Predictors of PTSD symptoms in adults admitted to a Level I trauma center: A prospective analysis ☆

Mark B. Powers [a,*], Ann Marie Warren [b], David Rosenfield [c], Kenleigh Roden-Foreman [d], Monica Bennett [e], Megan C. Reynolds [b], Michelle L. Davis [a], Michael L. Foreman [b], Laura B. Petrey [b], Jasper A.J. Smits [a]

[a] University of Texas at Austin, United States
[b] Baylor University Medical Center, United States
[c] Southern Methodist University, United States
[d] UT Southwestern Medican Center, United States
[e] Baylor Scott & White Health, United States

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ABSTRACT

Trauma centers are an ideal point of intervention in efforts to prevent posttraumatic stress disorder (PTSD). In order to assist in the development of prevention efforts, this study sought to identify early predictors of PTSD symptoms among adults admitted to a Level I trauma center using a novel analytic strategy (Fournier et al., 2009). Upon admission, participants ($N = 327$) were screened for PTSD symptoms and provided information on potential predictor variables. Their PTSD symptoms were assessed again 3 months later ($N = 227$). Participants were classified as symptomatic (positive PTSD screen) or asymptomatic (negative PTSD screen) at the follow-up assessment. Multinomial logistic regression showed that age, depression, number of premorbid psychiatric disorders, gunshot wound, auto vs. pedestrian injury, and alcohol use predicted who had PTSD symptoms at FU with 76.3% accuracy. However, when controlling for PTSD severity at baseline, only age, number of premorbid psychiatric disorders, and gunshot wounds predicted PTSD symptoms at FU but with 78.5% accuracy. These findings suggest that psychological prevention efforts in trauma centers may be best directed toward adults who are young, have premorbid psychiatric disorders, and those admitted with gunshot wounds.

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It is estimated that most Americans (81%) will experience a trauma at some point in their lives (Breslau et al., 1998; Kessler et al., 2005; Sledjeski, Speisman, & Dierker, 2008) and a common point of first contact with these individuals is a Level I Trauma Center (Conrad, Hansel, Pejic, & Constans, 2013; Zatzick et al., 2004). Level I Trauma Centers are designated by the American College of Surgeons (American College of Surgeons, 2012) and must meet specific criteria including at least 1200 trauma patients yearly, 24-h availability of surgeons in multiple specialties, excellence in education, and an active research program.

Trauma is the leading cause of death for people ages 1–44 in the United States (National Center for Injury Prevention and Control (NCIPC), 2011), and among those who survive, at least 2.8 million are hospitalized each year with varying levels of disability (Hall, DeFrances, Williams, Golosinskiy, & Schwatzman, 2010). Most individuals who experience a trauma (71–94%) will report posttraumatic stress disorder (PTSD) symptoms immediately following the event (Riggs, Rothbaum, & Foa, 1995; Rothbaum, Foa, Riggs, Murdock, & Walsh, 1992). Although many experience steady emotional recovery, a sizable percentage of these individuals (15–25%) will continue to report symptoms and eventually meet formal diagnostic criteria for PTSD (Riggs et al., 1995; Rothbaum et al., 1992).

Fortunately, treatment for PTSD is highly effective for most (85%) patients (Powers, Halpern, Ferenschak, Gillihan, & Foa, 2010) and there are now pilot data showing that acute intervention may also prevent chronic PTSD (PTSD for ≥ 3 months) (Rothbaum et al., 2012). However, delivering interventions to all trauma survivors is not cost-effective, considering that many individuals recover without intervention (Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995; Riggs et al., 1995; Rothbaum et al., 1992), and for some, early intervention interferes with natural recovery (van Emmerik, Kamphuis, Hulsbosch, & Emmelkamp, 2002). Accordingly, identifying variables that predict who will develop chronic PTSD symptoms after a trauma may aid the more efficient use of resources for treating, or

preventing, possible chronic PTSD, and may aid the development of targeted intervention efforts in Level I Trauma Centers.

To date, studies examining potential PTSD risk factors have yielded inconsistent findings, likely because of various limitations in their methodological approaches (e.g., retrospective vs. prospective designs, adequate vs. inadequate control features in analyses). Despite this, PTSD risk factors have been identified by several meta-analyses (Creamer, Bell, & Failla, 2003; Kessler et al., 1995; Ozer, Best, Lipsey, & Weiss, 2003). Importantly, however, there is a lack of research on PTSD symptom predictors conducted in Level I Trauma Centers (Conrad et al., 2013). Further research is needed to determine which factors are associated with PTSD symptomatology onset, maintenance, or recovery in this setting while using more advanced analytic strategies. As such, we used an empirical four-stage analysis (Fournier et al., 2009) that balances the need to identify as many predictors as possible of PTSD symptomatology while minimizing identifying predictors that only emerge by chance.

