

# Posttraumatic Distress, Alcohol Disorders, and Recurrent Trauma Across Level 1 Trauma Centers

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**Background:** Injured survivors of individual and mass trauma receive their initial evaluation in acute care. Few investigations have comprehensively screened for posttraumatic stress disorder (PTSD) symptoms and related comorbidities across sites.

**Methods:** This investigation included 269 randomly selected injury survivors hospitalized at two level 1 trauma centers. All patients were screened for PTSD, depressive, and peritraumatic dissociative symp-

toms during their surgical inpatient admission. Prior traumatic life events and alcohol abuse/dependence also were assessed.

**Results:** In this study, 58% of the patients demonstrated high levels of immediate posttraumatic distress or alcohol abuse/dependence. Regression analyses identified greater prior trauma, female gender, nonwhite ethnicity, and site as significant independent predictors for high levels of posttraumatic distress.

**Conclusions:** High levels of posttraumatic distress, recurrent trauma, and alcohol abuse/dependence were present in more than half of acute care inpatients. Early mental health screening and intervention procedures that target both PTSD and alcohol use should be developed for acute care settings.

**Key Words:** PTSD, Alcohol abuse, Recurrent trauma, Injury, Acute care.

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Posttraumatic stress disorder (PTSD) is a psychiatric syndrome brought on by exposure to a life-threatening trauma such as physical injury requiring inpatient hospital admission.<sup>1</sup> Typically, PTSD is characterized by intrusive (e.g., memories, nightmares), avoidant (e.g., emotional numbing, avoidance of reminders), and arousal (e.g., irritability, insomnia) symptoms. Between 10% and 40% of hospitalized injured trauma survivors in the United States experience symptoms consistent with a diagnosis of PTSD in the weeks and months after their injury.<sup>2–7</sup>

Whereas PTSD must be diagnosed 30 days or more after the traumatic event, acute stress disorder (ASD) may be diagnosed within hours or days after the trauma. Typically, ASD includes the same intrusive, avoidant, and arousal symptoms as

PTSD and also incorporates peritraumatic dissociative symptoms (e.g., feelings that the event was unreal, amnesia for all or part of the event).<sup>8,9</sup> Approximately 10% to 25% of injured trauma survivors experience ASD.<sup>10–12</sup> Previous reports suggest that injured patients with PTSD and ASD frequently present with other psychiatric symptoms such as depression,<sup>2,5,13</sup> and somatic symptom amplification.<sup>14</sup>

It appears that along with immediate posttraumatic distress, substance abuse/dependence constitutes a major category of psychiatric disturbance for trauma center patients. Between 20% and 50% of trauma surgery inpatients have current or lifetime histories of alcohol or drug abuse/dependence.<sup>15–17</sup> Previous reports suggest that injured trauma survivors frequently experience recurrent traumatic life events and reinjury.<sup>5,18–22</sup> Patients intoxicated with alcohol at the time of their trauma center admission have an increased risk of injury recurrence.<sup>15</sup> Recurrent traumatic life events are an established risk factor for the development of PTSD.<sup>5,23</sup>

Therefore, prior investigations have identified immediate posttraumatic distress (PTSD, peritraumatic dissociation/ASD, and depression), alcohol use, and recurrent trauma as isolated problems afflicting trauma surgery inpatients. One previous investigation examined the co-occurrence of PTSD, depression, substance abuse, and pain in trauma center patients.<sup>24</sup> The current investigation builds upon and extends these prior reports by examining the constellation of immediate posttraumatic distress, alcohol abuse/dependence, and recurrent trauma in representative samples of surgical inpatients across two level 1 trauma centers. The study aimed to assess the frequency with which hospitalized injury survivors experience high levels of immediate posttraumatic distress, to

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investigate variations in levels of immediate distress across sites, and to understand whether there are other readily identifiable clinical, injury, or demographic factors at the time of the surgical inpatient admission above and beyond the site that explain variations in levels of immediate distress.

## MATERIALS AND METHODS

### Participants and Procedures

Patients were recruited from the University of California Davis Medical Center (UCD;  $n = 117$ ) and the University of Washington's Harborview Medical Center (Harborview;  $n = 152$ ) level 1 trauma centers. Patients included in the investigations were English-speaking survivors of intentional and unintentional injury ages 14 years or older. Adolescent patients were included in the investigation as they were routinely hospitalized with adults in surgical inpatient services. All informed consent procedures were approved by the University of California and the University of Washington institutional review boards. For participants younger than 18 years, adolescent assent and parental consent were obtained. Patients so severely injured that they could not participate in the interview (e.g., those with severe head injury) were excluded from the investigation.

