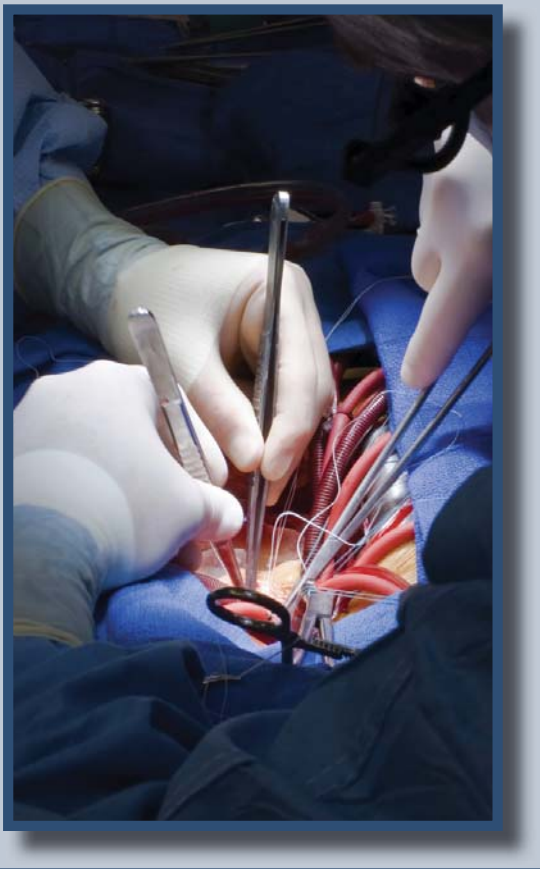
BERKELEY CENTER
FOR HEALTH TECHNOLOGY

Issue Brief

Costs and Reimbursement for Cardiac Valve Surgery in California Hospitals, 2008

The Berkeley Center for Health Technology (BCHT), together with the Integrated Healthcare Association (IHA), has conducted a study of Value-Based Purchasing of Medical Devices (VBP). The project included the collection and analysis of hospital and patient data on seven orthopedic, cardiac, and spinal procedures. This Issue Brief presents findings on implant costs, total surgical costs, complications, and insurance reimbursement for cardiac valve surgery.

Forty-five California hospitals participated in the full data colleciton initiative, providing data on device costs, total procedure costs, length of stay, complications, reimbursements, and patient characteristics. Of these hospitals, only 29 had cardiac surgery programs; the data presented here are from these institutions. Hospital participatns are diverse in terms of whether they belong to a multi-hospital system, urban or rual location, for-profit or non-profit status, teaching staus, and bed size. All data are from 2008.



Improvements in both surgical technique and the quality of implantable valves have permitted a substantial growth in the volume of aortic and mitral valve replacement procedures in the past decades, leading to a 33% increase between 1992 and 2003. Greater procedure volumes save lives, and also offer substantially better quality of life for patients who undergo the procedure, but they also raise concerns about the rising cost of both the surgeries and the implantable devices employed.

A key decision for surgeons who carry out these procedures is the choice of implantable valve from among the types of valve (mechanical or tissue-based) and among the competing medical device firms that manufacture the implants. Heart valves

