The Short-Term Economic Implications of Prosthetic Selection in Hemiarthroplasty of the Hip

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ABSTRACT

This retrospective study assessed the economic impact of prosthetic selection in the treatment of displaced intracapsular fractures. The records of 28 patients who received an Austin-Moore, nonmodular device and 12 patients (6 men and 6 women; mean age, 77 years) who received a modular bipolar device. The bipolar group had significantly greater mean operating times, total charges for the device, and total charges for supplies. Surgeons treating hip fractures should consider implant cost, functional outcome, and patient demands when selecting a prosthesis for hemiarthroplasty care.

More than 250,000 hip fractures occur annually in the United States.1 Published data from Denmark estimate that the number of hip fractures will triple by the year 2009 and will include up to one third of all women of age 80 years or older.2 The cost of caring for patients with hip fractures in the United States exceeds $8.7 billion.3 It is estimated that it will increase to over $16 billion annually by 2040.4

In the era of cost-effectiveness, accountability, and cost containment, orthopedists need to be aware of the importance of their decision making regarding hip care costs. Currently, a surgeon faced with a displaced intracapsular hip fracture in an elderly patient has several options: open reduction and internal fixation (ORIF), hemiarthroplasty, or total hip replacement.5,6 Although in most of the European countries the standard of care for a displaced femoral neck fracture is attempted ORIF, the choice of treatment in the United States for a patient older than 65 years is a hemiarthroplasty.7 In Florida alone, during 1992, more than 9600 hemiarthroplasties were performed.8 A conservative estimate would place the total number of hemiarthroplasties across the country at over 150,000.

Once the clinical decision has been made to perform a hemiarthroplasty, the surgeon must select a device. Stem selection is a complicated process, and currently there are more than 80 different choices.9 Once a stem has been selected, most modern modular systems allow the surgeon to use a unipolar or fixed-head device, or a bipolar device. The bipolar device was introduced in the United States in 1965 and was designed to minimize acetabular erosion.10 The theoretic advantages of a bipolar head include an inner bearing that protects the acetabular cartilage from erosion and the number of head sizes available, as well as the ease of conversion to total hip replacement. Published data have shown that bipolar devices, after a short period, cease to function as gliding devices and that their inner bearings freeze, rendering their functioning similar to that of unipolar heads.11,12 Two prospective randomized studies found that at 2 years, the functional scores of patients who received an Austin-Moore (nonmodular, older design) were no different than those of patients who received a bipolar device.13,14 In addition, large amounts of polyethylene debris are produced by bipolar devices.15

The costs of the devices available for hemiarthroplasty before the introduction of the bipolar head were about $400 to $800. Currently available bipolar devices cost anywhere from $600 to $4000, depending on the stem’s fixation mode. Surgeons now have the decision power to triple the cost of the part used in a common surgical procedure. The decision of whether to use a bipolar or a unipolar head alone can add $400 to $500 per surgical procedure. Devices of older design with nonmodular heads, such as the Austin-Moore or Thompson devices, are still sold by manufacturers for less than $400.

In 1986, Diagnostic Related Groups (DRG) reimbursements were introduced by Medicare. While this fixed-reimbursement policy, hospitals get a fixed fee for the treatment of a condition regard-
less of how much they spend in the actual treatment. The effect of the DRG prospective payment system on the quality of care remains controversial. We have shown that the implant-selection process has a significant impact in the total cost of primary and revision hip and knee surgery. In an effort to cut costs, inexpensive stems were introduced by the industry to the late 1980s. The availability of less expensive stems allows the surgeon to have modularity during these procedures. This is extremely important, since one of the problems with fixed-head devices was the inability to convert them to total hip arthroplasty at a later date, if necessary.

Currently, more than 10 of these “DRG” devices are available in the United States market. The manufacturing, material selection, and design characteristics of these devices are variable, and surgeons should be extremely careful when selecting a device based on cost alone. The price range can range from $450 to $900, depending on whether a bipolar or a unipolar head is selected. The objective of this study was to assess the economic impact of prosthetic selection in the treatment of displaced intracapsular fractures.

METHODS

The chart records of all hematroplasties performed at a university medical center (University of California at San Diego Medical Center, 1986-1987) were reviewed. Only cases with complete clinical and demographic data were selected. Patient age, sex, diagnosis, amputation state (before and after surgery), and length of hospital stay were noted. Charts were also reviewed to assess any information that addressed the decision process used to select the device. The operative report was reviewed, and estimated blood loss, operative time, and the use of cement were recorded. All significant in-hospital complications were also recorded.

The attending physician was contacted, and all hospital charges were collected. Cost-to-charge ratios for the particular financial period were available. These cost-to-charge ratios allowed the calculation of the true costs of the parts. The physician billing office was contacted, and the billed surgeon charges were also available for all patients. The Student’s t-test was used to compare the groups, and a P<0.05 was considered significant.

RESULTS

A total of 28 patients were identified who had complete demographic and financial data. The patients were then divided into two groups based on the device used. A Zimmer (Warsaw, IN) device was used in all cases. Group 1 consisted of 16 patients (4 men, 12 women; mean age, 78 years) who received an Austin-Moore, nonmodular device. Group 2 consisted of 12 patients (6 men and 6 women; mean age, 77 years) who received a modular bipolar device.