On weekdays, newly admitted trauma surgery inpatients were randomly selected for approach by a research associate using numeric assignments from a random numbers table. At UCD, 397 patients were screened for the study. Of these, 174 patients were ineligible: 76 discharged before approach, 54 monolingual and non-English-speaking, 36 severely injured/cognitively impaired and not able to participate, and 8 representing miscellaneous circumstances preventing participation. Because of time constraints, 67 patients were screened but not approached. Of the remaining 156 patients approached for consent in the surgical ward by the research associate, 29 declined participation, and 10 consented to the interview but did not finish it (8 patients were transferred or discharged before completion, and 2 patients declined ongoing participation).

At Harborview, 1,176 patients were screened for the investigation. Of these, 339 were ineligible: 272 discharged before approach, 37 monolingual and non-English-speaking, and 30 severely injured/cognitively impaired and unable to participate. Because of time constraints, 657 patients were screened but not approached. Of the remaining 180 patients approached for consent in the surgical ward by the research associate, 28 declined participation, and 152 consented to the ward interview and completed it.

All 269 participants were administered a 1-hour face-to-face interview while hospitalized. The interview assessed demographic information (e.g., income, education, work status) as well as immediate posttraumatic distress, alcohol use, and prior trauma.

## Measures

### PTSD

The civilian version of the Post-Traumatic Stress Disorder Checklist (PCL-C),<sup>25</sup> a 17-item self-report Likert response<sup>1-5</sup> questionnaire, was used to assess the intrusive, avoidant, and arousal PTSD symptom clusters. The PCL-C allows for a PTSD algorithm to be developed that represents symptoms consistent with a *Diagnostic and Statistical Manual* (DSM-IV) diagnosis of PTSD. In a study of motor vehicle crash survivors, Blanchard et al.<sup>26</sup> reported that a cutoff score of 45 or more had a sensitivity of 0.95 and a specificity of 0.86, as compared with the clinician-administered PTSD Scale (CAPS), the gold standard for diagnostic interviewing.

### Depressive Symptoms

The Center for Epidemiologic Studies Depression Scale (CES-D),<sup>27</sup> a 20-item self-report Likert response (0-3) instrument, was used to assess depressive symptoms. The CES-D has good internal consistency and convergent validity.<sup>27</sup> A score of 27 or more has been suggested as a conservative indicator for high levels of depressive symptoms.<sup>28</sup>

### Peritraumatic Dissociation

Dissociative symptoms at the time of the traumatic event were assessed with the 8-item interview version of the Peritraumatic Dissociative Experiences Questionnaire (PDEQ).<sup>9</sup> The symptom items from the PDEQ were used in combination with the items from the PCL-C to construct a diagnostic algorithm consistent with DSM-IV ASD criteria.<sup>1,11</sup>

### Alcohol Abuse/Dependence

Current diagnoses of alcohol abuse/dependence were ascertained for the Harborview sample with the Composite International Diagnostic Interview (CIDI).<sup>29,30</sup> For the UCD sample, alcohol abuse/dependence diagnoses were derived from trauma registry diagnoses.

### Prior Trauma

To assess prior traumatic life events, this study used a modified version of the traumatic event inventory that accompanies the CIDI, as developed for the National Comorbidity Survey.<sup>31</sup> This measure screens for the occurrence of 12 traumatic life events such as physical and sexual assault, natural disasters, and combat.

