# Cost-effectiveness of Cement Augmentation for the Fixation of Unstable Trochanteric Fractures in the United States

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## BACKGROUND

Trochanteric hip fractures occur predominantly in older patients and are associated with high rates of mortality and morbidity, poor functional outcomes, and reduced quality of life.[1,2]

A previous randomized controlled trial (RCT)[3] showed a trend toward lower risk of revision surgery for unstable trochanteric fracture fixation using Proximal Femoral Nail Antirotation™ (PFNA) along with TRAUMACEM™ V+ Injectable Bone Cement augmentation vs. fixation without augmentation (0% vs. 4.4%). This potential benefit may translate into long-term cost savings and improved quality of life.

## OBJECTIVES

To assess the cost-effectiveness of TRAUMACEM V+ cement augmentation vs. no augmentation in unstable trochanteric fracture fixation from the United States healthcare payer's perspective.

## METHODS

A two-stage cost-utility model was developed (Figure 1):

**A.** A decision tree that simulated clinical events, costs, and utilities over one year after the index surgery based on RCT [3]

**B.** A Markov model to extrapolate events over a lifetime horizon.

**Model Inputs:** The model was populated with data from the previous RCT,[3] published literature and claims data (Table 1),

**Model Outputs:**

- Discounted costs (in 2020 US Dollar)
- Discounted quality-adjusted life years (QALYs) for effectiveness
- The incremental cost-effectiveness ratio (ICER) calculated as the incremental cost to gain an extra QALY ($/QALY) for fixation with augmentation compared with no augmentation.

## METHODS (Cont'd)

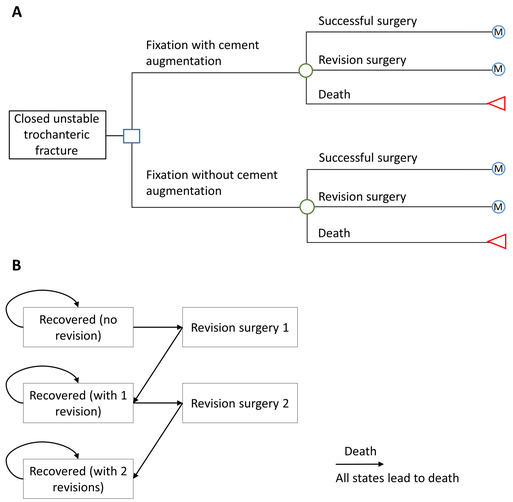
**Table 1.** Model Inputs

| Variables | Value | Reference/source |
|---|---|---|
| **Population characteristics** | | |
| Cohort size | 1,000 | - |
| Mean age at the first surgery, years | 85 | 3 |
| Male sex, % | 17.0% | 3 |
| **Decision tree model (1st year after index surgery)** | | |
| **Probabilities** | | |
| Revision surgery, fixation without augmentation | 4.4% | 3 |
| Revision surgery, fixation with augmentation | 0% | 3 |
| Successful surgery, fixation without augmentation | 85.2% | 3 |
| Successful surgery, fixation with augmentation | 88.4% | 3 |
| Death | 10.4% | 3 |
| **Utilities** | | |
| Successful surgery after fixation | 0.708 | 3 |
| Disutility (multiplier) of revision surgery | 0.85 | 3 |
| **Markov model (2nd year after index surgery to lifetime)** | | |
| **Probabilities of revision surgery** | | |
| 1st revision surgery given a successful index surgery | Time dependent | Survival analyses using the US Medicare SAF |
| 2nd revision surgery | 2.36% | Survival analyses using the US Medicare SAF |
| **Probability of death** | | |
| Mortality given a successful index surgery | Background mortality | 6,7 |
| Mortality after revision, year 1 (relative risk) | 2.13 | Survival analyses using the US Medicare SAF |
| Mortality after revision, year 2 (relative risk) | 1.57 | Survival analyses using the US Medicare SAF |
| Background mortality | - | 6,7 |
| **Utilities** | | |
| Successful surgery (SE) | 0.754 (0.004) | 4 |
| Disutility (multiplier) of revision surgery | 0.85 | 3 |
| **Costs and use of healthcare resources** | | |
| Cement augmentation costs | $1,723.0 | 2021 List price |
| Leakage test costs | $151.53 | 2021 List price |
| **Costs of healthcare resource utilization due to revision surgery** | | |
| Physicians visit | $4,602.0 | 5 |
| Home health agency | $1,835.37 | 5 |
| Skilled nursing facility | $7,858.59 | 5 |
| Inpatient rehab facility | $7,068.77 | 5 |
| Outpatient hospital | $2,179.36 | 5 |

## METHODS (Cont'd)

Deterministic and probabilistic sensitivity analyses were conducted to assess model uncertainty.

**Figure 1.** Two-stage Model Structure: A. Decision Tree, B. Markov model




## RESULTS

### Base-case analysis:

Fixation with cement augmentation vs. no augmentation:

- Reduced mean total cost per patient by $163.6 ($2,596.9 vs. $2,760.5)
- Increased QALYs by 0.02 per patient (3.41 vs. 3.39 QALYs/patient).

**Fixation with augmentation was the dominant strategy with an ICER of -$9,714/QALY**

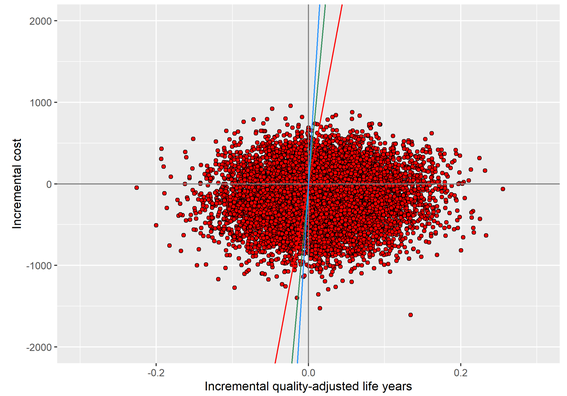
### Sensitivity analyses:

Major influential parameters for ICER were augmentation cost and revision rate and mortality rate in the first year. Probabilistic sensitivity analysis: fixation was associated with lower costs and increased QALYs in 68.1% and 59.8% of the 10,000 simulations, respectively (Figure 2).

## RESULTS (Cont'd)

Fixation with cement augmentation was more likely to be cost-effective than without augmentation regardless of the willingness-to-pay threshold.

**Figure 2.** Incremental cost-effectiveness scatterplot comparing fixation with cement augmentation versus fixation without augmentation.




Note: Willingness-to-pay thresholds at $50,000 (red line), $100,000 (green line), and $150,000 (blue line) per quality-adjusted life year.

## CONCLUSIONS

- Based on an RCT with low revision rates, intramedullary nail fixation along with TRAUMACEM V+ cement augmentation dominated fixation without augmentation for unstable trochanteric fracture, resulting in cost savings and QALY gains.
- Estimates of cost savings were more robust than those of increased QALYs given parameter uncertainties.

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