Routine Fixation of Humeral Shaft Fractures is Cost-Effective: Cost-Utility Analysis of 215 Patients at a Mean of Five Years following Nonsurgical Management

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INTRODUCTION: The primary aim of this study was to estimate the cost-effectiveness of routine fixation for all patients with humeral shaft fractures. The secondary aim was to estimate the health economic implications of using a Radiographic Union Score for HUmeral fractures (RUSHU) <8 to facilitate selective fixation for patients at risk of nonunion.

METHODS: From 2008-2017, 215 adult patients (mean age 57yrs [range 17-18], 61% female) with a nonsurgically managed humeral diaphyseal fracture were retrospectively identified. Union was achieved in 77% (n=165/215) after initial management, with 23% (n=50/215) uniting after surgery for nonunion. Costs were measured in Pounds Sterling (GBP) and based on the English National Health Service tariff or departmental procurement costs. The EuroQol Five-Dimension (EQ-5D) 3-Level Health Index was obtained via postal survey. Multiple regression was used to determine the independent influence of patient, injury and management factors upon the EQ-5D. An incremental cost-effectiveness ratio (ICER) of <£20,000 ($25,000) per quality-adjusted life-year (QALY) gained was considered cost-effective.

RESULTS: At a mean of 5.4yrs (range 1.2-11.0), the mean EQ-5D was 0.736 (95% CI 0.697-0.775). Adjusted analysis demonstrated the EQ-5D was inferior among patients who united after nonunion surgery (beta=0.103, p=0.032). Offering routine fixation to all patients in order to reduce the rate of nonunion would be associated with increased overall treatment costs of £1,542/patient ($2,000), but would confer a potential EQ-5D benefit of 0.120/patient over the 5yr period of study follow-up. The ICER of routine humeral shaft fracture fixation was £12,850 ($16,000) per QALY gained. Selective fixation – based on a RUSHU<8 at 6wks post-injury – would be associated with reduced treatment costs of £415/patient ($500) and conferred a potential EQ-5D benefit of 0.335 per 'at-risk patient' over the 5yr period of study follow up.

DISCUSSION AND CONCLUSION: Routine fixation for patients with humeral shaft fractures, in order to reduce the rate of nonunion following nonsurgical management, appears to be a cost-effective intervention at 5yrs post-injury. Selective fixation of patients at risk of nonunion based upon their RUSHU may confer even greater cost-effectiveness, given the potential cost savings and improvement in health-related quality of life.