### Injury Severity

Injury severity was abstracted from surgical records using a conversion software program<sup>32</sup> that transforms recognized International Classification of Disease, Ninth Version, Clinical Modification (ICD-9-CM) codes into Abbreviated Injury Scores (AIS), and subsequently, into Injury Severity Scores (ISS).<sup>33</sup> The AIS is a numeric scale ranging from 0 (no injury) to 6 (severe injury with high likelihood of fatality). The ISS is de-

defined as the summed squares of the highest AIS score in each of the three most severely injured body regions.<sup>34</sup>

### Chronic Medical Conditions

Comorbid chronic medical conditions also were derived from ICD-9-CM diagnostic codes. More than 10 conditions such as diabetes, hypertension, chronic liver disease, ischemic heart disease, degenerative nervous conditions, epilepsy, obesity, and coagulation defects were included.<sup>35</sup>

### Statistical Analyses

To assess the representativeness of the study sample, the demographic, injury, and clinical characteristics of the patients included in the investigation were compared with the characteristics of all the patients admitted to the UCD and Harborview trauma surgery services during the period of the study. Next, the frequencies were examined and compared across sites for patients with high levels of PTSD, depressive, and ASD symptoms. The authors created an “any distress” category of patients with one or more of the following symptom presentations: high PTSD (PCL-C  $\geq$  45), high depression (CESD  $\geq$  27), and symptoms consistent with a diagnosis of ASD. They also assessed and compared across sites the frequency of patients who were intoxicated at the time of inpatient admission or who had histories of prior trauma.

Next, logistic regression models were developed that included as dependent variables high PTSD, high depression, ASD, and the combined “any distress” category. The following were entered as independent variables into each logistic model: UCD or Harborview site, level of prior trauma, ethnicity (white vs nonwhite), gender, injury severity, income level, injury type (intentional vs unintentional), alcohol abuse/dependence diagnoses, chronic disease (none vs one or more), and insurance status. Each model was tested for significant interaction effects (effect modification) by site.

## RESULTS

The demographic and injury characteristics of the study participants resembled the characteristics of all the patients admitted for traumatic injury to both trauma centers (Tables 1 and 2). No significant differences between patients included in the investigation and other trauma center admissions were observed for gender, injury mechanism, or injury severity. At UCD, a significantly greater proportion of study patients were tested or identified as positive for alcohol (Table 1). At Harborview, the patients included in the study were significantly younger than other patients admitted during the study period (Table 2). The younger Harborview study patients also had significantly fewer chronic medical conditions (Table 2).

Of the randomly selected patients, 58% demonstrated high levels of immediate posttraumatic distress or alcohol abuse/dependence at the time of surgical inpatient admission (Fig. 1). Findings showed that 45% of the patients demonstrated high levels of immediate distress in the surgical ward, and that 26% had alcohol abuse/dependence diagnoses. Across sites, 20% of the inpatients had high levels of PTSD symptoms, 36% had high levels of depressive symptoms, and 20% met symptomatic criteria for ASD.

The patients at the two sites did not differ significantly with regard to injury severity ( $t[267] = 1.76; p = 0.08$ ), gender ( $\chi^2[1] = 1.50; p = 0.22$ ), number of chronic medical conditions ( $\chi^2[1] = 1.76; p = 0.08$ ), or length of inpatient stay ( $t[267] = 0.18; p = 0.85$ ). The patients at UCD were significantly more likely to be younger ( $t[267] = 2.81; p < 0.01$ ), low-income ( $\chi^2[1] = 14.72; p < 0.01$ ), nonwhite ( $\chi^2[1] = 6.09; p = 0.01$ ) individuals who had incurred intentional injuries ( $\chi^2[1] = 4.45; p = 0.04$ ), and had greater levels of prior trauma ( $\chi^2[1] = 15.82; p < 0.01$ ). The inpatients at UCD had significantly greater frequencies of high PTSD ( $\chi^2[1] = 11.43; p < 0.01$ ), high depression ( $\chi^2[1] =$

**Table 1** Clinical, Injury, and Demographic Characteristics of Study Patients Compared with All Other Inpatients Admitted to the UC Davis Level 1 Trauma Center 12/97–08/98

Characteristic	Study Sample (n = 117) N (%)	All Others (n = 1323) N (%)	$\chi^2$ (df)	p
Female	43 (36.8)	403 (30.5)	1.71 (1)	0.19
Mechanism of injury			0.04 (1)	0.85
Unintentional	79 (67.5)	911 (68.9)		
Intentional	38 (32.5)	412 (31.1)		
One or more chronic medical diagnoses	16 (14)	528 (26)	6.94 (1)	0.01
Medical diagnosis	8 (6.8)	70 (5.3)	0.25 (1)	0.62
Blood alcohol			8.50 (2)	0.01
Negative	63 (53.8)	641 (48.5)		
Positive	40 (34.2)	380 (28.7)		
Not tested	14 (12.0)	302 (22.8)		
	Mean (SD)	Mean (SD)	t (df)	p
Age	33.9 (12.1)	35.1 (13.3)	0.97 (1438)	0.33
ISS	8.7 (7.1)	9.5 (12.0)	0.77 (1404)	0.44

