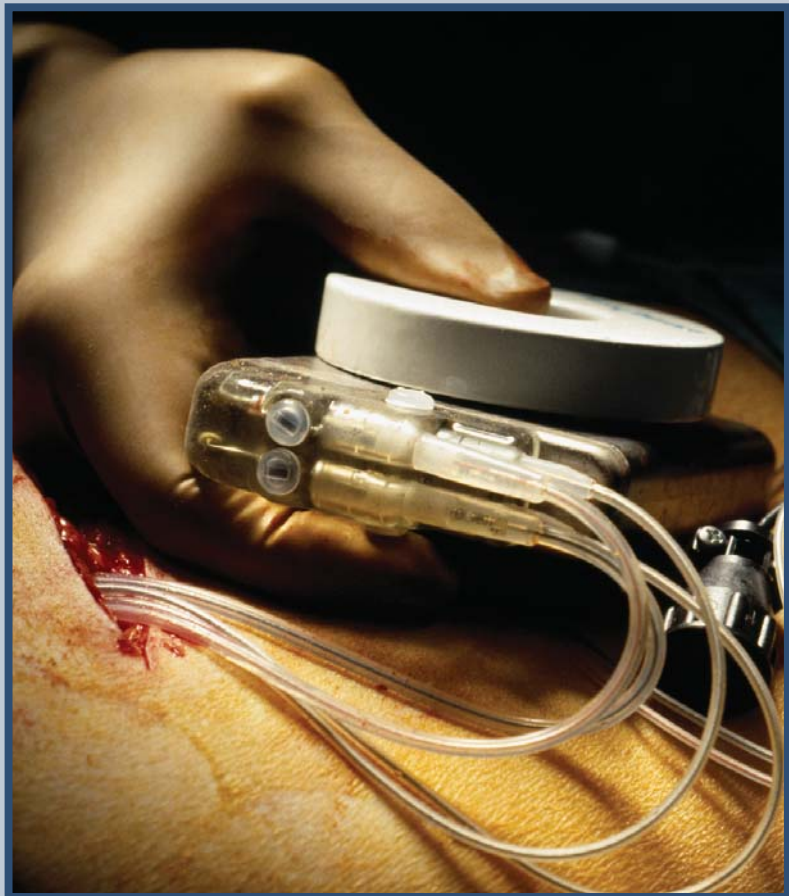


## **Pacemaker and Implantable Cardioverter-Defibrillator (ICD) Implant Procedures in California Hospitals**

The Berkeley Center for Health Technology (BCHT) has been working with the Integrated Healthcare Association (IHA) on its Value-Based Purchasing of Medical Devices (VBP) project, which has included the collection and analysis of hospital and patient data on seven major orthopedic, cardiac, and spine procedures.

This Issue Brief is the seventh in a series that comes out of this project, and presents findings on implant costs, total surgical costs, complications, and insurance reimbursement for the implantation of cardiac pacemakers and Implantable Cardioverter-Defibrillators (ICD). The VBP Project and this series of Issue Briefs were funded by the Blue Shield of California Foundation and the California Health Care Foundation.

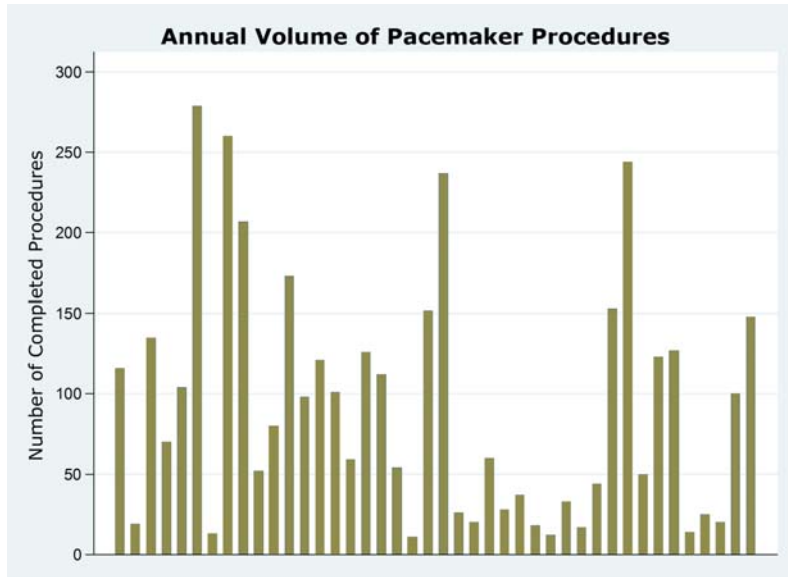
Forty-five hospitals in California participated in the full data collection initiative, providing data on device costs, total procedure costs, patient characteristics, length of stay, complications, and reimbursements. Of these hospitals, 34 performed ICD implantations, and 42 performed