Figure One

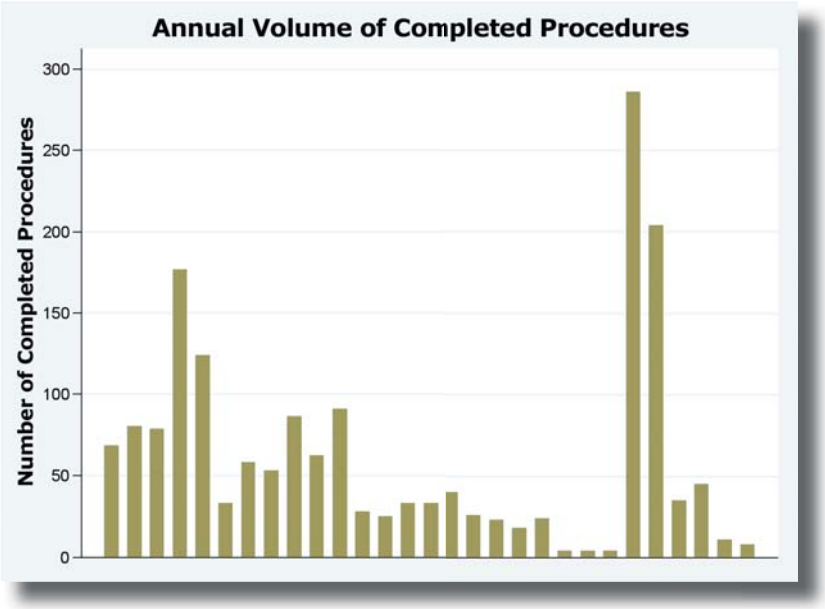
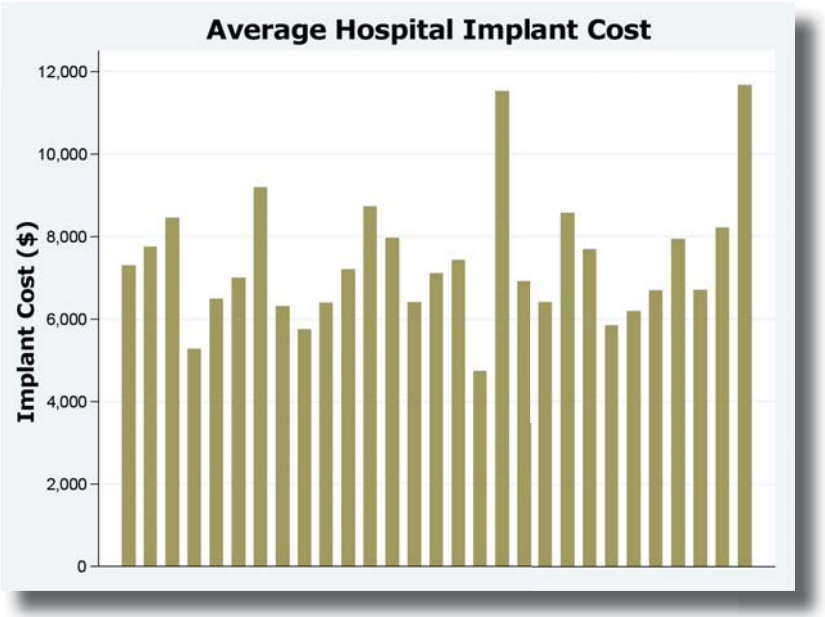


Figure Two



are physician preference items (PPI), which means that the choice of valve is made by the surgeon responsible for its implantation. This contrasts with many other hospital supplies, which are chosen by the purchasing department based on comparisons of price and quality across all potential vendors. Physician preference items can create tension between physicians and hospitals, as they are high cost supplies, and the surgeon's choice may not be made with regard to the hospital's goals of cost containment and quality improvement.

Hospital efforts to moderate cost growth in surgery are often referred to as 'value-based purchasing' (VBP) initiatives. Under VBP, a hospital and its physicians select inputs based on considerations of cost and quality and in a manner that relies as much as possible on solid clinical evidence and on the experiences of all participating surgeons. VBP initiatives are common for orthopedic knee and hip replacement surgery, for spine surgeries such as lumbar and cervical fusion, and for interventional cardiology procedures such as angioplasty with stent, or cardiac rhythm management with a pacemaker or defibrillator.

In an effort to highlight the salience of VBP initiatives, this Issue Brief presents data on procedure volume, implant costs, total procedure costs, and insurance reimbursement for aortic and mitral valve replacements in California hospitals, collected in the Value-Based Purchasing of Medical Devices project.

There is Substantial Variation in the Annual Volume of Valve Procedures

Across the 29 participating hospitals, the annual procedure volume varied by a factor of over seventy, with the lowest-volume hospital completing four procedures, and the highest-volume hospital completing 286 in 2008. This variation is showcased in Figure One. The average number of procedures

was 61. Differences in surgical volume are important to note for two reasons. First, there is an inverse relationship between hospital volume and mortality rates for both aortic and mitral valve replacement surgeries, meaning surgeons and hospitals that perform high numbers of procedures experience better patient outcomes than do those performing fewer procedures.