**Table 2** Clinical, Injury, and Demographic Characteristics of Study Patients Compared with All Other Inpatients Admitted to the Harborview Level 1 Trauma Center 03/10–01/02

Variable	Study Sample (n = 152) N (%)	All Others (n = 2358) N (%)	$\chi^2$ (df)	p
Female	44 (28.9)	651 (27.6)	0.07 (1)	0.79
Mechanism of injury				
Unintentional	114 (75.0)	1611 (81.1)		
Intentional	31 (20.4)	376 (18.9)		
One or more chronic medical diagnoses	19 (12.5)	525 (25.9)	10.89 (1)	<0.001
Blood alcohol			2.66 (2)	0.26
Negative	89 (58.6)	1344 (57.0)		
Positive	47 (30.9)	656 (27.8)		
Not tested	16 (10.5)	359 (12.2)		
	Mean (SD)	Mean (SD)	t (df)	p
Age	38.4 (14.7)	41.8 (18.3)	2.70 (2509)	0.03
ISS	10.7 (7.0)	10.8 (9.4)	0.11 (2509)	0.91

4,5;  $p < 0.03$ ), and any distress ( $\chi^2[1] = 7.9$ ;  $p < 0.01$ ) than the Harborview inpatients (Fig. 2).

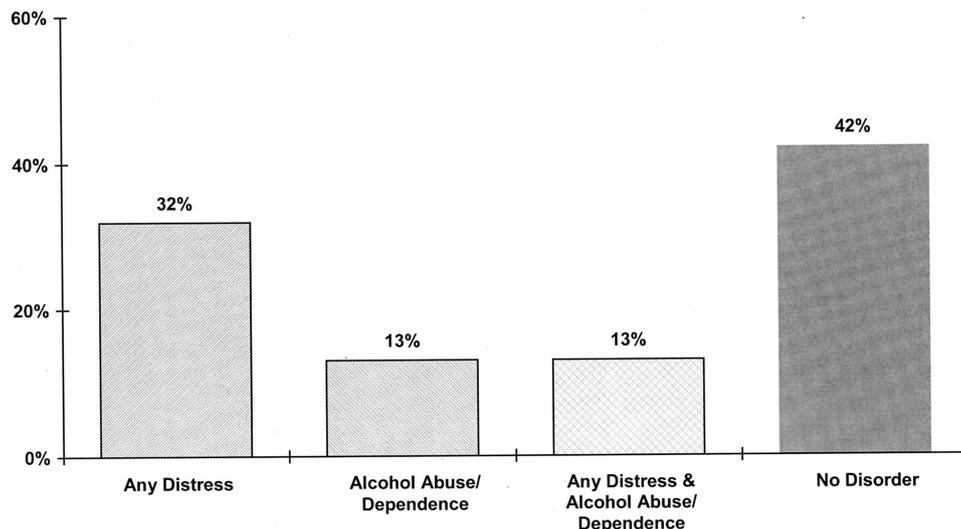
More than 60% of the patients at the UCD site and 36% of the patients at the Harborview site reported experiencing four or more traumas before the event that brought them to the hospital (Fig. 2). Interestingly, patients currently admitted with an intentional injury frequently reported histories of both intentional and unintentional trauma, with 71% of intentionally injured patients reporting a previous assault, and 68% of these patients reporting a previous life-threatening accident. Similarly, the patients who presented with unintentional injuries had substantial histories of both unintentional and intentional events, with 45% reporting a prior assault and 39% reporting a previous life-threatening accident.

