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Title: Development and validation of a simple clinical prediction tool to identify individuals in the emergency department at high risk of posttraumatic stress disorder after motor vehicle collision

Study objectives: Approximately 4 million individuals are seen in US EDs after motor vehicle collision (MVC) each year. The overwhelming majority (>90%) are discharged to home after evaluation. Posttraumatic stress disorder (PTSD) is a relatively common sequelae in this population, occurring in ~15-30% of individuals discharged to home from the ED. No ED-based or ED-initiated secondary preventive interventions are routinely available to prevent PTSD among those at high risk. The development of such interventions has been hampered by the lack of a simple clinical prediction tool that can be used in the ED to risk stratify individuals for PTSD risk. We sought to develop and validate such a tool.

Methods: ED patients 18-75 years old were recruited at 28 ED sites. Candidate predictive baseline characteristics assessed (n=265) spanned 11 risk factor domains, including sociodemographic characteristics, lifetime trauma, pre-trauma stressors and psychological distress, pre-trauma mental and physical health, MVC characteristics, peritraumatic symptoms, personality, and social support. PTSD was defined by a PCL-5 score ≥ 38 at 3-month follow-up. Inverse missing probability weighting was used to balance baseline characteristics with full cohort (e.g., 20% without 3-month follow-up). Lasso logistic regression with nested binary variables for identified influential factors was used to develop the predictive tool in the derivation sample (19 ED sites in 13 states, n=1282). Application of tool in the validation sample (11 different ED sites in 6 states, n=286) was used to assess generalizability.

Results: In derivation and validation samples (n=1570, 68% female, 33% non-Hispanic White, mean age 36), 26% met criteria for 3-month PTSD. A simple 8-item tool had AUC=0.83 with excellent calibration in the derivation cohort, and AUC=0.76 with continued excellent calibration in the validation cohort. (The tool also had AUC=0.78 and excellent calibration in a separate non-MVC sample.) At thresholds of .3 and .4, the tool had sensitivity/specificity of 69%/80% and 58%/85%, respectively. The most important predictors were anxiety sensitivity, pre-MVC depressive and distress symptoms, and peritraumatic psychophysiological symptoms.

Conclusion: A simple 8 question tool can be used in the ED to help identify those at high risk of PTSD. This tool may be useful in clinical trials testing secondary preventive interventions for PTSD. Funded by NIMH U01MH110925, US Army Military Operational Medicine Research Program, The One Mind Foundation, and The Mayday Fund.