Second, higher-volume hospitals may be able to leverage their implant purchases in order to command lower device prices, which could reduce the overall cost of care for the facility and, over time, for the patient and the patient's insurer. It is certainly not invariably the case that hospitals with high procedure volumes receive price discounts from valve manufacturers, however, since implant choice is made by each individual surgeon without necessarily any cooperation or consultation with other surgeons or hospital administration. If valves are chosen by individual surgeons without respect to cost, there is no reason to believe that hospitals using more valves will obtain lower prices than those using fewer valves.

Hospital Implant Costs Vary by a Factor of Two and a Half Across Hospitals

The average implant cost per hospital is charted in Figure Two. The minimum average cost across the 29 hospitals was $4,740, and the maximum average cost was $11,666, with a midpoint of $7,373.

Variation in Hospital Complication Rates and Length of Stay

Characteristics of the surgical procedures themselves (not just the implants) are also quite variable across hospitals. In the VBP project, complications are defined as events severe enough to prolong hospital stay by at least one day. For valve replacement, complications per hospital ranged from 0 to 1.1, with an average of 0.4. This variation

Figure Three

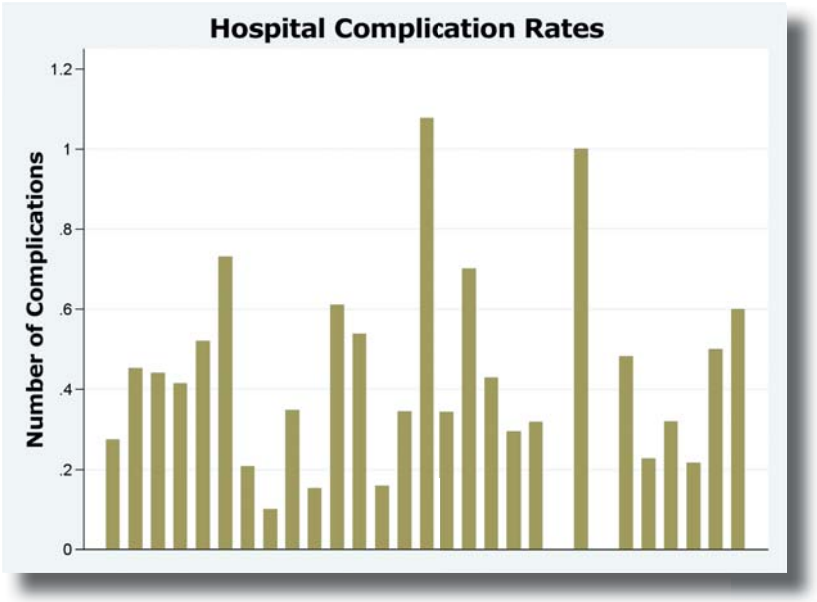


Figure Four

can be seen in Figure Three. Length of stay, not illustrated here, ranged from a minimum of 8.1 days to a maximum of 53 days, with a mean of 12.2. The hospital with a 53-day LOS also had the lowest procedure volume, completing only four procedures in 2008. This average was just over a day less than the national mean length of stay for heart valve replacement (11.4).[1]

