



Viewpoint

The Value Equation: Time for a Rethink!

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Our healthcare spending is at an all-time high and is projected to consume 19.4% of our gross domestic product by 2027 [1]. As the most commonly performed procedure for Medicare beneficiaries totaling \$20 billion in costs [2], total joint arthroplasty (TJA) has come under much scrutiny by federal and private payers. The increased demand for TJA [3] combined with an unsustainable trajectory of spending has triggered a paradigm shift toward value-based care. Perhaps the most commonly cited formula for value determination is the one introduced by Michael Porter in 2009, wherein value is defined as the ratio of outcomes divided by the costs to achieve those outcomes [2,4,5]. Healthcare economists have proposed that adoption of value-based care will help to improve the economic stability of our system [6].

As demonstrating value takes an increasing role in healthcare reform and reimbursements, there is a challenge to accurately measure value. First, there are no industry-wide accepted metrics to assess outcomes of TJA. Second, determining the costs associated with an episode of care is often tedious, incomplete, and subject to high institutional variability [7]. If orthopedic surgeons are to be compensated based on the value of care, there needs to be a better method to measure it. Our concern is that the value equation defined by Porter [8] is too simplistic to adequately measure value and may underestimate the true impact of a life-changing procedure such as TJA. The following case vignettes better illustrate some of its shortfalls.

Case 1

An 89-year-old female with a past medical history significant for osteoporosis and lumbar spine fusion presented with end-stage osteoarthritis (OA) of her right hip that significantly limited her activities of daily living. She was otherwise an independent community ambulator who enjoyed gardening. After failing conservative measures, she underwent a cemented total hip arthroplasty (THA, Fig. 1). She was fully satisfied with her outcomes (5/5) and elected to undergo a contralateral THA 3 months later. Her Hip disability and Osteoarthritis Outcome Score for Joint Replacement (HOOS Jr) at 1-year follow-up was 100/100.

Case 2

A 59-year-old morbidly obese female with a past medical history significant for diabetes and depression who presented with end-stage OA of her hip that limited her ability to ambulate and work. She underwent in situ pinning of the ipsilateral hip as a child secondary to slipped capital femoral epiphysis. During preoperative optimization, she was able to reduce her weight resulting in a reduction of her body mass index from 56 to 48. After failure of nonoperative measures, she underwent conversion to THA (Fig. 2). The patient was discharged to home on the first postoperative day and was fully satisfied with her procedure (5/5). At 1-year follow-up, she had an uncomplicated clinical course, and her HOOS Jr was 85/100, although she had regained most of the weight lost preoperatively.

Case 3

A 29-year-old, otherwise healthy, female presented with end-stage OA of her right hip that limited her ability to ambulate and work. Socially, she was a single mother who worked 2 jobs to make ends meet. She had Perthes disease as a child, and her radiographs showed abnormal remodeling of the hip with acetabular dysplasia and limb shortening measuring about 6 cm. She failed all nonoperative measures and subsequently underwent THA with subtrochanteric shortening osteotomy (Fig. 3). She was discharged to home on the second postoperative day and was fully satisfied with her procedure (5/5). At 1-year follow-up, she had an uncomplicated clinical course with complete healing of the osteotomy. Patient was

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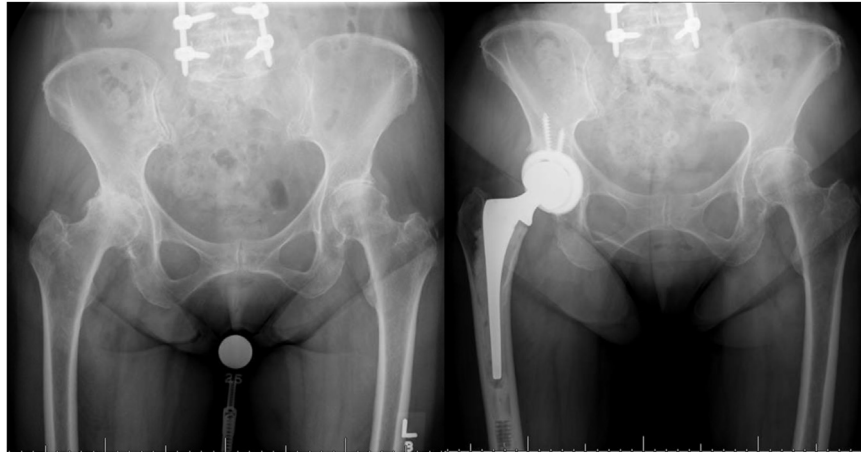


Figure 1. Preoperative and postoperative radiographs of Case 1 showing total hip arthroplasty with a cemented femoral stem. Anteversion of the acetabular component was slightly increased given her lumbar stiffness.

