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Investigating the Cost-Effectiveness of Various Distal Radius Fracture Treatments

Background: Distal radius fractures are among the most common orthopedic injuries treated today, with recent estimates of Medicare system costs reaching $535 million annually and projections of 40% due to the growing and aging populations. All the while, orthopaedic surgeons must consider multiple treatment modalities, such as, open or closed reduction, internal or external fixation, and implant structure and function specific to their patient or their practice. Similarly, physicians must weigh the pros and cons of these different interventions alongside minimally invasive nonoperative management. Our goal was to conduct a cost-effectiveness study utilizing distinct post-treatment outcome patterns that have not been previously assessed, for the following treatment modalities: nonoperative management, external fixation, closed reduction and internal fixation (wiring), and open reduction and internal fixation (plating).

Methods: We created a decision tree to model the treatment of distal radius fractures using nonoperative management (casting), external fixation, wiring (CRIF), and plating (ORIF). Each node of the model is associated with specific costs, in dollars ($), a utility adjustment (QALY), and a percent likelihood. The decision tree nodes included uneventful healing, eventful healing and no further intervention, failure of reduction and further operative management, carpal tunnel syndrome, trigger finger, and tendon rupture. Percent probabilities of each transition state, QALY values, and costs of intervention were gleaned from a systematic review. Rollback and incremental cost-effectiveness ratio (ICER) analyses were conducted on the data to identify optimal treatment strategies. Threshold values of $50,000 per QALY and $100,000 per QALY were used to distinguish modalities in ICER analysis.

Results: Rollback analysis revealed nonoperative management as the predominant strategy which yielded a net monetary benefit of $34,738/QALY, compared to $32,333/QALY for plating, $33,437/QALY for wiring, and $31,400/QALY for external fixation. Similarly, nonoperative management proved cost-effective in ICER analysis when compared to the other modalities. Nonoperative dominated external fixation and plating, although was comparable to wiring fixation—yielding a $2,242 lesser cost and a 0.0166 lesser effectiveness.

Conclusions: The cost-effectiveness of nonoperative management is driven by its decreased cost to the healthcare system. Plating and external fixation methods have been shown to be both more

expensive and less effective than other proposed methodology. Wiring fixation reports with more favorable effectiveness in the literature, and thus may be more cost effective in certain circumstances. Further studies may find value in investigating further clinical aspects of distal radius fractures and their association with nonoperative management versus plate fixation