Universal Access to a Percutaneous Coronary Intervention Hospital
Is It Feasible or Desirable?

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During the past decade, advances in device technology (eg, drug-eluting stents), development of safer anticoagulants (eg, bivalirudin), and refinement in procedural techniques have led to a dramatic improvement in the effectiveness and safety of percutaneous coronary intervention (PCI), despite increasing clinical and anatomic complexity of treated patients. As safety and effectiveness have been documented, the indications for PCI have expanded. In patients with ST-segment elevation myocardial infarction (STEMI), the superiority of primary PCI (when readily available) over thrombolytics is well established. More recently, PCI has also become a viable alternative to coronary artery bypass grafting in select patients with coronary artery disease.

As appreciation of the effectiveness of PCI has grown, there has been rapid diffusion of PCI capability into US hospitals. Dissemination of PCI has been further augmented by generous hospital and physician reimbursement, reductions in federal regulatory policies, and accumulating evidence that PCI can be performed safely at hospitals without on-site cardiac surgical backup. As a result, hospitals with PCI availability in the United States increased from 929 in 1993 to 1316 in 2004.

Despite the growth in capacity, PCI is not available at all hospitals at all times. In fact, most patients with STEMI initially present to hospitals without PCI capability, where treatment options may include on-site thrombolysis or transfer to the nearest PCI-capable hospital for primary PCI. Based on demonstration of the superiority of primary PCI over thrombolytics, transfer to a PCI-capable hospital has been widely promoted as a treatment strategy for these patients. However, reperfusion in patients transferred for primary PCI is frequently delayed because <10% of these patients achieve the recommended door-to-balloon (D2B) time of <90 minutes. This is in sharp contrast to patients presenting directly to PCI-capable hospitals, where the astounding success of the D2B Alliance Program has led to a remarkable reduction in reperfusion delays and achievement of a median D2B time of 64 minutes. Given this disparity in reperfusion times for direct-arrival and transferred patients with STEMI, it is important to assess whether new PCI programs have brought more patients closer to a PCI-capable hospital.

To address this matter, in this issue of Circulation: Cardiovascular Quality and Outcomes, Concannon et al provide interesting new data describing the growth of PCI capability in US hospitals between 2001 and 2006 and how this expansion has affected geographic access to PCI hospitals for the general population. By using data from the American Hospital Association survey, they found that the proportion of US hospitals providing PCI increased from 25.5% in 2001 (1176 of 4609) to 36.2% in 2006 (1695 of 4673), a 44% relative increase in the proportion of hospitals with PCI. Despite the addition of >500 new PCI programs, geographic access for patients improved little during the period of study. In particular, the percentage of the US population residing within 60 minutes of a PCI-capable hospital increased by a mere 0.9% (79.0% in 2001; 79.9% in 2006). Moreover, the average driving time and total elapsed time from 9-1-1 call to hospital arrival decreased by 48 and 30 seconds, respectively, suggesting that most new PCI programs have opened in areas with preexisting PCI hospitals. Although the improvement in geographic access from new PCI programs appears to have been small, the costs of these new programs are likely substantial. The fixed costs of setting up a new cardiac catheterization laboratory (construction and equipment) have been estimated at $3.1 million, without including the cost of physicians, nurses, and technologist staffing. Thus, the capital costs of the new PCI laboratories that have opened in this 5-year period are likely to have exceeded $1.5 billion.

Although these analyses advance our understanding of how geographic access for patients has changed with growth in PCI services, important limitations need to be kept in mind. First, the method used to identify PCI hospitals by Concannon et al in the current study differs from the method used by Nallamothu et al that serves as the comparator. It is unclear precisely how differences in methods between the 2 studies may have biased results. Second, the authors did not attempt to map new PCI programs to population density. From the data that are presented, it seems likely that many
new PCI programs were redundant (ie, built in areas that already had PCI available), but it is also possible that some new programs expanded access in important ways, especially in areas where there may have been significant “unmet” need for PCI services. Finally, although the authors found significant state-level variation in geographic access to PCI hospitals, variation in geographic access by urban and rural location and how this access changed over time were largely unexplored.

