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CORR Insights®: What is the Long-term Economic Societal Effect of Periprosthetic Infections After THA? A Markov Analysis

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Where Are We Now?

Parisi and colleagues created a state-transition Markov model to estimate the long-term economic burden of post-THA periprosthetic joint infection (PJI). The model consisted of patients 55- to 65-

years-old who underwent one of three initial surgical treatments in a fixed proportion. Using systematic reviews to identify the probabilities of various health states associated with the treatments, and Medicare reimbursement data to estimate direct costs where applicable, the authors estimated the lifetime cost of a PJI of the hip for a middle-aged patient to exceed USD 390,000.

One conclusion of the study is that the long-term cost of infected THA is considerably higher than previously thought. This is not surprising considering costs were viewed from a broader, lifetime perspective than previous studies focused on direct costs over a 1-year episode [4]. The findings in the current study also correlate with previous decision analyses showing that the overall cost burden of revision THA will be impacted more by reducing PJI compared to any other

complication [10]. Finally, the current study complements the annual report of the American Joint Replacement Registry highlighting that post-THA PJI is now a dominant cause of early post-THA revisions [2]. In fact, the estimated cost of joint arthroplasty revision for PJI in the United States alone now stands at USD 1.6 billion.

PJI is arguably the most-pressing issue facing clinicians and investigators in the arthroplasty community [7]. However, there is no “magic bullet” on the horizon for prevention or mitigation of the devastating effects of periprosthetic hip infection. The International Consensus Statement on Periprosthetic Joint Infection published in 2013 underscores the depth and complexity of the problem [9].

Where Do We Need To Go?

While eradicating PJI of the hip is unrealistic in the short-term, reducing its frequency and the total cost of managing it should be among our highest priorities. Incremental improvements in prospective studies and systematic reviews offer

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the potential for a genuine breakthrough, but parallel efforts must be undertaken to further refine our approaches to economic analysis and decision analysis. It is not the integrity of the probability models that limits the clinical applicability of decision analysis at this stage as much as the need for better data sources. These models need to realistically reflect the probabilities related to the incidence, treatment protocols, risk of recurrence, and systemic costs related to PJI. Only with more-accurate assumptions will they support practical clinical decisions in the absence of randomized trials. For example, a decision analysis with highly credible inputs that addresses the implant-exchange options currently under debate would inform decisions for the surgeon faced with a highly morbid implant extraction, a patient who expresses a reasonable desire for preferring one specific surgical approach, or for a patient with a highly sensitive, low-virulence organism. Moreover, better-designed models will identify patient groups requiring specific interventions for reducing preoperative risk, and patients who should not have a THA in the first place.

How Do We Get There?

Randomized controlled trials will never offer all the answers we need to address the range of clinical

permutations that exist in battling this devastating complication. Therefore, high-quality economic and quality-of-life decision analyses serve a growing research need in the area of PJI.

In order to set specific priorities for risk-reduction efforts, further economic impact modeling of PJI by specific demographic and risk subgroups is needed. Future models can combine the probability of occurrence or reoccurrence of PJI with the estimated long-term direct and indirect costs. Only with the application of ongoing high-quality systematic reviews, commercial claims-based cost data, and reliable benchmarks for productivity can morbidity, cost, and quality-of-life impact be accurately simulated. For example, Medicare data often are used as a proxy for direct costs in patients who underwent THA who are increasingly represented by commercial payers. Claims data across commercial payers are now available for investigators to accurately estimate weighted costs for the study population. Likewise, work-productivity impact has been estimated in association with THA, but better, standardized definitions of productivity that can be consistently applied to both gains associated with successful THA and losses associated with complications are needed. In addition, standardized data definitions for a broad range of inputs are required for comparability.

For example, a similarly constructed Markov model may define an “episode” of care as 90 days in one study versus 1 year in another. Standardizing episode definitions has major implications for estimating long-term cost in PJI, where the natural history of the complication includes multiple cycles through expensive care episodes over time for many patients. The results in the current study are highly sensitive to episode definitions that are more arbitrary than standardized.

Perhaps the most-urgent need for improved economic models is determining which surgical treatment is most appropriate for specific patient subgroups with PJI. Sporadic reports, especially outside the United States, suggest that one-stage revision, and even implant-retention strategies, should be considered for selected patients with chronically infected THAs [5, 8]. However, this remains a controversial subject with relatively scant data available on these approaches [1, 6]. Nevertheless, the cost and morbidity of the “gold standard” two-stage revision approach for chronic PJI is increasingly viewed as unacceptable, so ongoing investigations on these alternatives remain a compelling avenue for study [3].

PJI is a highly morbid, costly, and growing problem for patients and payers. This problem demands more effective strategies for risk reduction

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and management to protect the favored status of THA among major surgical interventions in the healthcare system. Decision analysis will continue to play a prominent role in advancing the standard of care in this arena.

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