discharged from the hospital alive, and four of them were able to live a relatively normal life afterward. Meanwhile, only 24 patients who would have been declared dead under the more conservative ALS rule were able to be resuscitated in the ER. None of them survived long enough to be sent home from the hospital.

In other words, the BLS rule misclassified only 0.2 percent of patients, and the ALS rule classified all patients correctly. Either rule, the authors say, could be used – but the BLS rule would save the most emergency medical resources while still meeting ethical criteria for medical care.

"Through our study and others, the BLS rule has now been applied to more than 10,000 patients in the U.S. and Canada, with less than a 0.1 percent misclassification rate," Sasson says. "Currently, EMS systems vary widely in the care they deliver to cardiac arrest patients. To implement the BLS rule more widely would standardize the care and transport of these patients, so that we can reduce the risk of injuries or death to EMS personnel and the public in high speed transports, decrease the pressure on our overcrowded ER's, allow our ER staff to focus on patients who can be treated, and open up intensive care unit beds."

Source: University of Michigan

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