EDITORIAL COMMENT

The Value Proposition in Percutaneous Coronary Intervention*

Sunil V. Rao, MD, Manesh R. Patel, MD
Durham, North Carolina

New therapies are incorporated into clinical practice for a variety of reasons. Usually, they are more efficacious than what is currently used for a specific disease state. Sometimes, they are just as efficacious but safer. When a new treatment strategy is able to achieve better efficacy and safety, at an equal or lower cost, it becomes a “dominant” strategy. Few therapies in cardiovascular medicine are considered dominant because efficacy and safety are often at odds—for example, the use of potent antiplatelet therapies in the management of acute coronary syndrome (ACS) reduces the risk of recurrent myocardial infarction at the risk of increased major bleeding (1)—and costs are often not evaluated in the pivotal trials of a new treatment. Complicating matters even further is that the term costs is often used indiscriminately to describe a variety of resource use metrics from the patient, hospital, and societal perspective. Ultimately, what patients, providers, and payers seek is “value”—defined as health outcomes achieved per dollar spent (2). The concept of value in healthcare is one that is patient-centered and outcomes-based; thus, achieving the desired outcomes at reduced costs provides the greatest value for all healthcare system stakeholders.

In this issue of JACC: Cardiovascular Interventions, Amin et al. (3) utilized data from 5 hospitals to examine the association between transradial percutaneous coronary intervention (PCI) and costs. In this study, costs were assessed from the hospital perspective, that is, what the hospital pays for equipment, personnel, and resources in order to perform PCI. After adjustment for differences between procedures performed via radial or femoral access, transradial PCI was associated with a significant decrease in costs. The authors make 3 other important observations. First, the procedural costs (the cost of doing the PCI via radial or femoral access) were not statistically different between the 2 access approaches, although they favored radial. Second, the cost savings with transradial PCI were driven to a large extent by reduced length of stay, and minimally by reductions in bleeding complications. Third, the cost savings from the radial approach were greater among patients at higher risk for post-PCI bleeding. These data provide an important backdrop for discussing a broad range of issues related to achieving “value” in PCI.

Because achieving desired health outcomes is a fundamental aspect of determining value, it is important to first determine whether transradial PCI is associated with efficacy and/or safety that is superior to transfemoral PCI. The study by Amin et al. (3) also examined clinical outcomes as a secondary endpoint and showed an association between radial access and a significant reduction in bleeding. Other observational and randomized studies have demonstrated similar findings (4). This safety advantage is realized without sacrificing efficacy. Because the radial artery can readily accommodate 6-F introducer sheaths in most patients, complex clinical scenarios such as unprotected left main stenoses (5), bifurcations (6), chronic total occlusions (7), and acute ST-segment elevation myocardial infarction (8) can be successfully addressed via radial access. One disadvantage of transradial PCI is that there is a learning curve associated with becoming proficient enough to realize the safety advantage over femoral access (9). Although the curve may not be steep, operators who are early in their radial experience may realize longer procedure times, higher radiation exposure (10), and even higher rates of procedural failure (11). This is the “price” that operators have to pay when starting a radial program, and there may be opportunity costs during this early period that were not differentiated in the study by Amin et al. (3). The radial approach is often avoided in patients at higher risk for bleeding such as females and the elderly (12) because transradial PCI may be more difficult to perform in these patients, especially when operators are still learning the procedure.

The other dimension of determining value is the cost associated with adopting the radial approach. A common misconception is that transradial PCI requires specialized equipment such as catheters with radial-specific shapes, which may be more expensive than standard femoral guide catheters. The study by Amin et al. (3) shows that procedural costs, defined as costs incurred on the day of the procedure (including what the hospital pays for any specialized equipment), were not significantly different between radial and femoral procedures. This result is not surprising to experienced radial operators because the only specialized piece of equipment that is necessary is a hydrophilic introducer sheath, and most radialists use standard femoral curves for transradial PCI (13). Thus, transradial PCI can be adopted using the


From the Duke Clinical Research Institute, Durham, North Carolina. Dr. Rao receives an honorarium (modest, <$10,000) as a consultant for Terumo Medical. Dr. Patel has reported that he has no relationships relevant to the contents of this paper to disclose.
equipment that is readily available in all catheterization laboratories. Although procedural costs were not different, total costs were $1,531 lower with radial procedures—a difference that was primarily driven by decreased length of stay among patients who underwent transradial PCI, and to a lesser extent by the reduction in bleeding. In a retrospective study, it is difficult to clearly distinguish costs directly related to a bleeding event from those related to length of stay; however, for the purpose of determining the value of transradial PCI, such distinctions are largely immaterial, because the issue is really whether the overall costs of delivering the procedure are lower compared with the femoral approach. Hence, the study by Amin et al. shows that among experienced operators and centers, the radial approach is a dominant strategy.