Figure Five

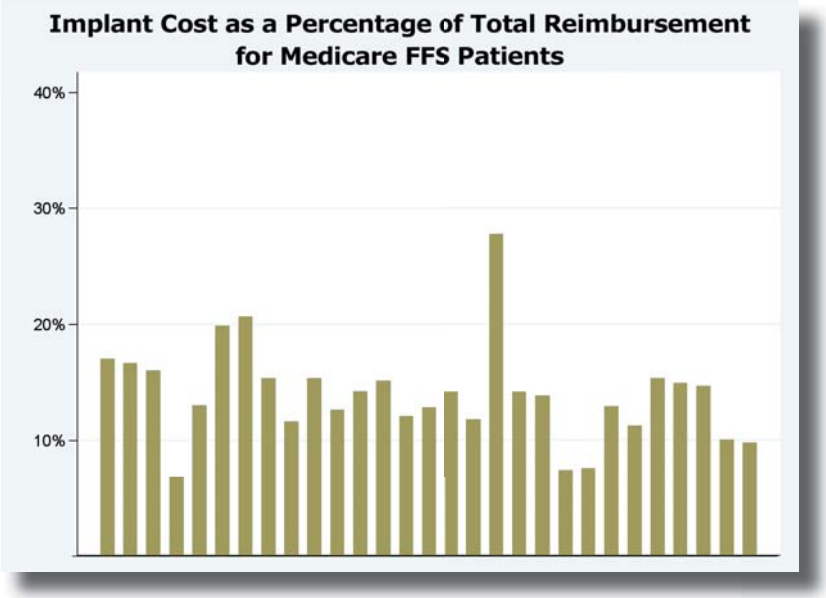
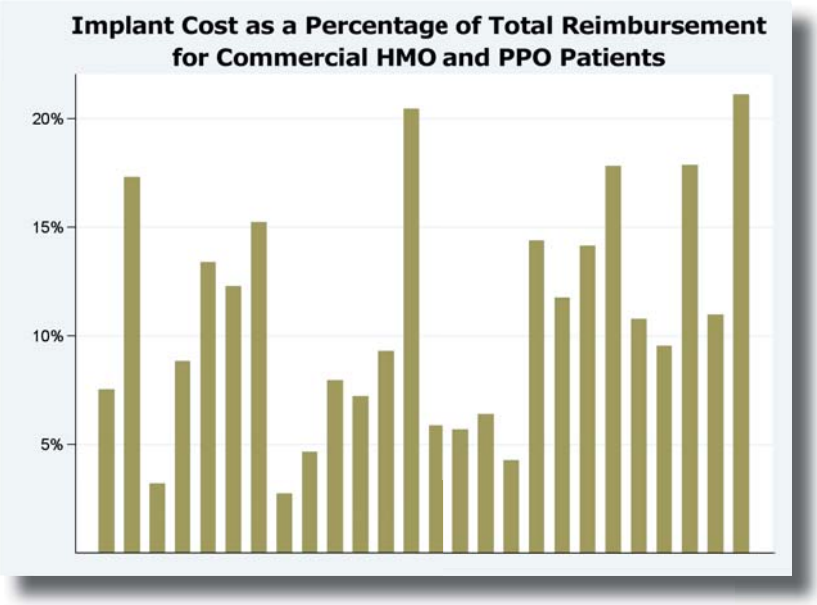


Figure Six



Hospital Total Costs Vary by a Factor of Over Three

Figure Four presents average total costs for valve replacement surgery across participating hospitals, which range from $28,555 to $95,480, with a mean of $46,495. Total costs include the cost of the replacement valve plus staffing, operating room time, drugs, and other ancillary supplies, but do not include the professional fees paid to the surgeon and other physicians.

Implant Cost as a Percentage of Reimbursement

Traditionally, commercial reimbursement is more profitable for hospitals than Medicare reimbursement. This is due to the fact that while CMS dictates Medicare rates, hospitals can often negotiate more beneficial rates with commercial insurers. Hospitals also often 'carve out' the price of a device from commercial reimbursements, isolating themselves from price increases, whereas Medicare DRG payments include the device. This means that if a device manufacturer introduces a new and more expensive implantable device, a hospital can potentially increase its revenues from commercial insurers, but must absorb the cost for its Medicare patients.

Figure Five shows implant costs as a percentage of total reimbursement for Medicare fee-for-service patients, which ranges from 6.8% to 27.7%, with a mean of 13.9%. For commercial HMO and PPO patients, shown in Figure Six, device cost as a

percentage of reimbursement ranges from 2.7% to 21.1%, with a mean of 10.8%.

