Posttraumatic Stress and Depressive Symptoms, Alcohol Use, and Recurrent Traumatic Life Events in a Representative Sample of Hospitalized Injured Adolescents and Their Parents

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Objective Few investigations have comprehensively assessed the scope of impairment of injured adolescents presenting to acute care inpatient settings. Methods Randomly sampled injured adolescent inpatients and their parents were screened for posttraumatic stress (PTS) and depressive symptoms, preinjury alcohol use, and preinjury trauma. Linear regression was used to assess which clinical, demographic, and injury characteristics were independently associated with increased levels of adolescent PTS and depressive symptoms. Results Seventy percent of adolescent–parent dyads endorsed high levels of PTS or depressive symptoms and/or high preinjury alcohol use. Adolescent female gender, greater levels of preinjury trauma, greater subjective distress at the time of the injury, and greater parental depressive symptoms were independently associated with increased levels of adolescent PTS and depressive symptoms. Conclusions The adoption of early screening and intervention procedures that broadly consider the scope of impairment of injured adolescents and their family members could enhance the quality of acute care mental health service delivery.

Key words adolescents; alcohol; depression; injury; posttraumatic stress; trauma history.

Recent commentary has encouraged investigations that bridge public health and pediatric psychological perspectives (Fuemmeler, 2004). Population-based epidemiologic investigation can serve to characterize the scope of symptomatic impairment (Kazdin, 1996) that injured youth and their family members experience (Stoddard & Saxe, 2001). This information can in turn inform which mental health symptom clusters/disorders may be important to screen for in acute care settings. Initial epidemiological investigations can also facilitate intervention development in general medical settings by informing the selection of intervention components and combinations when multifaceted treatments are required for patients with comorbid medical and psychiatric conditions (Kazdin, 1996; Shrout, 1998; Zatzick, Simon, & Wagner, submitted for publication; Zatzick & Roy-Byrne, 2003). Commentary by child psychologists suggests that by more fully addressing issues of primary concern to youth and family members, screening and intervention procedures that broadly address the scope of impairment of patients presenting to real world treatment settings may have an increased likelihood of initially engaging youth and families in the delivery of empirically supported treatments (Weisz, Chu, & Polo, 2004; Weisz, Southam-Gerow, Gordis, & Connor-Smith, 2003).

The National Co-morbidity Survey (NCS), an epidemiological survey of mental disorders in Americans ages 15–54, established that traumatic life events and posttraumatic stress disorder (PTSD) were endemic among US civilians (Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995). Eleven percent of individuals in the NCS reported that over the course of their lifetime they had experienced four or more severe traumas (e.g., natural disaster, assault). The NCS also demonstrated that over 80% of individuals with PTSD had a lifetime history of one or more co-morbid Axis I diagnoses. Major depression and alcohol use disorders were among the most common co-morbidities, occurring in 30–50% of individuals with PTSD. Other investigations of trauma exposed youth (Kilpatrick et al., 2003) and adults (Resnick, Acierno, Holmes, Dammeyer, & Kilpatrick, 2000) have also identified the constellation of PTSD, depressive symptoms, and substance abuse.

Prior investigation suggests that along with postinjury PTS, traumatically injured youth may be at risk for the development of postinjury depressive symptoms (Reijneveld, Crone, Verhulst, & Verloove-Vanhorick, 2003), are more likely to report preinjury histories of recurrent traumatic life events (Shemesh et al., 2003) and are more likely to report high levels of preinjury alcohol consumption (Spirito et al., 2001). Investigations in representative samples of injured adults across level I trauma center sites suggest that this scope of impairment/constellation of PTS and depressive symptoms, high preinjury alcohol use, and substantial preinjury cumulative trauma burden is highly prevalent (Zatzick, Jurkovich et al., 2004). A literature review revealed no previous studies that have broadly screened for this scope of impairment in adolescents admitted to acute care settings after incurring traumatic injuries.

The goal of this investigation was to assess the constellation of PTS and depressive symptoms, preinjury alcohol use, and preinjury trauma in hospitalized injured adolescents and their parents. The investigation employed clinical epidemiological methods in an effort to attain a representative sample of intentionally (e.g., injuries associated with human malice such as physical assaults) and unintentionally (e.g., motor vehicle crashes) injured adolescents admitted to a level I trauma center. The investigation also aimed to contribute to the understanding of the development of posttraumatic symptomatic distress (i.e., PTS and depressive symptoms) in the days and weeks following traumatic injury. Because pragmatically oriented acute care providers may have limited time available for mental health screening (Winston et al., 2003; Zatzick, Russo, Pitman et al., 2005), the investigation aimed to ascertain clinical, demographic, and injury characteristics readily identifiable at the time of acute care inpatient admission that were independently associated with PTS and depressive symptoms (Kraemer, Stice, Kazdin, Offord, & Kupfer, 2001).

