A Prospective Comparison of Injury Scoring Systems in Penetrating Trauma

Background: The Injury Severity Score (ISS) is an accepted measure of traumatic injury. The ISS is limited in that it ignores multiple injuries within the same body region. The New Injury Severity Score (NISS) incorporates these injuries in its calculation, thus it might be a better measure of severity in patients with multiple injuries confined to a single body region. We hypothesized that the NISS would predict outcomes among penetrating trauma patients better than the ISS.
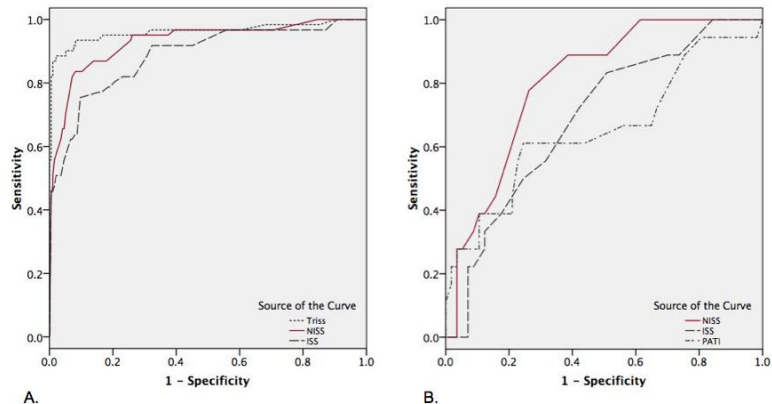
Methods: A prospective, observational study of penetrating trauma patients from June 2008 to March 2009 was performed comparing the ISS, NISS, Trauma Injury Severity Score (TRISS) and Penetrating Abdominal Trauma Index (PATI). Two patients were excluded because of incomplete autopsy data. Receiver Operating Characteristic (ROC) curves were generated testing mortality and complications. Model calibration was performed with the Hosmer-Lemeshow Statistic. Area under the curve (AUC) comparisons were made using the Hanley-McNeil test. Normally distributed data were compared with t-tests, and the Wilcoxon signed ranks test was used for skewed data.

Results: Two hundred and fifty-six patients were included. The mean age was 29.2 ± 11.4 years, and 91.4% were male. Patients were mostly African American (69.6%). Single (35.2%) and multiple (37.1%) gunshot wounds occurred more frequently than stab wounds (27.8%). Among the patients, 148 had injuries to a single body region, and 106 (41.4%) had multiple injuries within the single injured region. One hundred and forty-nine (58.2%) patients required operations for their injuries. The overall mortality rate was 23.8% and the mean length of stay was 9.2 ± 15.9 days.

The ISS and NISS scores were highly correlated, r=0.94. The ISS, NISS, and TRISS were good-fitting models for mortality (Hosmer-Lemeshow Statistic > 0.05 for all). The AUC of the NISS scores was greater than that for ISS scores (0.93 vs. 0.88, p=0.01; Fig 1A). The difference between NISS and TRISS curves was not significant (0.93 vs. 0.96, p=0.06).

Thirty-one complication events occurred in 25 patients. The most frequent complication was sepsis (9.5%). PATI scores could be calculated for 79 (31.6%) patients. The NISS, ISS, and PATI were good-fitting models for complications. The AUC for NISS was greater than the area for PATI (0.78 vs. 0.60, p=0.01), however the difference was not significant for NISS compared to ISS (0.78 vs. 0.71, p=0.08; Fig 1B).

Figure 1. ROC Curves Comparing Scoring Systems. A) NISS was a better test of mortality compared to ISS, p=0.01 and B) NISS was a better test of complications compared to PATI, p=0.01.

Conclusions: The ISS has become the standard measure of injury severity despite its lack of precision among patients with multiple injuries within a single body region. Several authors have speculated that the NISS would outperform the ISS among patients with penetrating trauma. However, many of these data are based on subset analyses or victims of military conflict. To our knowledge, this study represents the first prospective comparison of ISS and NISS in a civilian, purely penetrating trauma sample. The ability of the NISS to discriminate survivors from non-survivors, its accuracy in predicting complications, and its ease in calculation suggest that it should replace the ISS as the anatomic scoring system of choice.

Brian P. Smith, M.D.   (O) 215-707-7302
Temple University Hospital   (C) 484-437-9582
brsmith@temple.edu