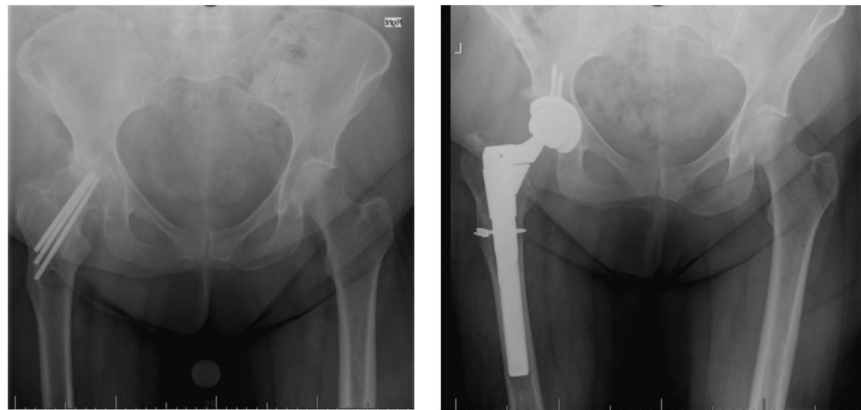


Figure 2. Preoperative and postoperative radiographs of Case 2 showing total hip arthroplasty with a diaphyseal-fitting femoral component. The choice of stem was used given the abnormal remodeling of the proximal femur with sclerosis and retroversion. There was also abnormal remodeling of the lateral cortex, necessitating the use of a prophylactic cerclage wire to prevent iatrogenic fracture.



Figure 3. Preoperative and postoperative radiographs of Case 3 showing total hip arthroplasty with a subtrochanteric shortening osteotomy. Controlled over medialization of the acetabular component was performed to avoid the need for augments.

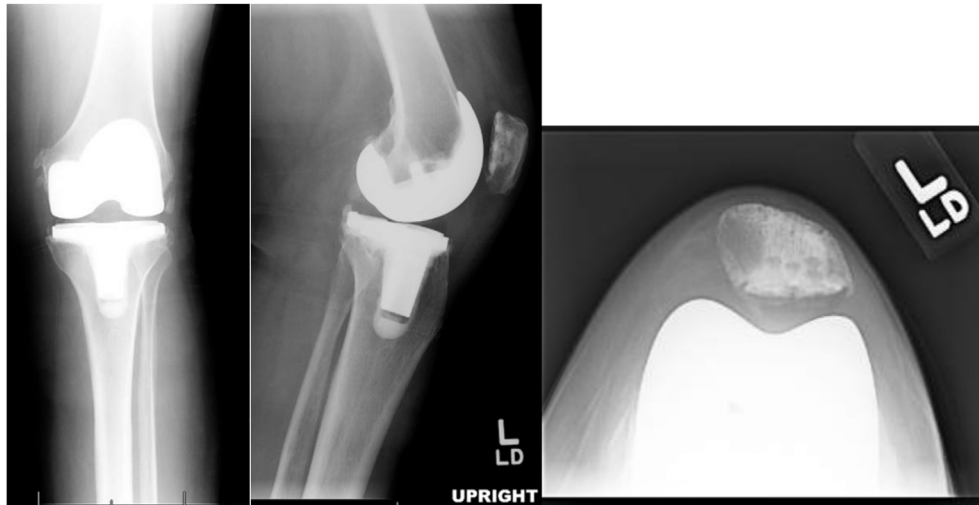


Figure 4. Radiographs of Case 4 who presented with a painful total knee arthroplasty performed 3 years before consultation.

ordered a 2-cm shoe-lift to compensate for her residual leg length discrepancy but never obtained it. Her HOOS Jr at 1-year follow-up was 85/100.