Four logistic regression models were developed to assess which clinical, injury, and demographic variables were inde-

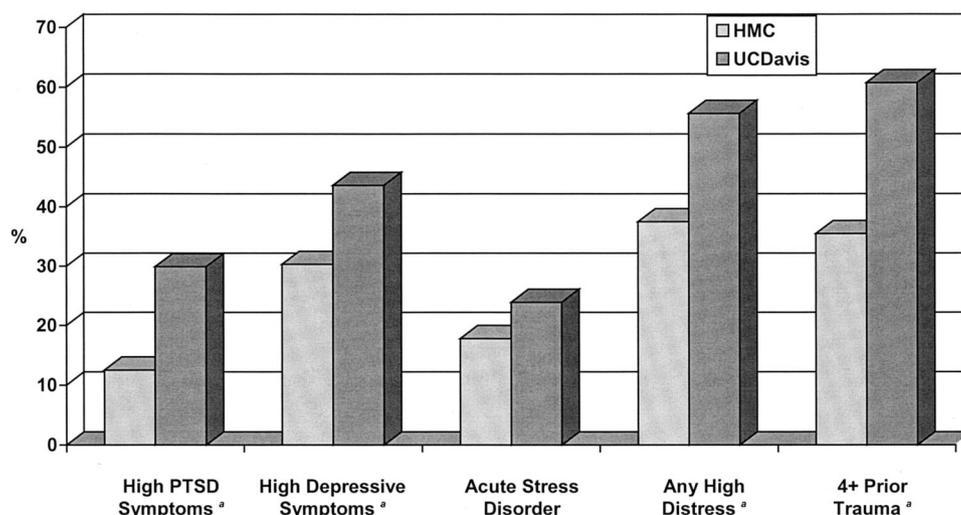
pendent predictors of high PTSD, high depression, ASD, and any high levels of distress (Table 3). A history of four or more prior traumas was independently associated with a significantly increased risk of distress across all four symptom categories. Nonwhite ethnicity was independently associated with an elevated risk of high PTSD, ASD, and any distress. Female gender was independently associated with an elevated risk of high depressive symptoms. After adjustments for other demographic, injury, and clinical characteristics, the UCD site was associated with an increased risk of high PTSD only.

**DISCUSSION**

Level 1 trauma center patients experience high levels of immediate posttraumatic distress, and frequently are intoxicated with alcohol or stimulants at the time of their acute care admission. More than 50% of randomly selected inpatients



**Fig. 1.** Posttraumatic distress and alcohol abuse/dependence among randomly selected acute care inpatients (n = 269) (a) Any distress = posttraumatic stress disorder (PTSD) checklist score<sup>25</sup>  $\geq 45$  and/or Center for Epidemiologic Depression Score<sup>27</sup>  $\geq 27$  and/or symptoms consistent with a diagnosis of acute stress disorder.<sup>1</sup>



**Fig. 2.** Posttraumatic distress and level of prior trauma across sites. High posttraumatic stress disorder (PTSD) = PTSD checklist score<sup>25</sup>  $\geq 45$ . High depression = Center for Epidemiologic Depression Score<sup>27</sup>  $\geq 27$ . Any distress = PTSD checklist score  $\geq 45$  and/or Center for Epidemiologic Depression Scale Score  $\geq 27$  and/or symptoms consistent with a diagnosis of acute stress disorder.<sup>1</sup> (a)  $p < 0.05$  for comparison across sites. HMC, Harborview Level 1 trauma center; UC Davis, University of California Davis Level 1 trauma center.

across two level 1 trauma center sites demonstrated high levels of immediate posttraumatic distress or alcohol diagnoses during their surgical inpatient admissions. The findings showed that 45% of the patients demonstrated symptoms consistent with ASD or high levels of PTSD/depressive symptoms.

Whereas only 10% of American civilians have experienced four or more lifetime traumas,<sup>31</sup> 45% of trauma center inpatients reported four or more traumatic events before the event that brought them to the hospital. Interestingly, more than 40% of both intentional and unintentional injury survivors had experienced a prior assault, whereas more than 35%

