

Severely Injured Pediatric Patients with Major Orthopaedic Injuries Have Higher Mortality Rates and Greater Resource Utilization

Prism S. Schneider, MD, PhD¹; Ioannis N. Liras²; Alfred Ameen Mansour; Bryan A. Cotton, MD, MPH²

¹University of Calgary, Calgary, Alberta, CANADA

²University of Texas, Houston, Texas, USA

Purpose: Injury continues to be the leading cause of death for children worldwide and incurs significant psychosocial and financial burden. Direct and indirect economic costs are greatly affected by length of stay, medical treatments, and a reduction in quality-adjusted life years. The purpose of this study was to compare in-hospital complication rates, resource utilization, and mortality rates between pediatric trauma patients with and without major orthopaedic injuries.

Methods: Consecutive pediatric trauma patients (≤ 17 years of age) who met the highest-level trauma activation (January 2010 to May 2016) were included. Patients were dichotomized into ORTHO (extremity AIS ≥ 2) or non-ORTHO (extremity AIS < 2). Demographics, vital signs, blood transfusions, and rapid thrombelastography (rTEG) were obtained upon hospital arrival. Continuous data were compared using the Wilcoxon rank sum test and categorical data were compared using Chi-squared or Fisher exact tests. Multivariate logistic regression analysis was completed using age, sex, ORTHO, Injury Severity Score (ISS), and admission haemoglobin to identify risk factors for predicting in-hospital mortality.

Results: 956 pediatric patients met inclusion; 337 ORTHO and 619 non-ORTHO. ORTHO patients were older (median 15 vs. 14 years), more commonly injured due to blunt trauma (86% vs. 65%), and presented with higher ISS (median 22 vs. 10); all $p < 0.05$. The ORTHO group had an increased mortality (10% vs. 6%; $p = 0.05$), in-hospital pneumonia (6% vs. 3%), respiratory failure (19% vs. 12%), transfusion rate, and had fewer ICU-free and ventilator-free days; all $p < 0.05$. Based on admission rTEG, ORTHO patients had significantly lower median 30-minute clot lysis level, a measure of degree of clot stability, (1.6 vs. 2.1; $p = 0.016$). and impaired fibrinolysis (38% vs. 28%; $p = 0.006$). On multivariate analysis, increased admission ISS (Odds Ratio = 0.90; 95% CI = 0.89 to 0.93; $p < 0.001$) and major orthopaedic injury (Odds Ratio = 1.99; 95% CI = 1.03 to 3.89; $p = 0.042$) were independent predictors of in-hospital mortality.

Conclusion: In 956 severely injured children, 35% presented with major orthopaedic injuries. Major orthopaedic injury was associated with increased in-hospital respiratory complications, higher mortality rates, and increased resource utilization. This study can be used to inform cost-analysis and demonstrates the need to evaluate current pediatric scoring systems for predicting mortality.