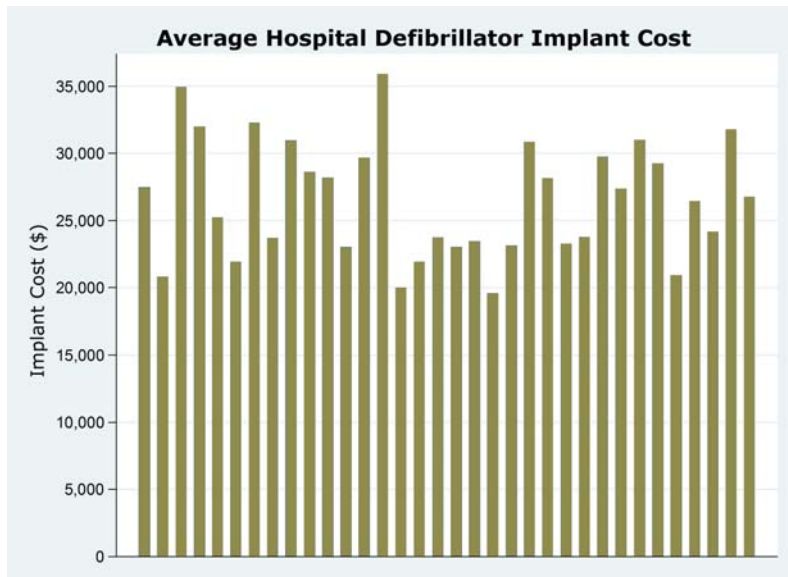
pacemaker implantations; the data presented here are from these institutions.

Hospital participants are diverse in terms of whether they belong to a multi-hospital system, urban or rural location, for-profit or non-profit status, teaching status, and bed size. All data are from 2008.

**Figure One**



**Figure Two**



The treatment of cardiac arrhythmia sometimes involves the implantation of either a pacemaker or an implantable cardioverter-defibrillator (ICD) to monitor the arrhythmia and to correct irregularities when they occur. Over the past several decades, technical advances have been rapid and clinical indications have expanded for both types of device.

Cardiac rhythm management devices are physician preference items (PPI), which means that the choice of device is made by the cardiologist, as opposed to the hospital purchasing department. Most hospital supply purchases are coordinated by this department, which can leverage discounts from bulk purchasing. In contrast, PPI can be a source of conflict between physicians and hospitals as the devices are often high cost, and chosen without weighing the hospital’s desire to contain costs.

Engendering cooperation between hospitals and physicians is necessary in moving towards more value-based purchasing of high-cost devices. A first step in this process is identifying variation in performance across hospitals, which highlights avenues for increased cooperation as well as the costs of non-cooperation. This Issue Brief highlights variation in procedure volume, implant cost and total costs, complications and length of stay, and insurance reimbursement for pacemaker and ICD implantation for hospitals participating in the Value-Based Purchasing of Medical Devices project.

**The Number of Procedures Varies Substantially Across Hospitals**

The number of ICD implantations ranged from 12 to 279 across the participating hospital, with a mean of 110 procedures. The number of pacemaker procedures ranged from 11 to 279, with a mean of 92. The annual number of pacemaker implantation procedures is shown in Figure One.

**Average Implant Costs Differ Across Hospitals and Procedures**

ICD implants, whose average costs per hospital are shown in Figure Two, are substantially more expensive than pacemakers. ICDs range in price from \$19,578 to \$35,916, with a mean of \$26,562, while pacemaker costs range from \$4,937 to \$10,818, with an average price of \$6,672. These figures derive from hospital cost accounting systems and reflect the amounts paid by the hospitals to the device manufacturers and distributors, rather than the “charges” billed by the hospitals to insurers for reimbursement of these devices. Variation across hospitals in the average prices paid suggests that some hospitals are deriving substantial financial benefit in cost savings through more effective PPI evaluation and purchasing.

