

ECGs administered by paramedics can speed treatment for severe heart attacks

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A new program that trains emergency medical service technicians (EMS) to read electrocardiograms so that they can evaluate patients with chest pain, and expedite treatment for the severe heart condition known as ST-segment elevation myocardial infarction (STEMI), a serious form of heart attack, has excellent results and should become the standard of care, according to two studies published in the current issue of the *Canadian Journal of Cardiology*.

"It's well established that morbidity and mortality in myocardial infarctions is directly related to the duration of [ischemia](#), and delays in restoring the flow of blood to the heart of even 30 minutes have been associated with an increase in mortality," says lead investigator Robin A. Ducas, MD, of the University of Manitoba, Winnipeg, Canada. "By training EMS to administer and interpret ECGs at the scene, with oversight from an on-call physician, we demonstrated that we could achieve benchmark times from first medical contact to treatment."

An audit of hospitals in Manitoba in 2005 had previously revealed that only 14% of patients received thrombolysis, the administration of drugs to dissolve [blood clots](#), within 30 minutes from first medical contact, and only 11% received primary [percutaneous coronary intervention](#) (PPCI, or [angioplasty](#)) within 90 minutes of first medical contact, the benchmark established by leading heart associations, including the Canadian Cardiovascular Society.

To address this, a system of pre-hospital ECG interpretation and triage was developed. EMS receive additional training in administering and interpreting ECGs for signs of STEMI. When EMS suspect STEMI, the ECG is transmitted to the hand-held device of the on-call physician for confirmation. When STEMI is confirmed, the physician directs EMS to begin pre-hospital thrombolysis (PHL) or to alert the PPCI laboratory

at the hospital to prepare for the patient.

Transmission of the ECG allows for a real-time conversation between the physician and EMS, decreases false positive test results for STEMI, and improves resource allocation by decreasing activation of the catheterization laboratory when it is not warranted. The emergency room is bypassed in positive cases, and patients are directly transported to the cardiology department or the PPCI laboratory. In cases in which the physician finds the ECG negative for STEMI (PHENST), patients are transported to the nearest emergency room.

The investigators evaluated 380 cases from July 2008 to July 2010. Of 226 patients confirmed with STEMI, 70% received PPCI, 21% received PHL, and 20% underwent coronary angiography without revascularization. The median time from first medical contact to treatment in the PHL treatment group was 32 minutes. In the PPCI group, the median time was 76 minutes. In the PHENST group, 41% were directed to a hospital capable of PPCI and 59% were sent to one of the six other hospitals in the system. They presented more often outside of normal catheterization laboratory hours. 44% were diagnosed with acute coronary syndromes, including seven cases of missed STEMI, and a higher mortality rate.

"The adoption of similar strategies in other urban areas could allow for achievement of guideline times, particularly for PPCI and regardless of the time of day," says Dr. Ducas. "Transfer of patients with suspicious but negative ECG for STEMI (PHENST) to hospitals with comprehensive cardiac care may be warranted, and deserves further consideration."

In a related study, Dr. Ducas and her team audited 703 cases evaluated by EMS. 323 cases were evaluated as negative for STEMI and therefore were not transmitted to the on-call physician. Upon arrival at the nearest emergency room, 52%

received a diagnosis of "nonspecific chest pain" and were subsequently discharged; one case of STEMI was missed, and 2 other patients developed STEMI after arrival at the hospital. 25% had a cardiovascular diagnosis after physician evaluation.

The ECGs of 380 patients were evaluated as positive and transmitted. Of this group, physicians suspected 226 cases of STEMI, of which 96.9% were confirmed. The false activation of the catheterization lab occurred in only seven of the 226 cases, and the physician missed the diagnosis in seven cases.

"The high level of false positives is a concern, given the risk of treatment," notes Dr. Ducas. "We do not have a clear guide as to what are acceptable levels of false positives and negatives. However, we have found both in the literature and in our own study that EMS pre-hospital ECG interpretation is fast, reliable, and plays a pivotal role in the care for patients with STEMI."

In an editorial accompanying the articles, Robert C. Welsh, MD, FRCPC, FAHA, FACC, of the Department of Medicine, University of Alberta and the Mazankowski Alberta Heart Institute, Edmonton, Alberta, Canada, says, "Our colleagues describe a program which provides the optimal platform to advance STEMI care in Canada. Although this approach is dependent on a motivated group of physicians willing to invest additional time and energy to deliver enhanced STEMI care, it allows pre-hospital confirmation of diagnosis, individual patient risk stratification, immediate decision regarding the optimal mode of reperfusion, and expansion of optimal systems of care to rural patients."

More information: "Cardiac Outcomes Through Digital Evaluation (CODE) STEMI Project: Pre-hospital Digitally-Assisted Reperfusion Strategies," by Robin A. Ducas, MD, Roger K. Philipp, MD, Davinder S. Jassal, MD, Anthony W. Wassef, MD, Erin Weldon, MD, Farrukh Hussain, MD, Christian Schmidt, BA, ACP, Aliasghar Khadem, MD, John Ducas, MD, Rob Grierson, MD, James W. Tam, MD, ([DOI: 10.1016/j.cjca.2012.02.005](https://doi.org/10.1016/j.cjca.2012.02.005))

"To Transmit or Not to Transmit: How Good are

Emergency Medical Personnel in Detecting STEMI in Patients with Chest Pain?" by Robin A. Ducas, MD, Anthony W. Wassef, MD, Davinder S. Jassal, MD, Erin Weldon, MD, Christian Schmidt, BA, ACP, Rob Grierson, MD, James W. Tam, MD ([DOI: 10.1016/j.cjca.2012.04.008](https://doi.org/10.1016/j.cjca.2012.04.008))

Editorial: "Computer-Assisted Paramedic Electrocardiogram Interpretation with Remote Physician Over-Read: The Future of Prehospital STEMI Care?" by Robert C. Welsh, MD, FRCPC, FAHA, FACC ([DOI 10.1016/j.cjca.2012.04.002](https://doi.org/10.1016/j.cjca.2012.04.002)).

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