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Research In-Progress

Expert-Novice Behavioral Differences in a Pediatric Supracondylar Distal Humerus Fracture Reduction and Fixation Simulation

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Introduction: Simulators that provide immediate skill-specific feedback enable orthopedic residents to improve fracture reduction and fixation skills. Supracondylar distal humerus fractures are the most common surgically treated fractures in pediatrics, with an incidence rate of 177.3 per 100000, accounting for 16% of pediatric fractures [1]. Few validated simulators allow practice of both fracture reduction and fixation. This study aims to validate an updated pediatric supracondylar distal humerus fracture reduction and fixation simulator by comparing expert and novice performance. It is hypothesized that experts perform faster and use fewer fluoroscopic images than novices.

Methods: The simulator replicates key perceptual cues of supracondylar fracture reduction and fixation, including haptic feedback during bone manipulation, forearm positioning, surgical drilling, and visual input from fluoroscopy. Seventeen participants (12 novices: PGY-1 to PGY-3; 5 experts: PGY-5, fellows or staff) will perform simulated surgeries on two fracture patterns, oblique and transverse, with two repetitions each. Performance metrics include but are not limited to procedure time, number of fluoroscopic images, number of pinning attempts, and pin spread at the fracture site. Statistical analyses will compare these metrics across experience levels.

Preliminary Results: Based on a prior study using an earlier version of the simulator [2], we expect significantly shorter procedure time, fewer pinning attempts, fewer fluoroscopic images obtained, and greater consistency in pin placement for experts compared to novices. In the prior study simulating only reduction, experts and novices averaged 61.4 vs.151.2 seconds for reduction and 6.6 vs. 16.3 fluoroscopic images obtained, respectively.

Next Steps: Data collection is scheduled for Fall 2025. Observing similar trends would support the simulator's ability to differentiate experience levels and support the validity of its use as a tool for training and assessment. 1. Micheloni GM, et. Al, Acta Biomed. 2021;92(S3):e2021015. DOI:10.23750/abm.v92iS3.11725 2. Tatum M. Master's thesis. University of Iowa; 2019. DOI: 10.25820/etd.007203