

### Cost Reduction for Knee-Spanning External Fixation in the Staged Treatment of Tibial Plateau Fractures: A Practical Intervention

*Kevin R. Hayek, MD; Dylan Lowe McCreary, BA; Breana Siljander, MD; Kendra Kibble, BS; Brian Cunningham, MD*

*University of Minnesota & HealthPartners, St. Paul, MN, United States*

**Purpose:** Knee-spanning external fixation is a high-cost intervention with large variation. The purpose of this study is to determine if an education intervention changes the practice of implant selection as measured by total implant costs.

**Methods:** A retrospective review of 221 tibial plateau fractures treated with initial temporizing external fixation between 2010 and 2016 at 2 Level-I trauma centers was conducted. Factors associated with cost variation were assessed using nonparametric comparative and goodness-of-fit regression tests. No strong correlations were noted between construct cost and patient demographics ( $r^2 = 0.02$ ), fracture characteristics ( $r^2 = 0.02$ ), or injury-independent characteristics ( $r^2 = 0.10$ ). A wide variation in construct cost was noted. An educational intervention was conducted. The above findings were presented with 3 clinical cases of OTA 41-C3 (Schatzker VI) tibial plateau fractures to staff orthopaedic surgeons at 1 institution. Radiographs and external fixator constructs specific to each case including individual pin, bar, and clamp prices were reviewed. Total implant costs ranged from \$2354 to \$11,696 in the 3 cases. Following the intervention, tibial plateau fractures treated with external fixation were prospectively collected for a duration of 1 year. These fractures were matched to similar same-site cases from prior to the intervention for comparison. Comparisons were conducted using t-test and  $\chi^2$  tests.

**Results:** 24 cases were prospectively collected following the intervention and matched to 24 prior-to-intervention cases using Schatzker classification and surgeon. Construct costs were blinded during matching. OTA fracture classifications for the postintervention group were as follows: 41-C3, 14 (58.3%); 41-C2, 4 (16.6%); 41-C1, 2 (8.3%); and 41-B3, 4 (16.6%). Between the 2 matched groups there were no significant differences in patient age ( $P = 0.74$ ), the length of time external fixators were used ( $P = 0.77$ ), or the OTA classification ( $P = 0.78$ ). The mean cost of constructs in the postintervention group was \$4550.20 (95% CI [confidence interval] \$3945.60 to \$5154,) which was significantly different compared to the preintervention group (\$6046.75; 95% CI \$5309.54 to \$6783.97) (t-test  $P = 0.003$ ).

**Conclusion:** An educational intervention reduced total implant costs of external fixation constructs in temporizing management of tibial plateau fractures within 1 year. The average cost savings projected is \$35,893.20 at the institution per year. Surgeon awareness of implant component costs and use variation enables clinical practice change.