**Table 3** Logistic Regressions Predicting High PTSD, High Depression, Acute Stress Disorder, and Any Distress

Independent Variables	Dependent Variables (Odds Ratio and 95% Confidence Interval)			
	High PTSD	High Depression	Acute Stress Disorder	Any Distress
4+ prior trauma	2.47 <sup>a</sup> 1.24–4.93	2.02 <sup>b</sup> 1.16–3.54	2.63 <sup>b</sup> 1.31–5.28	1.97 <sup>b</sup> 1.14–3.39
Non-white ethnicity	1.86 0.94–3.65	1.26 0.73–2.19	3.16 <sup>b</sup> 1.60–6.26	1.93 <sup>b</sup> 1.13–3.32
Female gender	1.31 0.62–2.79	1.87 <sup>a</sup> 1.02–3.44	1.87 0.87–4.03	1.71 0.94–3.11
UC Davis	2.63 <sup>b</sup> 1.30–5.32	1.31 0.75–2.31	0.94 0.47–1.89	1.52 0.87–2.64
Low income	0.97 0.47–1.99	1.76 0.96–3.21	1.21 0.59–2.48	1.44 0.79–2.62
ISS (continuous)	1.31 0.83–2.06	0.96 0.66–1.38	0.66 0.41–1.08	0.91 0.63–1.30
Age (in years)	1.03 0.63–1.69	1.09 0.73–1.62	1.03 0.63–1.68	1.03 0.69–1.53
Alcohol abuse/dependence	1.93 0.90–4.16	1.47 0.78–2.78	1.69 0.78–3.69	1.65 0.88–3.11

<sup>a</sup>  $p < 0.05$ .

<sup>b</sup>  $p < 0.01$ .

High PTSD = PTSD Checklist score<sup>25</sup>  $\geq 45$ . High Depression = Center for Epidemiologic Depression Scale Score<sup>27</sup>  $\geq 27$ . Any Distress = PTSD Checklist score  $\geq 45$  and/or Center for Epidemiologic Depression Scale Score  $\geq 27$  and/or symptoms consistent with a diagnosis of acute stress disorder.<sup>1</sup>

Independent variables tested in each model include injury type, education, insurance payer, marital status, presence of one or more chronic diseases, 4+ prior trauma, ethnicity (non-white vs. white), gender, income (<\$15,000/year vs. >\$15,000/year), trauma center site (UC Davis vs. Harborview), injury severity score, age (years), and substance toxicology result (positive vs. negative). Each model was tested for effect modification by site: no significant effect modification was found.

of the patients from both groups reported a prior life-threatening accident. These findings corroborate and extend previous observations of chronic recidivistic trauma among acute care inpatients.<sup>5,18–22</sup>

High levels of immediate distress were associated with greater prior trauma, nonwhite ethnicity, and female gender. This profile of at-risk injured trauma survivors contrasts with previously reported demographic and injury characteristics of substance-abusing trauma patients. Alcohol and drug use is more frequent among young adult male intentionally injured patients.<sup>15,16,36</sup> Future investigations may need to elucidate further the mechanisms by which these factors contribute to higher levels of immediate distress. For ethnocultural heritage in particular, future investigations may need to delineate better how an individual's prior life experience interacts with preevent, event, and service delivery system characteristics to influence posttraumatic symptom exacerbation or resilience.<sup>37</sup>

The current investigation was limited by the use of symptom screens rather than clinician-administered diagnostic instruments for the assessment of PTSD, depression, and ASD. The study also was limited by the use of trauma registry-derived alcohol diagnoses at the UCD site, as compared with the gold-standard, structured clinical interview assessments at the Harborview site. Also, the generalizability of the study is limited by the inability to recruit weekend trauma admissions at both sites.

Besides these considerations, the investigation's findings have important implications for the development of acute care mental health evaluation and treatment procedures. The investigation establishes the fact that screening for prior traumatic events and immediate posttraumatic distress in the acute care setting is quite feasible. As mental health researchers work to narrow the posttraumatic symptom clusters with the greatest potential for identifying at-risk patients,<sup>5</sup> acute care providers can consider including routine screens for prior trauma and selected posttraumatic symptom clusters.

With regard to early intervention development, the observation that more than 50% of trauma center patients demonstrated high levels of immediate posttraumatic distress or alcohol abuse/dependence suggests that routine mental health screening and referral should be implemented at level 1 trauma centers. Further impetus is provided by the observations that alcohol intoxication is associated with recurrent injury,<sup>38</sup> and that PTSD is independently associated with a broad profile of functional impairment among injured trauma survivors even after adjustments for important covariates such as injury severity.<sup>39</sup> Three randomized clinical trials suggest that early mental health interventions can be feasibly and effectively delivered in the acute care setting.<sup>40–42</sup> The collaborative care intervention model combining evidence-based pharmacologic and psychotherapeutic PTSD interventions, motivational interviewing that targets alcohol use, and master's level trauma support activities holds particular promise for the repeatedly traumatized, multiply comorbid patients who present to acute care settings.<sup>43</sup>