If applying the value equation as defined by Porter [8] to the aforementioned cases, there is a misconception of decreasing value from case 1 to 3. This is because all measurable outcomes (readmissions, reoperations, complications, emergency room visits, and patient reported outcome measures) were virtually identical. However, there was a considerable increase in direct costs owing to increasing complexity and resource utilization going from case 1 to 3. Furthermore, the current value equation failed to account for a number of intangible factors that have been shown to affect outcomes (eg patient demographics, comorbidities, expectations, and societal contributions) [9–12]. Although the value for Case 3 may appear lowest from a payer perspective, it carries the highest societal value than the other 2

cases in terms of reduction in lost wages, disability claims, and tax-payer burden.

Case 4

A 45-year-old morbidly obese female presented with a painful left total knee arthroplasty (TKA) performed at an outside facility (Fig. 4). She was never satisfied with her TKA, which was performed 2 years before the current presentation. On examination, her range of motion was only 20°–60°. She endorsed postoperative depression as a result of her knee pain that significantly limited her ability to work. Review of her preoperative radiographs (Fig. 5) and notes showed mild narrowing of the medial compartment, and the decision to perform the TKA was based on magnetic resonance imaging changes.

It is clear that strict indication criteria were not followed in this case, which illustrates that arthroplasty performed without

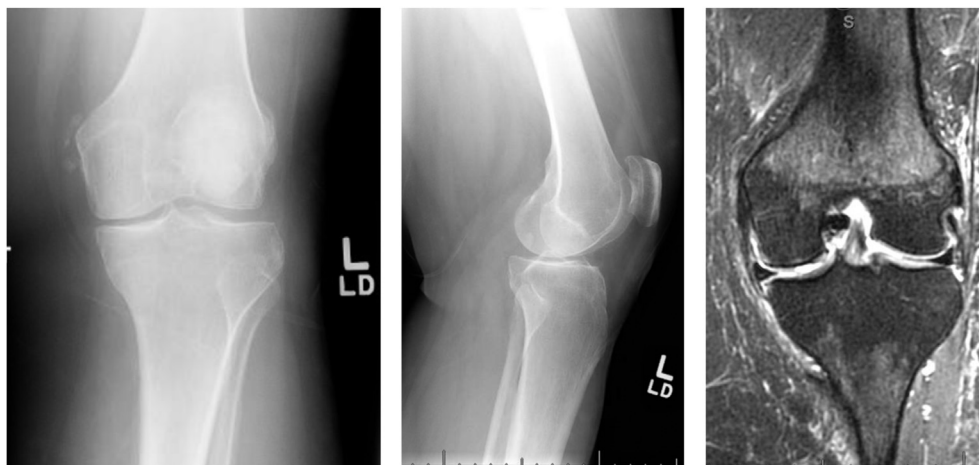


Figure 5. Preoperative radiographs of Case 4 showing mild narrowing of the medial compartment of the knee. Joint spaces otherwise remain largely preserved. There is patella alta. Patient's chief complaint before her total knee arthroplasty was anterior knee pain especially with climbing stairs. Magnetic resonance imaging was used to confirm operative indication.

appropriate vetting is likely to result in little to no value and even worse outcomes. While there is disparity in the literature regarding the optimal measures to assess TKA outcomes, this patient's Knee Injury and Osteoarthritis Outcomes Survey for Joint Replacement was 0/100, not to mention the societal costs from loss of employment. Obtaining appropriate history, physical examination, and radiographic imaging combined with an evidence-based preoperative treatment approach are keys to successful outcomes. In addition, having clear and transparent discussion of patient expectations, especially in the setting of severe symptoms that are not well correlated with clinical or radiographic OA findings, cannot be overemphasized and is often underestimated.

All stakeholders including patients, providers, payers (federal, state, and commercial), hospitals, and taxpayers desire an increase in value per dollar spent, but current considerations of value appear to be incomplete. The widely cited value equation is too simplistic and often underestimates the true value of care. If our profession is to be assessed by the value of services we deliver, orthopedic surgeons need better assessment tools that take into consideration the surgical risks, patient characteristics, societal benefits, and appropriateness of surgery. There is also a need for industry-wide accepted metrics to assess outcomes.

Conflict of interest

The authors declare there are no conflicts of interest.

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