Moving Toward Improved Care for the Patient With ST-Elevation Myocardial Infarction
A Mandate for Systems of Care

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Humanity’s greatest advances are not in its discoveries—but in how those discoveries are applied ....
—Bill Gates, Harvard commencement on June 7, 2007

Primary percutaneous coronary intervention (PCI) is the preferred reperfusion strategy for the patient with ST-elevation myocardial infarction (STEMI) regardless of whether they present to a PCI or non–PCI-capable hospital.2,3 These recommendations, based on randomized clinical trials and subsequent meta-analysis and meta-regression of these trials,4,5 are accompanied by a caveat: PCI must be performed in a timely manner. The unfortunate reality in the United States today is that many STEMI patients who are well suited for primary PCI do not receive PCI, or, when they do, it is frequently not within guideline-recommended time standards, a problem in particular for patients who present to hospitals without PCI capability.6

The evidence supporting improved STEMI systems of care was strengthened by 3 articles in this month’s Circulation: Cardiovascular Quality and Outcomes. The first uses retrospective analysis to provide insight into missed opportunities in the care of patients with acute myocardial infarction (AMI),14 the second provides tangible health care benefits derived from a current statewide system,15 and the third provides guidance for future development of these STEMI systems in the United States.16

The analysis provided by Iwashyna et al examined 71,336 Medicare beneficiaries with AMI admitted to nonrevascularization hospitals in 2006 and allows us examination of the basis for triage decisions made for these patients and suggests potential areas for improvement in our systems. Using complex modeling and 30-day risk-standardized mortality rates and AMI volume from the Hospital Compare website, the authors suggest that transfer of AMI patients to the closest hospital with the lowest 30-day mortality might produce a clinically meaningful reduction in mortality rates. However, 37% of transferred patients actually bypassed a revascularization hospital with better survival than the hospital the patient was transferred to, and therefore it appears that factors other than outcomes at the revascularization hospital often guide referral patterns between hospitals. The complex interplay between proximity, established relationships, and fiscal concerns certainly may affect patient outcomes, and strategies aimed at breaking down these barriers must be developed.7

The article also highlights an important limitation in the current system used to evaluate AMI care in the United States. This analysis is based on a large number of patients from a heterogeneous population including both STEMI and non-STEMI patients with a focus on the predominantly elderly Medicare population. Our ability to improve AMI care in the United States could be further enhanced if more comprehensive data regarding the entire STEMI population were available, as similar to population-based registries in many European countries.17

Furthermore, despite the fact that revascularization has been shown to improve short- and long-term outcomes in both STEMI and high-risk non-STEMI patients and current ACC/AHA guidelines recommend it for the majority of these patients, only 43% of patients were transferred to a revascularization hospital. Of the patients transferred, only 61% received revascularization. Low rates of revascularization probably reflect the fact that these are elderly patients. These results are consistent with previous data that suggest both transfer and revascularization are less likely to occur in
higher-risk patients, frequently to the detriment of the elderly.\textsuperscript{18} It is possible that increased availability and use of revascularization, especially in the higher-risk elderly patients might further reduce mortality in this high-risk population. Inefficiencies of the current system are also reflected by the average 2.5-day length of stay at the nonrevascularization hospital before transfer, implying some delay to reperfusion and increased length of stay compared with an initial presentation to a revascularization hospital.