These data add to the body of literature that supports the wider adoption of transradial PCI, and reinforces the importance of implementing more efficient care models. The current healthcare reimbursement structure may provide an incentive for the adoption of such models that emphasize value over volume. Although reimbursement is an area that is constantly changing, payment for PCI can be divided into 2 categories based on whether a procedure is considered outpatient or inpatient. For patients covered under the Medicare program, facility outpatient services are paid using codes that fall under the Ambulatory Payment Classifications (APC) system, which is a prospective payment system begun under the Federal Balanced Budget Act of 1997. Reimbursement for outpatient PCI provides a fixed payment for hospitals that includes dependent, ancillary, supportive, and adjunctive items used to provide the service. According to the Centers for Medicare and Medicaid Services (CMS):

“When patients with known diagnoses enter a hospital for a specific minor surgical procedure or other treatment that is expected to keep them in the hospital for only a few hours (<24), they are considered outpatients for coverage purposes regardless of the hour they came to the hospital, whether they used a bed, and whether they remained in the hospital past midnight” (14).

By contrast, inpatient PCI procedures, such as those for patients hospitalized with ACS, are covered another prospective payment system that uses Diagnosis Related Group (DRG) codes. Both are forms of “bundled” payments where any savings generally determines the hospital’s margin.

Because of the premium for inpatient PCI (Table 1), hospitals previously had an incentive to bill all PCI procedures under the DRG system, including elective procedures for stable angina. Many of these patients were observed overnight in the hospital and discharged within 24 h. Changes to the InterQual admission criteria resulted in elective PCI procedures being dropped from the list of procedures deemed appropriate for inpatient status. In 2005, CMS implemented the Recovery Audit Program (which was made permanent in 2006), with the goal of recouping overpayments made under the Medicare and Medicaid Programs. A prime focus of these audits is payment made under the inpatient prospective payment system that should have been billed under the lower rates of the APC. Several high-profile recovery audits have taken place for inappropriate inpatient billing of PCI procedures with short inpatient stays (i.e., ≤24 h) that were more appropriate for the lower reimbursement under the outpatient system (15), resulting in millions of dollars in fines for hospitals.

The increased scrutiny of hospital billing practices and the focus on value provides the ideal context in which to apply the lessons from the study by Amin et al. (3). Hospital margins on outpatient PCI procedures are related to the savings that a hospital can realize while providing appropriate care. Thus, transradial PCI represents a strategy, not only to improve the safety of PCI, but also to reduce hospital costs and potentially realize a financial return. Radial access is ideally suited for same-day discharge (16); for many centers, same-day discharge after elective transradial PCI may increase bed availability and allow for even greater margins by reducing the overhead costs associated with observing patients overnight (17). Additionally, for patients, if same-day discharge can be safely implemented, then it will likely be broadly favored. The value proposition of the transradial strategy extends beyond just outpatient procedures. As mentioned, patients at highest risk for bleeding have the greatest potential to benefit from radial approach.

<table>
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<tr>
<th>Table 1. Inpatient and Outpatient Facility Reimbursement Rates for Selected PCI Procedures</th>
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<td><strong>In-patient reimbursement</strong></td>
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<tr>
<td>Percutaneous cardiovascular procedure with non–drug-eluting stent without major complication or comorbidity (MS-DRG 249)</td>
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<tr>
<td>Percutaneous cardiovascular procedure with non–drug-eluting stent with major complication or comorbidity or 4+ vessels/stents (MS-DRG 248)</td>
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<tr>
<td>Percutaneous cardiovascular procedure with drug-eluting stent without major complication or comorbidity (MS-DRG 247)</td>
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<tr>
<td>Percutaneous cardiovascular procedure with drug-eluting stent with major complication or comorbidity or 4+ vessels/stents (MS-DRG 246)</td>
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<tr>
<td><strong>Outpatient reimbursement</strong></td>
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<tr>
<td>Transcatheter placement of intracoronary stents (APC 0104)</td>
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<td>Transcatheter placement of intracoronary drug-eluting stents (APC 0656)</td>
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Rates shown for inpatient reimbursement are based on fiscal year 2013; rates shown for outpatient reimbursement are based on calendar year 2013. Actual rates for individual hospitals may vary due to geographic wage differences.

APC = Ambulatory Payment Classifications; MS-DRG = Medicare Severity Diagnosis Related Group.
High-risk ACS patients, such as those with ST-segment elevation myocardial infarction, may also realize a mortality benefit from transradial PCI (18). As payers look for healthcare systems to provide more comprehensive care for inpatient diagnoses, there will likely be implementation of payment reforms such as bundled payments that cover both the initial hospital-based episode of care as well as follow-up over a defined period of time. Under this structure, several innovations or cost-reducing actions will be evaluated, and the role of transradial PCI may take on even greater significance. The challenge will be for hospitals and operators to navigate this new landscape and maximize patient outcomes.

As the healthcare environment evolves, providers must take into account, not only the efficacy and safety of new therapies, but also the costs of implementing them and how these costs affect the overall healthcare value equation. For PCI, the goals of therapy include relief of angina, prolonging life, and reducing the need for subsequent procedures, while minimizing bleeding and vascular complications. Given the robust body of evidence supporting the safety and efficacy of transradial PCI, and the data demonstrating cost savings, greater use of the radial approach across the spectrum of clinical risk will translate into delivering value to patients and payers.

Reprint requests and correspondence: Dr. Sunil V. Rao, The Duke Clinical Research Institute, 508 Fulton Street (111A), Durham, North Carolina 27705. E-mail: sunil.rao@duke.edu.

REFERENCES


Key Words: economics ■ percutaneous coronary intervention ■ transradial.