Despite the previously described limitations, these analyses are thought provoking, mainly because of the questions they raise. The apparent disconnect between growth in PCI hospitals and improvement in geographic access is striking. Although not clearly quantified, these data suggest that most new PCI programs opened in areas with preexisting PCI hospitals nearby. The potential impact of the growth in PCI hospitals on healthcare outcomes and costs is critically important. Although some may argue that establishing new PCI programs in close proximity to existing PCI programs will encourage competition, thereby increasing quality and lowering costs, empirical evidence suggests otherwise. Studies have shown that total healthcare costs are higher for patients treated in hospitals that operate in competitive markets because of perceived threat for “customers,” which may result in non–price-based competition (eg, investments to improve amenities of care).

Furthermore, given that national PCI volume has remained relatively unchanged during this period, patient outcomes may worsen if increased local competition results in redistribution of a fixed volume of cases between more hospitals. There is also concern that market competition increases use rates of procedures, especially for discretionary or even inappropriate indications to fulfill unmet capacity to provide a service. Furthermore, given that national PCI volume has remained relatively unchanged during this period, patient outcomes may worsen if increased local competition results in redistribution of a fixed volume of cases between more hospitals. There is also concern that market competition increases use rates of procedures, especially for discretionary or even inappropriate indications to fulfill unmet capacity to provide a service.

Because of these concerns, growth of new revascularization programs, including PCI, was regulated by federal certificate-of-need programs in the past. After the federal law was repealed in 1984, nearly half of the US states continued certificate-of-need regulation for cardiac revascularization, including PCI. States that discontinued this legislation had greater expansion in the number of new PCI programs, higher inappropriate use of cardiac catherization, and a higher overall PCI use rate compared with states with certificate-of-need regulations. However, the impact of these regulations in improving patient outcomes or achieving equitable access remains unsettled. With the ongoing proliferation of new PCI programs, a better understanding of the markets (and hospitals) in which these programs have been established, their impact on clinical appropriateness, use, cost of care, patient outcomes, and population health is clearly warranted. This will inform future policy aimed at aligning growth in PCI capacity with improved access to quality care. To their credit, the authors validated the American Hospital Association data as a reliable source of information about a hospital’s PCI capability, which would be useful in conducting future research in this area.

The findings from this study also carry implications for STEMI regionalization. Despite the growth in PCI capacity, 42 million Americans lived outside a 60-minute prehospital time window to a PCI-capable hospital, a number that has remained largely unchanged over the past 5 years. Although several hospital systems have developed innovative transport strategies (eg, emergency air medical services) to make PCI available to some of these patients, these efforts have not been successful in achieving timely revascularization in these patients as the result of significant delays at local hospitals.

Does this argue for a PCI laboratory in every hospital? Although this may achieve universal access to PCI and obviate the need for interhospital transfer, this strategy is impractical and expensive. To overcome this, some centers have been successful in improving interhospital transfer times through targeted interventions (strengthening of emergency medical response and systematic treatment protocols); this requires substantial investment that may not be realistic for all hospitals and communities. With new evidence suggesting that modern thrombolytic therapy has substantially attenuated the mortality benefit from primary PCI, it may be time to re-examine initial thrombolysis as a reperfusion strategy for eligible patients, followed by transfer to a PCI hospital. As we deliberate strategies to deliver optimal care to patients with STEMI, especially those who present to non-PCI hospitals, we may be well served to also learn from technological innovations in the area of stroke regionalization. Several hospital systems have effectively used telemedicine to support hospitals without a neurologist on site in initial evaluation, management, and decision making in stroke patients with improved patient outcomes. There may be potential for a similar strategy in improving care for patients with acute coronary syndrome, including STEMI, who present to hospitals without PCI capability.

Last, access to quality care is a complex construct, and geographic proximity represents only 1 of its dimensions. Other dimensions of access that are particularly relevant include socioeconomic factors (eg, health insurance), cultural factors (eg, perceived stigma), and perceived need for care (eg, treatment-seeking behavior). The current study analyzes only geographic access and does not directly measure whether new PCI programs provided greater access to patient subgroups who have historically been less likely to receive revascularization with PCI (eg, women, elderly individuals, African Americans, and patients without health insurance). If the new programs markedly improved access among these patient subgroups, this would be of major importance, despite the limited improvement in geographic access that the new programs added. This is an importance area for future research.

In conclusion, the study by Concannon et al documented a marked increase in the number and proportion of US hospitals offering PCI between 2001 and 2006; however, this was accompanied by little improvement in geographic access to PCI. Future studies need to better understand the impact of the new programs on patient outcomes, healthcare use, and costs to better inform policy.

Disclosures
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References

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