Conclusion

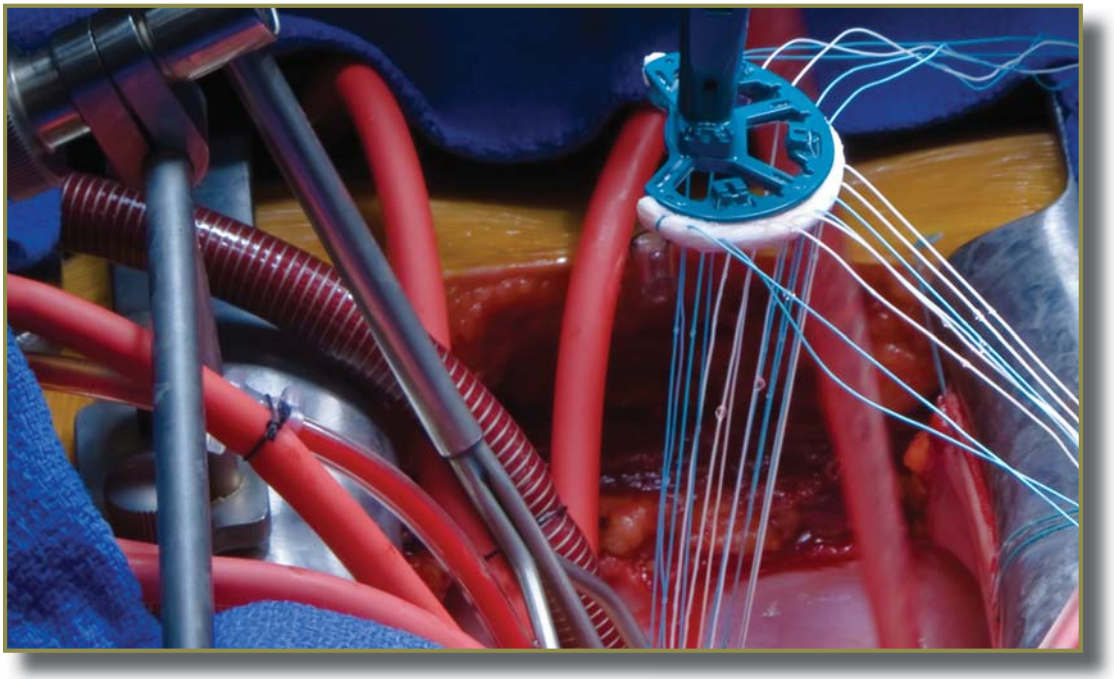
As presented in this Issue Brief, the Value-Based Purchasing initiative documented substantial variation in the annual volumes of aortic and mitral valve replacement surgery in California hospitals, from a low of four to a high of 286. Research studies have found an association between volumes and outcomes, with patients in high-volume hospitals experiencing better quality than patients in low-volume hospitals.[2]

The VBP initiative also documented substantial variability in the average cost per surgical procedure. In separate analyses using detailed patient-level data, we found no association between the annual volume of procedures done in a particular hospital, on the one hand, and the cost per procedure, on the other. Rather, high hospital costs were found for patients with greater severity of illness and those who suffered surgical complications during the course of their hospital stay. Moreover, hospitals in consolidated local markets manifest higher costs per procedure than hospitals in competitive markets, controlling for disease severity and surgical complications.

A substantial part of the variability among hospitals and patients in total surgical costs results from variability in the cost of the valve implants themselves. The average cost of the implants ranges across hospitals by a factor of two and a half, from a low of $4,740 to a high of $11,666. In turn, high implant costs absorb a large fraction of the total reimbursement for the procedure that the hospitals obtain from Medicare and private insurers. This is especially true for Medicare patients, where the cost of the artificial valve implant ranges from a low of 6.8% to a high of 27.7% of total reimbursement to the hospital.

[1] Data based on weighted national estimates from HCUP Nationwide Inpatient Sample (2008); these data include 102,795 discharges (all age groups).

[2] Birkmeyer JD, et al., Hospital volume and surgical mortality in the United States. *NEJM*. 2002;346.15:1128-1137..



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