To this end, we screened adults for symptoms of PTSD and for a number of potential predictor variables upon hospital admission (baseline) to a Level I Trauma Center, and assessed them for the presence or absence of these symptoms 3 months later. Recognizing that a formal PTSD diagnosis requires persistence of symptoms for at least 1 month following a trauma, we categorized patients according to whether or not they screened positive for symptoms of PTSD at a 3-month follow-up. Given the volume of patients admitted to our Trauma Center, these assessments were not intended to be fully diagnostic. However, examining the level of symptoms of PTSD before a formal diagnosis can be made (at baseline) allowed us to control for baseline symptoms levels and examine an understudied time interval which may be very relevant to later development of a PTSD diagnosis. We identified specific predictor variables from the literature (e.g. Brewin, Andrews, & Valentine, 2000; Chiu, deRoon-Cassini, & Brasel, 2011; Ozer et al., 2003) that may be associated with PTSD development and examined whether any of these variables were related to symptomatology at the 3-month follow-up.

1. Method

1.1. Design and procedures

The Baylor University Medical Center Dallas Institutional Review Board approved the study protocol. Trained clinical research assistants approached eligible patients once they were medically stable. The participants completed standardized questionnaires while hospitalized (baseline), and completed an assessment of PTSD symptomatology 3 months post-injury (follow-up) by phone.

1.2. Participants

Participants ($N = 327$) were patients meeting study eligibility criteria, admitted to the Level I Trauma Center between March 26, 2012, and June 10, 2013, who had sustained a traumatic injury (e.g., fall, motor vehicle collision, violent crime). The sample was primarily male (64%), white (68%), non-Hispanic (81%), with a mean age of 46 (SD = 18). Presence of traumatic injury was verified by cross-referencing the trauma and orthopedic trauma admission lists with Trauma Registry database criteria. Inclusion criteria included (1) admission to the trauma service with total hospital admission at least 24 h, (2) 18 years of age and older, and (3) ability to provide at least one contact phone number for follow-up. Exclusion criteria included (1) traumatic brain injury (TBI) and/or premorbid cognitive deficits (e.g., dementia, Alzheimer's) that

would interfere with the ability to respond to the measures, and (2) inability to understand spoken English or Spanish. All participants provided informed consent.

1.3. Measures

1.3.1. PTSD screening

The *Primary Care Post-Traumatic Stress Disorder Screen (PC-PTSD)* is a four-item PTSD screen designed for use in medical settings (Reese et al., 2012) and is the current screening instrument used in Veterans Affairs (VA) centers (Prins et al., 2003). The items assess the presence or absence of the three PTSD clusters including re-experiencing, avoidance, and hyperarousal. The PC-PTSD is considered a psychometrically sound screen for determining the presence of PTSD in the VA setting and has also been used in the civilian primary care population. With a cut-off score of 3, the PC-PTSD screener has shown 85% diagnostic efficiency, 78% sensitivity, and 87% specificity (Prins et al., 2003). A score of 3 or higher on the PC-PTSD was considered a positive screen for clinical levels of PTSD symptoms. Individuals were categorized as: symptomatic (positive PTSD screen) or asymptomatic (negative PTSD screen) at the follow-up assessment.

1.3.2. Predictor Variables

Study measures collected at baseline were organized into the following domains: demographic variables, psychological variables, cause of injury, hospitalization characteristics, substance use, and injury related variables.

Demographic variables. Demographic information was taken from the hospital trauma registry including age, gender, ethnicity, marital status, educational level, and income level.

Psychological variables. The Patient Health Questionnaire (PHQ-8) is a psychometrically sound measure of depression for population-based studies and clinical populations (Kroenke, Spitzer, & Williams, 2001).

The Connor-Davidson Resilience Scale 10 Item (CD-RISC 10) is a measure of resilience with sound psychometric properties (Connor & Davidson, 2003) and has been used in populations who have sustained traumatic injuries (White, Driver, & Warren, 2010). The Social Provisions Scale (SPS) assesses social support received within the context of interpersonal relationships and has adequate psychometric properties (Cutrona & Russell, 1987).

The patient's history of psychiatric illness was assessed by self-report, with patients answering Yes, No, or Unknown to having ever been diagnosed with or treated for psychological conditions including depression, bipolar disorder, PTSD, generalized anxiety disorder, and/or schizophrenia.

Hospitalization characteristics. Hospitalization characteristics were obtained from the hospital Trauma Registry, (TraumaBase – Clinical Data Management, Colorado Springs, CO) and included number of complications, days spent on a ventilator, length of stay in Intensive Care Unit (ICU), total length of hospital stay, and number of comorbidities.

Injury related variables. Injury-related information obtained from the Trauma Registry included mechanism of injury, pain level (Numeric Rating Scale) at baseline, pulse at time of admission, penetrating trauma (or not), the Glasgow Coma Scale (GCS), and the Injury Severity Score (ISS).

The Numeric Rating Scale (NRS) is one of the most commonly used measures in assessing pain and has been validated as a measure of pain intensity (Fraenkel et al., 2012; Lund et al., 2005). For the purposes of the study, participants were asked at baseline to rate pain on average since their injury.

The Glasgow Coma Scale (GCS) was designed to assess the level of consciousness following injury (Rowley & Fielding, 1991;