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Humeral shaft fracture: a cost-effectiveness analysis of fixation techniques

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Keywords

humeral shaft fracture, open reduction and internal fixation, intramedullary nail, functional brace, cost-benefit analysis

Abstract

Background

Humeral shaft fractures account for 3% of managed fractures. Historically, in the absence of neurovascular injury, open fracture, or polytrauma they have been managed non-operatively with functional bracing. An upward trend in operative fixation rates has recently emerged. Operative fixation techniques for the humeral shaft include open reduction and internal fixation (ORIF) and intramedullary nailing (IM).

Although numerous studies have compared outcomes of these treatment modalities, there is no consensus on the ideal approach for isolated fractures. Moreover, no investigation has applied a value-based lens to differentiate the cost-effectiveness of these treatments, an increasingly pertinent consideration with U.S. healthcare spending surpassing \$3.2 trillion annually. Thus, the present study applies a decision tree model to investigate the value of operative treatment for humeral shaft fracture with ORIF or IM approaches, in comparison to functional bracing.

Methods

A decision tree model describing treatment of these injuries is utilized. For each treatment strategy, outcomes are estimated using weighted average via systematic review of the literature; outcomes include uneventful healing, non-union and revision, symptomatic hardware removal, and deep infection requiring debridement. Weighted averages define probabilities for each decision tree node. Cost-effectiveness is evaluated using incremental cost-effectiveness ratios (ICERs), defined as the ratio of the difference in cost and difference in effectiveness of each approach, measured in dollars per quality-adjusted life-year (QALY). The model is assessed at threshold ICERs of \$50,000/QALY and \$100,000/QALY. Sensitivity analysis of all outcomes will assess cost-effectiveness of each approach across a range of outcome values.

Results

Ninety-three papers met inclusion criteria. Data abstraction is underway. Preliminary results will be available for Research Week.

Conclusions

Delivering value-based care has become an elevated priority as implementation of bundled payment models continues. Synthesizing understanding of intervention cost and outcome quality, this study serves to inform optimal value-based management of humeral shaft fractures.