The economics of new age arthroplasty: Can we afford it?

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Summary The current economics of arthroplasty surgery have put increasing financial pressure on hospitals. Technological advances are necessary to improve the cost-effectiveness of healthcare. Newer technologies must demonstrate their efficacy in long-term follow-up and be clearly superior to conventional implants.

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New technology in joint replacement design and materials adds cost, which must be documented by improved outcomes. This is not always the case as the recent metal/metal data has shown. The current economics of arthroplasty surgery have put increasing financial pressure on hospitals and will progress under new healthcare legislation. New technology must be cost-effective, and this will be increasingly difficult in an era of outstanding long-term results with current designs. Cost may necessitate less expensive alternatives (e.g., generic implants) in arthroplasty patients.

Joint replacement surgery has evolved over the past four decades into a highly successful surgical procedure. Earlier designs and materials which demonstrated inferior functional and long-term results have disappeared in a Darwinian fashion. Through this evolutionary process, many of the current designs have proven efficacy and durability. Current outcome data indicates that hip and knee designs demonstrate 90–95% success rates at 15 years follow-up [1]. Technological advances are necessary to improve implant design and materials; however, only in an environment of reduced reimbursement to hospitals can the increased cost be justified.

The rationale that technology in medicine would be expensive at the outset yet be cost-effective eventually has not been the case in many areas. Currently, about one half of the rapid increase in healthcare costs in relation to Gross National Product may be attributed to technology. Uwe Reinhardt, an economist at Princeton University, in referring to new technology has stated that the healthcare system provides misaligned incentives that create overutilisation or misutilisation of everything that is new. It is
now common knowledge among healthcare economists that if the cost of healthcare is to be controlled, the growth of technology must be constrained.

Increasingly, as new technology emerges, the question will be: What is the cost—benefit analysis? A new era of comparative effectiveness research is being launched and will become predominant in medicine and arthroplasty surgery in the future. What is the newest may not always be the best. According to Reinhardt, there is a need for comparative effectiveness studies of emerging and existing technology so that the new can be priced in a way that reflects its incremental value. New technology must demonstrate its benefit to justify its cost; often in arthroplasty, there is little data available to document these better outcomes.

The high-flex knee designs are an example of implant modification adding significant cost to the prosthesis. This design is intended to provide greater knee motion for patients; however, there are many patient-related variables which impact on knee motion, and there is little substantiated evidence that these implants produce knee flexion that is superior to conventional designs. The gender-specific knee design, despite increased cost, has not produced better outcomes.

In terms of computer-assisted surgery, this is a technology that has struggled to gain a foothold in arthroplasty surgery. Computer-assisted navigation for joint replacement adds cost to the procedure both in terms of equipment and added operating time. If these systems, particularly in hip replacement surgery, improve acetabular orientation and leg length equality, then the cost may be justified; however, this has not been demonstrated to date. Additionally, current systems require multiple pin insertion for tracking devices which may increase morbidity. Navigation system cost must be reduced and the tracking mechanisms must be simplified to justify generalised utilisation. A recent paper by Kim et al. [2], reports results in 520 bilateral total knee replacements, one side performed with navigation, and one side with conventional instrumentation. At 10.8 years mean follow-up, there was no difference in “clinical function or alignment and survivorship of the components” between the two techniques.

Robotic surgery is another example of expensive technology with little evidenced-based literature to support its use. Robotic systems can cost from $750,000 and currently add time to the procedure.

If we look to the future, there will certainly be a place for these navigation-assisted surgical devices, and the technology will improve and be more cost-effective and user-friendly. In the end, it may improve the accuracy in low volume surgeons and reduce outlier implant results.

Implant costs can account for 30–40% of hospital costs for a joint replacement patient, and new bearing surfaces and designs always come with significant increase in price. Only minor changes in design will generate cost increase of up to 25% without evidence of improved outcome. With current healthcare reform policy, reimbursement to hospitals will continue to decline and cost of new technology will not be sustainable in most hospitals with current profit margins of 1–2%. Large implant manufacturers have documented profit margins in the order of 15–25%, and reduction in implant costs with or without new technologies must occur for many hospitals to survive. If indeed the implant industry is able to do this, then there may be a place for their utilisation in younger patients with greater life expectancy.

In a recent study by Bozic et al. [3], the cost-effectiveness of new technologies were evaluated. Based on the authors’ findings for an alternative bearing with an incremental cost of $2000 to be cost saving for a 50-year-old, there would have to be a 19% reduction in 20-year failure rates. The likelihood of cost savings for these alternate bearings in patients 63 years or older is highly unlikely at current costs. Newer biomaterials (metal/metal, ceramic/ceramic, highly cross linked polyethylene) also have limited outcome analysis in patients beyond short- to mid-term follow-up evaluation, and all of these technologies add significant cost to the implant. Metal-on-metal hip arthroplasty has had significant issues with severe peri-prosthetic reaction with necrosis and, in some cases, pseudotumour formation. With diminishing reimbursement, careful analysis of utilisation of these newer technologies must be weighed if hospitals are to maintain economic viability.

The pharmaceutical, airline, and food industries have all moved towards generic products which are less costly, and this will be the trend in the future in prosthetic implants as well. Newer technologies must demonstrate their efficacy in long-term follow-up and be clearly superior to conventional implants. Examples such as modular femoral neck designs, metal-on-metal articulations, and newer designs with increased impingement are demonstrating early failure results inferior to earlier proven designs and materials. Change does not always mean progress.

References