

**Editorial Commentary: Cost-Effectiveness of Orthopaedic Procedures:  
“A Nickel Ain’t Worth a Dime Anymore” – Yogi Berra**



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**Abstract:** Although cost-effectiveness research has assumed a critical role in decision making in medicine, it, by definition, must be derived from solid, germane, reproducible data. The absence of such high-quality data tends to induce compromises in analysis that may degrade a scientific article’s seemingly intuitive message.

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**M**akhni et al.<sup>1</sup> in their paper titled “Cost-effectiveness of reverse total shoulder arthroplasty versus arthroscopic rotator cuff repair for symptomatic large and massive rotator cuff tears” have endeavored to add to the growing body of literature that addresses the pressing and timely issue of cost effectiveness of orthopaedic procedures. With the spiraling costs of health care, providers, researchers, policy makers, and payers are requiring proof of cost effectiveness to justify allocation of limited resources and funds in this era of cost containment. What is desperately needed are well-executed, comparative studies that bring clarity to the rapidly expanding field of cost-effectiveness research.

Before we enter the details of this scholarly work, a brief understanding of the current state of cost-effectiveness research is necessary. Ideally, these are prospective high-quality studies, with primary source data that are both robust and transparent. For example, cost data for these studies may be degraded by the accounting systems used, the confidentiality of negotiated price points at individual institutions, and regional variations in both cost and reimbursements. In addition, outcomes included in these analyses should ideally come from Level I studies (prospective randomized studies) that allow for reproducible and verifiable results that provide a clear direction in treatment options.

Unfortunately, there is a dearth of data that allows for optimal studies. In 2008, approximately 3% of orthopaedic studies were randomized clinical trials,<sup>2</sup> and Rongen et al.<sup>3</sup> reported that only 25% of orthopaedic randomized clinical trials were registered with The

International Committee of Medical Journal Editors and federal payers (i.e., National Institutes of Health). Consequently, we are often left with suboptimal data to perform any analysis, and this may necessitate creative assumptions and extrapolations to reach a conclusion. Such is the nature of the primary source data, and, as such, we are restricted in our ability to produce high-quality cost-effectiveness publications. Accordingly, the primary author’s own publication in 2015 concludes that:

The increasing popularity and reliance on cost effectiveness studies to inform clinical and policy decision-making requires high-quality research. Given that a substantial portion of orthopaedic studies provide weak recommendations and have varied methodologic practices, we suggest that clinicians read these studies with a critical eye, incorporating recommendations in practice with considerable caution.<sup>4</sup>

Despite these shortcomings, Makhni et al. have concluded through an in-depth, rigorous analysis of a series of disparate publications that arthroscopic rotator cuff repair, despite its reported high retear rates, may be more cost effective for large and/or massive repairable rotator cuff tears, than primary reverse total shoulder arthroplasty. The assumption here was that in a 65-year-old man with a massive, symptomatic repairable rotator cuff tear without glenohumeral arthropathy (with or without pseudoparalysis) who has failed nonoperative management, it is more cost effective to repair the rotator cuff than to proceed directly to a reverse total shoulder replacement. Although reverse total shoulder arthroplasty has been shown to be as frequent as conventional total shoulder arthroplasty,<sup>5</sup> to our knowledge, it is not commonly indicated as the

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index treatment for a massive repairable rotator cuff tear without evidence of arthropathy in a 65-year-old patient.<sup>6</sup> In fact, in 2 of the papers cited in the article that provided critical cost-effectiveness data, less than half of the patient cohort was for massive rotator cuff tear without arthropathy, and both papers defined these patients as having *irreparable* tears.<sup>7,8</sup> The base case here assumes that the tear is repairable (or at least partially so), which makes this analysis in our opinion less relevant to the treatment options often used for this patient population. Such is the nature of the necessary compromises when the relevant, high-quality data are not available.

In 1996, the Panel on Cost Effectiveness in Health and Medicine recommended that 2 generic health state measurements (Health Utilities Index [HUI] and the EuroQoL [EQ-5D]) were the standard measures of patient health state preference. These 2 measures can be used to calculate utility values for cost-utility models, such as the Quality-Adjusted Life Year, which is the de facto unit of measurement for a patient's health-related quality of life. Additional measures, including the SF-6D (derived from the SF-36), are now accepted measures to construct the "utility," or preference, for a particular health state. Importantly, these generic measures have multiple domains, including pain, anxiety and/or depression, mobility, self-care, and activities of daily living, providing a holistic view of overall well-being. The ability to correlate or impute joint specific outcome measures, similar to the American Shoulder and Elbow Surgeon's (ASES) score, into a generic health state has been disputed in the literature. Not surprisingly, the ASES is a highly focused joint specific questionnaire that was never intended to measure overall well-being. Makhni et al., because of a paucity of high-quality primary data, constructed a linear relationship between ASES scores and corresponding health utility values employing the existing literature (possessing ASES values but many no health utility measurements), in an attempt to derive such health utility values for cost-effectiveness calculations. Although this is not a novel strategy and has been used sparingly in the orthopaedic literature, one must exercise great caution in assuming that a joint specific measurement possesses a linear relationship with HUI, particularly when this has been refuted in the existing literature.<sup>9</sup>

Furthermore, the studies used to compute HUI from ASES were often not relevant to the index case that was presented. For example, Renfree et al.'s publication,<sup>10</sup> utilized as the only source to compute the HUI for reverse total shoulder arthroplasty, was performed on patients with cuff tear arthropathy, not in the absence of cuff tear arthropathy, as was dictated by the case example.<sup>10</sup> In addition, the HUIs for 4 of the 7 states were derived from a single article, indicative of the poor

primary data sourcing available for such studies. In addition, expert opinion consensus by the authors postulated that 30% of all symptomatic rotator cuff tears will progress to rotator cuff arthropathy because longitudinal studies are not available. The final conclusions of this study must therefore be critically evaluated in the context of both the number of assumptions necessary and the overall relevance and quality of these data they are based on. As Yogi Berra said, we all believe that "A nickel ain't worth a dime anymore"—we just need high-quality data to quantify and prove it.

Despite the absence of adequate primary source data, including averaging cost data across several studies, Makhni et al. performed an elegant sensitivity analysis testing their hypothesis. Although this adds great mathematical rigor to the analysis and the authors should be congratulated for their efforts, it is the absence of high-quality data that hamstring many cost-effectiveness papers. This should be a siren call for our profession—in the absence of data, policy makers and payers will have great latitude to determine resource allocations for those under their management and the scholarly cost-effectiveness research that Makhni et al. and others will endeavor to complete may be inadequate for us to justify the efforts we make on behalf of our patients.

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