Despite the fact that AMI remains a major public health problem in the United States and despite a wealth of data that a well-organized system of care for STEMI patients can yield improved outcomes, an organized national system still does not exist.\textsuperscript{7} Fortunately, over the last 5 to 10 years, there has been a tremendous growth in regional STEMI systems throughout the United States demonstrating improvements in time to treatment and the percentage of patients receiving primary PCI as well as observation data that suggest improved outcomes can be achieved.\textsuperscript{10–13} The reperfusion of AMI in North Carolina emergency departments (RACE) program represents a state-wide attempt to develop a regional system of STEMI care.\textsuperscript{13} In addition to the improvements in median reperfusion time, RACE also resulted in notable improvements in first door-to-device and door-to-needle times in non-PCI hospitals and door-in door-out times for patients transferred from non-PCI hospitals.\textsuperscript{13}

Disparities in health care delivery represent another major challenge in developing a national system of STEMI care that provides equal and improved outcomes for all Americans. Using data from the RACE project, Glickman et al\textsuperscript{13} provide evidence that the overall benefits in time to treatment were similar in women, elderly, and minorities. Importantly, the use of reperfusion therapy was >95% in all of these groups. In particular, there were relative improvements in treatment times for women and elderly at the non-PCI hospitals that appeared to “narrow the gap” in these health care disparities. Still, disparities exist, in particular for the elderly. Data from the Minneapolis Heart Institute STEMI system demonstrate that by using standardized protocols and an integrated transfer system for primary PCI, the differences in time to treatment and use of adjunctive medications and revascularization can be narrowed even further.\textsuperscript{19}

Although the goal of improving timely access to PCI is clear, a major outstanding challenge is improving the accessibility to PCI-capable hospitals. Concannon et al use complex modeling to determine the comparative effectiveness of an emergency medical services (EMS)-based strategy of transporting STEMI patients to existing PCI-capable hospitals compared with hospital-based strategies (creating new catheterization laboratories and expanded staffing). The authors acknowledge that the limitations and assumptions involved with such modeling may not be applicable in all regions. Still, the results demonstrate that an EMS-based strategy of transporting every patient to an existing PCI facility was less costly and more effective than expansion options. This information provides valuable insight to policy makers who must make decisions and overcome local factors and unique regional challenges. In fact, existing regional STEMI systems have addressed these challenges, showing that patients can be transferred from great distances in a timely manner, using a standardized protocol and organized transfer system.\textsuperscript{10–13} In addition, data from Michigan in 2005 demonstrated that expansion of PCI-capable hospitals was primarily limited to urban and suburban regions and was basically ineffective in increasing the number of patients with timely access to PCI.\textsuperscript{20} Only 3 of 12 hospitals were at least 20 miles from another PCI hospital, and even these facilities increased access for only 4.3% of the population.\textsuperscript{20} Although the results from the analysis by Concannon et al are provocative, we suspect the battle for expansion of cardiac catheterization laboratories to non-PCI centers versus the development of regional STEMI systems will continue to be fought on many levels.

Finally, the evidence for the positive impact of systems of care is not just limited to STEMI. The initial outcomes of implementation of a regional system for the detection and treatment of acute aortic dissection were presented in last month’s issue of Circulation: Cardiovascular Quality and Outcomes,\textsuperscript{21} and impressive results with the use of cooling and other advanced techniques for patients with out of hospital cardiac arrest are being reported in an increasing number of centers. Based on our results in Minnesota with STEMI, aortic dissection and out of hospital cardiac arrest, we have implemented regional systems using standardized protocols for abdominal aortic aneurysms, critical limb ischemia, non-STEMI, and stroke.

Building on 20 years of increasing knowledge from large randomized clinical trials and registry populations, it is time to apply that knowledge effectively. Every hospital in the United States should have a detailed plan on how to care for the patient who presents with STEMI. We should have data available on the outcomes of every STEMI patient, and we should be able to apply the results of new clinical trials rapidly. We believe it is not too much to ask for; in fact it is what should be expected.

\section*{Disclosures}
None.

\section*{References}


**Key Words:** Editorials ■ acute myocardial infarction ■ percutaneous coronary intervention
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doi: 10.1161/CIRCOUTCOMES.110.958421
Circulation: Cardiovascular Quality and Outcomes is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231
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Print ISSN: 1941-7705. Online ISSN: 1941-7713

The online version of this article, along with updated information and services, is located on the World Wide Web at:
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