**Complications and Length of Stay**

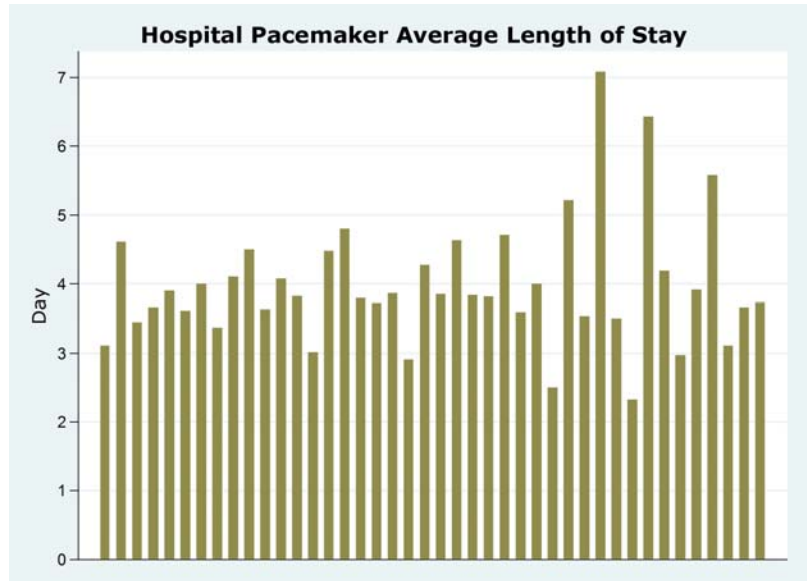
Both complication rates (not illustrated here) and length of stay were less variable for pacemaker procedures than ICD procedures. For ICD implantation, complication rates ranged from 0 to 33%, with an average rate of 6%. For pacemaker procedures, complication rates ranged from 0% to 16%, with an average rate of 5%. For the purposes of this project, complications were defined as in-hospital events that resulted in an increased length of stay of at least one day.

Length of stay ranged from 1 to 12 days for ICD procedures, with a mean of 4 days. For pacemaker procedures, the average length of stay was 4, with a range of 2 to 7. Figure Three shows length of stay for pacemaker procedures.

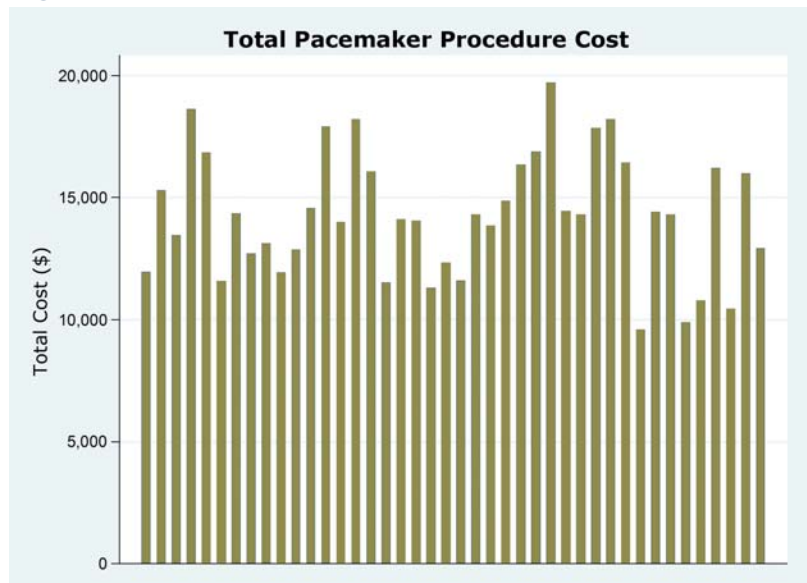
**Total Procedure Costs Vary by a Factor of Two among Hospitals**

