Letter to Editor

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Comment on "Comparative Analysis of 'Trauma and Injury Severity Scores' and 'Madras Head Injury Prognostic Scale' in Assessing Head Trauma Prognosis in the Emergency Department of Shahid Beheshti Hospital, Sabzevar, Iran"

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Dear Editor

We read the recent article by Hamidnezhad *et al.* [1] with great interest. The study provided a valuable head-to-head comparison of the Trauma and Injury Severity Score (TRISS) and the Madras Head Injury Prognostic Scale (MHIPS) for predicting outcomes following head trauma. Traumatic brain injury (TBI) represents a significant global health challenge, making access to reliable prognostic tools crucial. The application of such tools in emergency departments, especially in resource-limited settings, is essential for informed decision-making and for improving patient outcomes [2]. We commend the authors for demonstrating that both scoring systems are strong predictors of mortality and intensive care unit (ICU) admission, with neither being demonstrably superior.

The clinical implications of this work are significant. Globally, traumatic brain injury is a leading cause of mortality and disability, yet emergency physicians often lack robust tools for the rapid triage and management of these patients. The direct comparison between the MHIPS—which incorporates both systemic physiology and anatomical severity—and the TRISS—which places greater emphasis on head-injury-specific parameters—is therefore of considerable value.

The methodological rigor of the paper is commendable. This prospective study, conducted between January and November 2023, enrolled 140 patients—a pre-specified sample size calculated to ensure adequate statistical power. The prospective enrollment of patients minimized recall and selection bias, while the use of stringent inclusion criteria enhanced the clarity of the study population. The study's adherence to ethical safeguards, including informed consent, aligned with international research principles—an especially commendable aspect given the inherent challenges of conducting research in a trauma setting.

A further strength of the study was its dual-endpoint approach, assessing both mortality and ICU admission. This methodology captured not only patient survival but also the utilization of critical healthcare resources. The diagnostic performance measures were appropriately defined. The MHIPS demonstrated high sensitivity (92%) and a negative predictive value (98%) for ICU admission, thereby reducing the probability of failing to identify severely ill patients. In contrast, the TRISS showed greater specificity (96%) and positive predictive value (81%), which could help prevent unnecessary ICU admissions. The complementary strengths of these tools suggested potential utility in a sequential or concomitant application.

Finally, the use of robust statistical analyses—including logistic regression, Cox proportional hazards models, and comparisons of the area under the receiver operating characteristic (AUROC) curves—enhanced confidence in the findings The authors appropriately reported these analyses, which showed no statistically significant difference in predictive power for ICU admission (AUROC: 0.95 vs. 0.94, p=0.797); or for mortality (AUROC: 0.93 vs. 0.87, p=0.288). This work, therefore, made a substantial contribution to the fields of trauma prognostication and emergency medicine.

Despite these strengths, opportunities to advance this field remain. First, the study did not address model calibration—the concordance between predicted probabilities and observed outcomes. While discrimination was thoroughly evaluated using AUROC, calibration is equally critical, as a poorly calibrated model could systematically underestimate or overestimate risk. Calibration has been described as the "Achilles heel" of predictive modelling and is a key component of the TRIPOD guidelines for prognostic research [3]. Without an assessment of calibration, the practical reliability of these risk estimates remains uncertain.

Second, decision curve analysis (DCA) could offer valuable insight into clinical utility. Traditional performance measures do not account for the trade-offs between false-positive and false-negative results, whereas DCA quantifies the net benefit of a model across a range of clinical decision thresholds [4]. Evidence suggested that multi-domain models often provided a greater net benefit than single-domain instruments [5]. Applying DCA to TRISS and MHIPS would help determine their comparative value across different decision-making scenarios in emergency and critical care settings.

Third, previous prognostic models in trauma have themselves been criticized for methodological shortcomings, such as small sample sizes, limited external validation, inappropriate handling of missing values, and dichotomization of continuous predictors. A systematic review of models for predicting prognosis in TBI found that the majority of published models lacked external validation and clinician usability [6]. Future studies should therefore emphasize multicenter recruitment, robust imputation protocols, avoidance of dichotomizing continuous predictors, and the development of clinician-friendly instruments to improve generalizability and practical application.

Finally, model stability is an underexplored yet critical issue. Models developed from small samples might exhibit instability, with performance degrading upon external application. Techniques such as bootstrapping and instability index calculations could quantify and mitigate this risk [7]. Incorporating such methods would help ensure that tools such as the TRISS and MHIPS remain reliable when applied outside their derivation cohorts.

Overall, this study presented a timely and vigorous methodological comparison of the TRISS and MHIPS for predicting outcomes following head trauma. Both tools demonstrated adequate performance, supporting their potential usefulness in clinical practice. For future research, we recommend incorporating calibration analysis, decision curve analysis, external validation, robust handling of missing data, and assessment of model stability. These steps would enhance the robustness, reliability, and clinical utility of prognostic models in traumatic brain injury, ultimately supporting improved decision-making in emergency and critical care settings.

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