

An Injury Severity Score >20 Is a Strong Predictor for Fracture Nonunion and Mortality in Polytrauma

Jane Burgan; Maryam Rahmati; **Samuel K. Simister, MD**; Aziz Saade, MD; Shannon Tse, MBBS; Ellen P. Fitzpatrick, MD; Gillian Soles, MD; Mark A. Lee, MD; Sean T. Campbell, MD; Augustine M. Saiz, MD

Purpose: Polytraumatic patients, often defined with an ISS>15, present with a variety of injury factors, making evaluation and analysis difficult. ISS, however, may not accurately reflect a high-energy trauma population. We aim to re-evaluate the reliability of the ISS, with the hypothesis that ISS>15 is not the optimal grouping for outcome prognostics and reflection of polytrauma.

Methods: We analyzed adult polytrauma patients from 2014 to 2023 at a Level I trauma center. Demographics, injury characteristics, and surgical variables were recorded. Preliminary analysis grouped patient cohorts according to ISS in various cutoffs, with >20 showing the strongest correlation with outcomes of interest, thus defining our cohorts for analyses. Follow-up was evaluated for complications, including infection, nonunion, and reoperation.

Results: Our polytraumatic cohort included 625/1016 patients (61.5%) with an ISS>20 (average 33.3 ± 12.4), which were more likely to be younger (42.1 ± 17.6 , $P = 0.030$) and male (73.4%, $P = 0.002$), but less likely to be diabetic (5.18, $P = 0.025$). Their presentation had more open and multiple fractures ($P < 0.001$), including more severe fractures by AO/OTA classification (A = 14.4, B = 34.4, and C = 51.2%; $P = 0.006$). They had increased blood transfusions in their first week (4.25 ± 5.96 , $P < 0.001$), prolonged ventilator periods (4.34 ± 9.92 , $P < 0.001$), and ICU time (10.6 ± 12.4 , $P < 0.001$), with longer hospital stays (21.9 ± 22 , $P < 0.001$) and higher inpatient mortality (8.35%, $P < 0.001$). Surgical variables showed more soft-tissue coverage procedures (9.31%, $P = 0.002$), including skin graft (28.7%, $P = 0.001$), free flap (14.3%, $P = 0.005$), and rotational flap (9.77%, $P = 0.007$). Follow-up outcomes showed they were more likely to expire within 90 days (8.45%, $P < 0.001$) and experience nonunion (12.2%, $P = 0.05$). There was no significant difference in follow-up time ($P = 0.881$), averaging 228 ± 307 days.

Conclusion: Polytrauma patients present challenging clinical decisions and have few prognostic tools to assist in decision making. While traditionally classified with ISS>15, the present study found that that ISS>20 better represented a high-energy injury population requiring higher level of care. An ISS>20 was also linked with greater mortality and nonunion. Future evaluations of ISS and alternative injury classifications may improve the prognostic evaluation of orthopaedic polytrauma patients.