## REFERENCES

1. American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders*. 4th ed. Washington DC: American Psychiatric Press; 1994.
2. Blanchard EB, Hickling EJ, Taylor AE, Loos W. Psychiatric morbidity associated with motor vehicle accidents. *J Nerv Ment Dis*. 1995;183:495–504.
3. Holbrook TL, Anderson JP, Sieber WJ, Browner D, Hoyt DB. Outcome after major trauma: 12-month and 18-month follow-up results from the trauma recovery project. *J Trauma*. 1999;46:765–773.
4. Michaels AJ, Michaels CE, Moon CH, Zimmerman MA, Peterson C, Rodriguez JL. Psychosocial factors limit outcomes after trauma. *J Trauma*. 1998;44:644–648.
5. Zatzick DF, Kang SM, Muller HG, et al. Predicting posttraumatic distress in hospitalized trauma survivors with acute injuries. *Am J Psychiatry*. 2002;159:941–946.
6. Ursano RJ, Fullerton CS, Epstein RS, et al. Acute and chronic posttraumatic stress disorder in motor vehicle accident victims. *Am J Psychiatry*. 1999;156:589–595.
7. Mellman TA, David D, Bustamante V, Fins AI, Esposito K. Predictors of posttraumatic stress disorder following severe injury. *Depression Anxiety*. 2001;14:226–231.
8. Michaels AJ, Michaels CE, Zimmerman MA, Smith JS, Moon CH, Peterson C. Posttraumatic stress disorder in injured adults: etiology by path analysis. *J Trauma*. 1999;47:867–873.
9. Marmar CR, Weiss DS, Metzler TJ. The peritraumatic dissociative experiences questionnaire. In: Wilson JP, Keane TM, eds. *Assessing Psychological Trauma and PTSD*. New York, NY: Guilford Press; 1997:412–428.
10. Bryant RA, Harvey AG. Relationship between acute stress disorder and posttraumatic stress disorder following mild traumatic brain injury. *Am J Psychiatry*. 1998;155:625–629.
11. Brewin CR, Andrews B, Rose S, Kirk M. Acute stress disorder and posttraumatic stress disorder in victims of violent crime. *Am J Psychiatry*. 1999;156:360–366.
12. Bryant RA, Harvey AG, Dang ST, Sackville T. Assessing acute stress disorder: psychometric properties of a structured clinical interview. *Psychol Assess*. 1998;10:215–220.
13. Shalev AY, Freedman S, Peri T, et al. Prospective study of posttraumatic stress disorder and depression following trauma. *Am J Psychiatry*. 1998;155:630–637.
14. Zatzick DF, Russo J, Katon W. Somatic, posttraumatic stress, and depressive symptoms among injured patients treated in trauma surgery. *Psychosomatics*. 2003;44:479–484.
15. Rivara FP, Jurkovich GJ, Gurney JG, et al. The magnitude of acute and chronic alcohol abuse in trauma patients. *Arch Surg*. 1993;128:907–913.
16. Soderstrom CA, Smith GS, Dischinger PC, et al. Psychoactive substance use disorders among seriously injured trauma center patients. *JAMA*. 1997;277:1769–1774.
17. Jurkovich GJ, Rivara FP, Gurney JG, et al. The effect of acute alcohol intoxication and chronic alcohol abuse on outcome from trauma. *JAMA*. 1993;270:51–56.
18. Dowd MD, Langley J, Koepsell T, Soderberg R, Rivara FP. Hospitalizations for injury in New Zealand: prior injury as a risk factor for assaultive injury. *Am J Public Health*. 1996;86:929–934.
19. Smith RS, Fry WR, Morabito DJ, Organ CHJ. Recidivism in an urban trauma center. *Arch Surg*. 1992;127:668–670.
20. Sims DW, Bivins BA, Obeid FN, Horst HM, Sorensen VJ, Fath JJ. Urban trauma: a chronic recurrent disease. *J Trauma*. 1989;29:940–947.
21. Poole GV, Griswold JA, Thaggard VK, Rhodes RS. Trauma is a recurrent disease. *Surgery*. 1993;113:608–611.