There were no statistically significant differences between the two groups regarding patient age, sex, diagnosis, amputation state before and after surgery, and the use of cement. The length of the average hospital stay (15 days), as well as the average estimated blood loss (Austin-Moore group, 434 mL vs bipolar group, 555 mL), was not statistically different. The operative time, however, was statistically different, with the bipolar group having a longer mean operative time (192 minutes) than the Austin-Moore group (104 minutes).

The total charges for the device were statistically different, with the bipolar group having significantly higher charges (Figure A). The total charges for supplies (Figure B) were also significantly higher for the bipolar group. The billed surgeon charges were greater for the bipolar group (Figure C); this difference was statistically significant (P<0.01).

DISCUSSION

Traditionally, cost has not been a consideration in the clinical decision-making process of most surgeons. With the implementation of DRGs, institutions are paid a fixed amount for the total treatment of a particular condition. For DRG 210 (hip fracture), current reimbursement to the hospital ranges from $7000 to $10,000 depending on the geographic region of the country, complications encountered in the care of the patient, and comorbid conditions. It is easy to see how a surgeon selecting $5000 hydroxyapatite-coated stems with bipolar heads to treat hip fractures can become a financial burden to a hospital.

The differences observed in operating room time, as well as in implant costs, are probably due to the use of bipolar devices. The bipolar devices used in this study were modular components, as compared with the Austin-Moore devices, which are single, monopolar-type implants that do not have to be calibrated. The Austin-Moore devices are low in cost, whereas the bipolar devices are high-cost modular devices.

With the recent advances in information systems, it is easy to keep track of expenses and unnecessary use of resources for a particular diagnostic entity. Administrators have, at their finger-tips, computer terminals that will tell them how much each surgeon spends per case. In this era of effectiveness and cost containment, the use of the device that increases the cost of care for a particular procedure may have a great impact on the overall cost. Our data clearly demonstrate that implant selection significantly affects the total cost of hemiarthroplasty in intracapsular hip fractures.

In a prospective randomized study, Heintz and colleagues clearly showed that the functional outcomes in elderly patients treated with bipolar devices and in elderly patients treated with Austin-Moore devices were not different. In addition, the patient population that usually suffers these fractures has a very limited life expectancy. White and colleagues showed that these patients had a mortality rate of greater than 20% 1 year after the fracture. Kenzora and colleagues demonstrated a mortality rate double the expected rate for sex and age in patients suffering hip fractures. Surgeons must inform consumers when evaluating new technology.

The implant selection process has already been taken away from surgeons in large HMO hospitals in California. These large hospitals, with hundreds of thousands of patients, “contract out” with specific orthopedic implant companies and negotiate large discounts in exchange for volume. These negotiations are being done by administrators and accountants with very little knowledge about outcomes. The main reason that this is happening is the inability for us, as orthopedic surgeons, to assess new technology in a cost-effectiveness framework. At our institution, an orthopedic advisory group has been formed, and rigorous scientific and economic research is being done by surgeons and administrators to negotiate volume discounts for the "best device.

CONCLUSION

Surgeons treating hip fractures should consider implant cost, functional outcome, and patient demands when selecting the prosthesis for hemiarthroplasty care. It is imperative that orthopedic surgeons become the driving force in the negotiating process when implants are being selected for use in surgery.

REFERENCES

less of how much they spend in the actual treatment. The effect of the DRG prospective payment system on the quality of care remains controversial. We have shown that the implant-selection process has a significant impact in the total cost of primary and revision hip and knee surgery. In an effort to cut costs, inpatient stays were introduced by the industry in the late 1980s. The availability of less expensive implants allows the surgeon to have modularity during these procedures. This is extremely important, since one of the problems with fixed-head devices was the inability to convert them to total hip arthroplasty at a later date, if necessary. Currently, more than 10 of these "DRG" devices are available in the United States market. The manufacturing, material selection, and design characteristics of these devices are variable, and surgeons should be extremely careful when selecting a device based on cost alone. The price range can range from $450 to $900, depending on whether a bipolar or a unipolar head is selected. The objective of this study was to assess the economic impact of prosthetic selection in the treatment of displaced intra capsular fractures.

### METHODS

The chart records of all hemiarthroplasties performed at a university medical center (University of California at San Diego Medical Center, 1986-1987) were reviewed. Only cases with complete clinical and demographic data were selected. Patient age, sex, diagnosis, ambulation state (before and after surgery), and length of hospital stay were noted. Charts were also reviewed to assess any information that addressed the decision process used to select the device. The operative report was reviewed, and estimated blood loss, operative time, and the use of cement were recorded. All significant in-hospital complications were also recorded. The accounts receivable department was contacted, and all hospital charges were collected. Cost-to-charge ratios for the particular financial period were available. These cost-to-charge ratios allowed the calculation of the true costs of the pairs. The physician billing office was contacted, and the billed surgeon charges were available for all patients. The student's t-test was used to compare the groups, and a P value < 0.05 was considered significant.

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