Driven in part by higher device costs, ICD

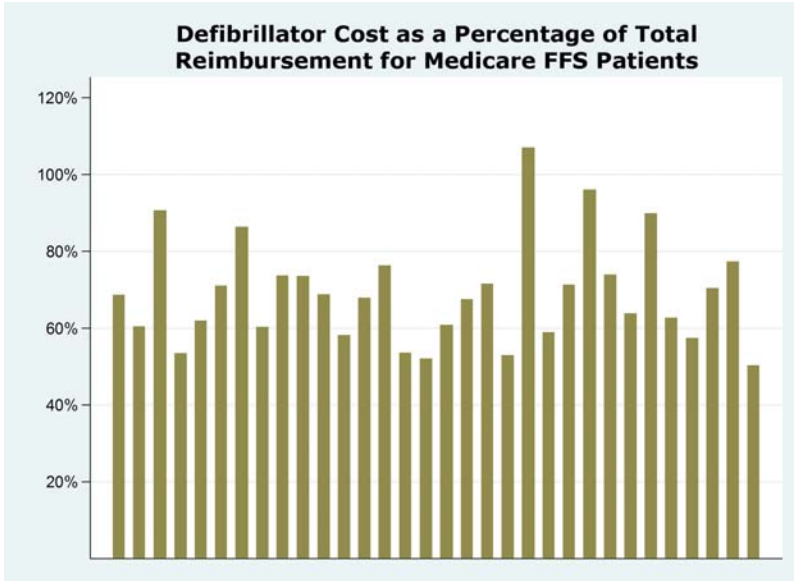
**Figure Three**



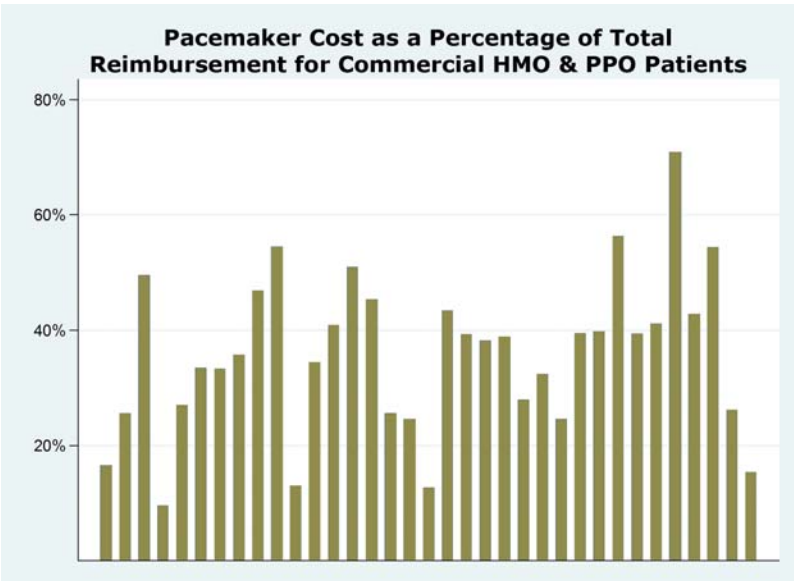
**Figure Four**



**Figure Five**



**Figure Six**



procedures have higher total costs than pacemaker procedures. For ICD implantation, total costs range from \$24,078 to \$57,347 with an average of \$36,098, whereas total costs for pacemaker implantation, range from \$9,616 to \$19,726, with an average cost of \$14,290. As with the implant data presented above, these procedure cost figures reflect actual costs incurred by the hospital (including price for the implant itself, other supplies, staffing, operating room time, &c.), and are not the “charges” billed to insurers for these procedures. Hospital procedure costs for pacemakers are shown in **Figure Four**.

**Implant Cost as a Percent of Insurance Reimbursement**

Implant cost as a percent of total reimbursement varies widely across hospitals, source of insurance coverage, and procedure. For both Medicare and commercial insurance, the implant cost as a percent of reimbursement was lower for pacemakers.

For defibrillator recipients covered by Medicare, implant cost as a percent of reimbursement ranged from 50% to 107%, with a mean of 69%. This variation is seen in **Figure Five**. For pacemaker recipients with Medicare insurance, implant cost as a percent of reimbursement ranged from 27% to 90%, with a mean of 41%.

For many procedures, Medicare reimbursement is lower than commercial reimbursement. This is due to the fact that CMS is able to dictate payment rates, and its rates include the price of the device. For commercial insurers, hospitals are often able to negotiate higher rates and can “carve out” the price of the device from payment for the procedure. This does not hold true across the board; for defibrillator procedures in participating hospitals (of which there were only 26 with ICD recipients covered by commercial insurance), implant cost as a percent of commercial reimbursement ranged from 23% to

981%, with a mean of 112%, which was significantly higher than the device cost as a percent of Medicare reimbursement. The hospital on the high end of this range is an outlier and completed only three ICD procedures for commercially insured patients in 2008. Eliminating this outlier hospital from the analysis, ICD implant cost as a percent of commercial insurance reimbursement ranged from 23% to 281%, with a mean of 78%. For pacemaker implantation, implant cost as a percent of commercial reimbursement ranged from 10% to 71%, with a mean of 35.7%. This is shown in Figure Six.

### Conclusion

The Value-Based Purchasing Initiative found substantial between-hospital variation in procedural volume, device cost and total surgical costs, and device costs as a percentage of reimbursement across all examined procedures. This held true for both cardiac rhythm management procedures outlined in this Issue Brief.

Substantial variation in device costs, complications, length of stay, and total costs point to opportunities for hospital cost savings through increased collaboration with their physicians and surgeons. One method would be to identify common complications and work with physicians to uncover their root causes. Another would be to seek better alignment on the choice of devices, through the use of in-hospital physician-run technology assessment committees.

Variation in measures of surgical efficiency suggests that healthcare resources are not being used to their full potential in hospitals across California. Highlighting this variation, as the Value-Based Purchasing of Medical Devices Project has done, is the first step towards reducing that variation and promoting best practices.



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