22. Reiner DS, Pastena JA, Swan KG, Lindenthal JJ, Tischler CD. Trauma recidivism. *Am Surg*. 1990;58:556–560.
23. Brewin CR, Andrews B, Valentine JD. Meta-analysis of risk factors for posttraumatic stress disorder in trauma-exposed adults. *J Consult Clin Psychol*. 2000;68:748–766.
24. Michaels AJ, Michaels CE, Smith JS, Moon CH, Peterson C, Long WB. Outcome from injury: general health, work status, and satisfaction 12 months after trauma. *J Trauma*. 2000;48:841–848.
25. Weathers FW, Huska JA, Keane TM. The PTSD checklist—civilian version. Boston MA: The National Center For PTSD, Boston VA Medical Center; 1991.
26. Blanchard EB, Jones-Alexander J, Buckley TC, Forneris CA. Psychometric properties of the PTSD Checklist. *Behav Res Ther*. 1996;34:669–673.
27. Radloff LS. The CES-D Scale: a self-report depression scale for research in the general population. *Appl Psychol Measurement*. 1977;1:385–401.
28. McDowell I, Newell C, eds. *Measuring Health: A Guide to Rating Scales and Questionnaires*. 2nd ed. New York: Oxford University Press; 1996.
29. Kessler RC, Crum RM, Warner LA, Nelson CB, Schulenberg J, Anthony JC. Lifetime co-occurrence of DSM-III-R alcohol abuse and dependence with other psychiatric disorders in the National Comorbidity Survey. *Arch Gen Psychiatry*. 1997;54:313–321.
30. World Health Organization. *Composite International Diagnostic Interview (CIDI) version 2.1*. Geneva: World Health Organization; 1997.
31. Kessler RC, Sonnega A, Bromet E, Hughs M, Nelson CB. Posttraumatic stress disorder in the national comorbidity survey. *Arch Gen Psychiatry*. 1995;52:1048–1060.
32. The Johns Hopkins Health Services Research and Development Center. *Determining Injury Severity From Hospital Discharges: A Program to Map ICD-9CM Diagnoses Into AIS and ISS Severity Scores*. Baltimore, MD: The Johns Hopkins University Press; 1989.
33. The Committee on Injury Scaling. *The Abbreviated Injury Scale, 1985 Revision*. Morton Grove IL: American Association for the Advancement of Automotive Medicine; 1985.
34. O’Keefe GE, Jurkovich GJ. Measurement of injury severity and comorbidity. In: Rivara FP, Cummings P, Koepsell TD, Grossman DC, Maier RV, eds. *Injury Control: A Guide to Research and Program Evaluation*. Cambridge, UK: Cambridge University Press; 2001.
35. MacKenzie EJ, Morris JA, Edelstein SL. Effect of preexisting disease on length of hospital stay in trauma patients. *J Trauma*. 1989;29:757–764.
36. Dunn C, Zatzick D, Russo J, et al. Hazardous drinking by trauma patients during the year after injury. *J Trauma*. 2003;54:707–712.
37. Kaplan JB, Bennett T. Use of race and ethnicity in biomedical publication. *JAMA*. 2003;289:2709–2716.
38. Rivara FP, Koepsell TD, Jurkovich GJ, Gurney JG, Soderberg R. The effects of alcohol abuse on readmission for trauma. *JAMA*. 1993;270:1962–1964.
39. Zatzick DF, Jurkovich GJ, Gentilello LM, Wisner DH, Rivara FP. Posttraumatic stress, problem drinking, and functioning 1 year after injury. *Arch Surg*. 2002;137:200–205.
40. Gentilello LM, Rivara FP, Donovan DM, et al. Alcohol interventions in a trauma center as a means of reducing the risk of injury recurrence. *Ann Surg*. 1999;230:473–480.
41. Zatzick D, Roy-Byrne P, Russo J, et al. A randomized effectiveness trial of stepped collaborative care for acutely injured trauma survivors. *Arch Gen Psychiatry*. 2004;61:498–506.
42. Zatzick DF, Roy-Byrne P, Russo J, et al. Collaborative interventions for physically injured trauma survivors: a pilot randomized effectiveness trial. *Gen Hosp Psychiatry*. 2001;23:114–123.
43. Zatzick D. Collaborative care for injured victims of individual and mass trauma: a health services research approach to developing early interventions. In: Ursano RJ, Fullerton CS, Norwood AE, eds. *Terrorism and Disaster: Individual and Community Mental Health Interventions*. United Kingdom: Cambridge University Press; 2003:189–205.