Primary percutaneous coronary intervention (PCI) has emerged as the preferred reperfusion therapy for ST-segment elevation myocardial infarction (STEMI) when performed in a timely fashion.1,2 Moreover, shorter time to reperfusion (door-to-balloon or device time) in patients with STEMI undergoing primary PCI has been associated with improved survival.3,4 However, of the 5000 acute care hospitals in the United States, only 1449 have the capability to perform emergency PCI,5 necessitating interhospital transfer for the majority of STEMI patients and an inherent treatment delay. Yet, previous randomized trials in highly organized European centers have demonstrated the benefit of primary PCI when compared with fibrinolytic therapy, even for patients who require transfer to a PCI-capable hospital.6,7 The American College of Cardiology (ACC) and American Heart Association (AHA) guidelines for STEMI recommend that PCI be performed within 90 minutes of first medical contact.1 Although voluntary national registries in the United States have shown that among patients with STEMI who undergo interhospital transfer, only 10% achieve a door-to-balloon time within 90 minutes,8 national initiatives have focused primarily on improvement in the timeliness of reperfusion in hospital centers that perform primary PCI.9,10 However, for patients requiring interhospital transfer for primary PCI, streamlined systems of care and integration of resources in the community are needed to effectively deliver time-sensitive treatment.11,12 Refining the systems to rapidly identify, triage, and transfer patients with STEMI presenting to non-PCI–capable hospitals is an important element of state and local regionalization initiatives for STEMI care.13,14

In this issue of Circulation: Cardiovascular Quality and Outcomes, Glickman and colleagues provide insights from the STEMI regionalization efforts in North Carolina—the Reperfusion of Acute Myocardial Infarction in North Carolina Emergency Departments (RACE) program—and report on specific factors that led to shorter door-in–door-out times for patients presenting to non-PCI (STEMI referral) hospitals who were subsequently transferred to a primary PCI-capable (STEMI receiving) hospital.15 The RACE program established a plan and set of recommendations for each step of the reperfusion pathway, from the initial contact with emergency medical services (EMS), to the STEMI referral hospital Emergency Department (ED), to treatment in the catheterization laboratory at the STEMI receiving hospital. This report examines 8 specific EMS, ED, and hospital processes among 55 STEMI referral hospitals and compares door-in–door-out times within these hospitals before (July 2005 to September 2005) and after (January 2007 to March 2007) a year-long implementation of standardized protocols as part of the statewide regionalization RACE program. The program was successful in achieving near universal adoption of certain recommendations including establishing a hospital-specific reperfusion protocol, ED activation of the catheterization laboratory with a single call number, and providing EMS equipment to perform prehospital ECGs. Implementation of recommendations set forth as part of the RACE program led to significantly shorter door-in–door-out times among the patients treated at STEMI referral hospitals when compared with door-in–door-out times before the RACE interventions [58 minutes; interquartile range, 35 to 90 minutes versus 97 minutes; interquartile range, 56 to 160 minutes; P<0.0001]. Univariate analysis showed that each of the care processes was associated with significantly shorter door-in–door-out times, and the adoption of additional processes within each category (EMS, ED, or hospital) was associated with even shorter door-in–door-out times. Adoption of all EMS processes, including performance of prehospital ECGs, a program to educate paramedics in recognizing STEMI on a 12-lead ECG, use of local ambulances to transport patients within 50 miles, and patients remaining on the ambulance stretcher at the STEMI referral hospital, was associated with the shortest door-in–door-out times (44 minutes).

Glickman and colleagues provide a refreshing examination of the crucial role of EMS and the STEMI referral hospital in the regional management and triage of selected patients for primary PCI within a STEMI system. Certainly, the authors are to be congratulated on their remarkable effort and success in organizing STEMI systems of care throughout the state of North Carolina.13 Although the findings are intuitive and door-in–door-out times are not linked to door-to-balloon times or to outcomes, this report extends the observations of other STEMI systems14,16 by focusing on the relationship between individual and combined specific process measures and the time spent in the STEMI referral hospital before transfer. Moreover, the authors highlight a new ACC/AHA performance measure—time from ED arrival at STEMI referral facility to ED discharge from STEMI referral facility.
in patients transferred for primary PCI\textsuperscript{17}—and provide an overview of the individual hospital response to the program and the proportion of hospitals implementing each process. Perhaps most important, the study underscores the importance of the integration of EMS, the ED, and the STEMI referral hospital in working together to implement STEMI systems of care.

In an effort to enhance quality of care for acute myocardial infarction in US hospitals, the Centers for Medicare and Medicaid Services and the Joint Commission on Accreditation of Healthcare Organizations collect and report quality process measures, including time to reperfusion for STEMI.\textsuperscript{18,19} Both the AHA Get With the Guidelines (GWGT)-Coronary Artery Disease (CAD) (that addresses overall CAD care) and the ACC Door-to-Balloon Alliance national quality improvement initiatives have resulted in a significant decrease in time to treatment for STEMI patients at PCI hospitals.\textsuperscript{10} Although successful campaigns in reducing door-to-balloon times, targeting attention and quality improvement efforts on a single metric, namely door-to-balloon time (where door is defined at the STEMI receiving hospital), has not yet been shown to correlate with reductions in mortality.\textsuperscript{13,20,21} The possible reasons for this seeming paradox probably are multifactorial, but significant delays from first medical contact to arrival at the STEMI receiving hospital have been implicated.\textsuperscript{22} It is in this context, that process measures to shorten door-in-door-out time will play an important role. Perhaps most critical is the lack of improvement in symptom onset-to-door time and in the proportion of STEMI patients activating EMS, where, to date, efforts have been largely unsuccessful.\textsuperscript{23} With improvements in door-to-balloon times at PCI hospitals and the increasing recognition of the importance of both the prehospital phase of care (ACC/AHA guidelines established first medical contact to balloon time as a system goal) and the time spent in the STEMI referral hospital, it is time to turn our attention next to the patient variables and time from symptom onset to entry into the system.\textsuperscript{24} Glickman and colleagues provide the impetus to do so, reporting no change in the 60\% of patients arriving at the hospital via self-transport both before and after implementation of the RACE process measures.

These findings underscore the importance of establishing integrated networks of hospitals, system-wide alignment of processes, and of reperfusion plans and protocols that address the unique challenge in reducing treatment times for STEMI patients who require interhospital transfer for primary PCI. Turning our attention from door-to-balloon time—now to first medical contact-to-balloon time—and next to symptom onset-to-balloon time, may finally allow us to win the RACE to primary PCI.

Disclosures

None.

References


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