A literature review revealed no previously published, comprehensive model for understanding the development of early symptomatic distress for injured youth initially presenting to acute care settings. Therefore, we used previous investigations of child and adolescent injury survivors to inform the selection of candidate variables. We hypothesized that adolescent female gender (Mirza, Bhadrinath, Goodyer, & Gilmour, 1998; Stallard et al., 1998; Winston et al., 2003), older age (Winston et al., 2003), and a preinjury history of emotional and behavioral disturbances (Daviss, Mooney, and Stallard, 2004) may be important to screen for in acute care settings.
et al., 2000; Daviss, Racusin et al., 2000; Winston et al., 2003) would be associated in bivariate analyses with increased levels of adolescent PTS and depressive symptoms. We also hypothesized that greater levels of preinjury trauma (Daviss, Mooney et al., 2000; Daviss, Racusin et al., 2000; Shemesh et al., 2003), event severity (Fein et al., 2001; Winston et al., 2003), adolescent physiological response (Winston et al., 2003), adolescent subjective distress at the time of the trauma (Aaron et al., 1999; Di Gallo et al., 1997; Ehlers et al., 2003; Mirza et al., 1998), and parental distress (Daviss, Mooney et al., 2000; Daviss, Racusin et al., 2000; de Vries et al., 1999; Mirza et al., 1998) would be associated in bivariate analyses with increased levels of adolescent PTS and depressive symptoms. The adult injury literature (Zatzick, Roy-Byrne et al., 2004) and child and adult reviews (Brewin, Andrews, & Valentine, 2000; Foy, Madvig, Pynoos, & Camilleri, 1994) informed predictions surrounding an association between greater adolescent preinjury alcohol use, non-white ethnicity, intentional injury, and low SES, and increased levels of adolescent PTS and depressive symptoms. Finally, because some (O’Donnell, Creamer, & Pattison, 2004), but not all (Shalev et al., 1998; Zatzick, Russo, Pitman et al., 2005) previous investigations in adult injury survivors have demonstrated similar predictors of PTS and depressive symptoms, we performed exploratory analyses aimed at determining whether similar demographic, injury, and clinical characteristics were independent predictors of early PTS and depressive symptoms in injured adolescents.

Method
Participants
The patient population targeted for inclusion in the study were adolescents ages 12–18 who presented to the University of Washington’s Harborview level I trauma center between July 2002 and August 2003 with injuries so severe that they required inpatient surgical admissions. Patients included in the investigations were hospitalized English-speaking survivors of intentional or unintentional injuries. Patients who were determined to have self-inflicted injuries were excluded from the study. One parent of each patient was also invited to participate in the investigation. All informed consent procedures were approved by the University of Washington’s institutional review board, and full informed consent was obtained before data collection. For patients under the age of 18, adolescent assent and parental consent were obtained.

Each weekday morning a research associate downloaded a list of all newly admitted injury survivors between the ages of 12 and 18 from the Harborview automated admissions/trauma registry database. Microsoft Excel (Microsoft Inc) was used to generate random number assignments for each newly admitted adolescent. The research associate then approached each potential participant in the surgical ward in the order dictated by the random number assignments. Upon approach, inpatients with severe injuries that prevented participation were excluded from the study. With regard to cognitive status, patients approached in the ward were required to have a Glasgow Coma Scale Score (Teasdale & Jennet, 1974) of 15 and a score of at least 7 on the two Mini-mental State Examination items that assess orientation to location and date (Folstein, Folstein, & McHugh, 1975).

Of 365 adolescent inpatients assigned random numbers for approach, 16 were ineligible (14 injury too severe, 2 deceased) and 159 were discharged before approach. One hundred and eighty-eight patients were approached in the surgical ward; 18 of these patients were aged 17 or younger, had no available parent, and therefore could not undergo informed consent, 15 patients and/or parents were monolingual non-English speaking, and 1 patient was discovered to have recently attempted suicide, leaving 154 available for approach for consent. Forty potential participants refused study participation. Of the 114 consented adolescent inpatients, 5 were discharged before completion of the surgical ward interview, 1 withdrew from the study, and 11 did not complete the interview within 30 days after the trauma, leaving 97 adolescents in the investigation. Nine 18-year-old adolescents were not living with parents and 5 parent interviews could not be completed before 30 days after the injury leaving 83 parents in the investigation.

Data Collection
Adolescents and parents were separately interviewed for approximately 1 h each. The hour-long interview contained measures assessing current symptoms, and preinjury health service use and functioning. Adolescent self-report was used to assess all adolescent symptoms and parent self-report was used to assess all parent symptoms. The investigation aimed to complete both the adolescent and parent assessment as early on after the traumatic injury as possible. Interviews were performed either in-person during the inpatient hospital admission or over the telephone after hospital discharge. Telephone follow-up is a commonly employed assessment strategy in acute care studies of trauma exposed youth.
and families (Daviss, Mooney et al., 2000; de Vries et al., 1999; Fein et al., 2001). A series of investigations support the equivalence of in-person and telephone assessments across a spectrum of anxiety and depressive disorders including PTSD (Dansky, Saladin, Brady, Kilpatrick, & Resnick, 1995; Paulsen, Crowe, Noyes, & Pfohl, 1988; Wells, Burnam, Leake, & Robbins, 1988). In this investigation, combining parent and adolescent interviews, 48% (n = 86) were performed in-person and 52% (n = 94) over the telephone. Interviews were conducted by research associates trained by the principal investigator (PI).

**Measures**

**Adolescent PTS Symptoms**

Adolescent posttraumatic stress symptoms were assessed with the adolescent version of the UCLA Reaction Index (RI) for DSM-IV (Steinberg, Brymer, Decker, & Pynoos, 2004). The RI includes seven items that evaluate the PTSD A1 criteria (i.e., exposure to traumatic elements of the event) and five items that assess the PTSD A2 criteria (i.e., subjective experience of the event). Each PTSD A1 and A2 item is scored as present or absent. The RI also included 20 items that assess the DSM-IV B (intrusion), C (avoidance), and D (arousal) PTSD symptom clusters. These items are rated on a five-point Likert scale ranging from 0 (none of the time) to 4 (most of the time). Adolescents were asked to anchor all symptom reports to the injury event (e.g., “How much of the time since your injury did you have dreams about the event in which you were injured or other bad dreams”). Steinberg et al. report a Chronbach’s alpha for the RI in the range of 0.90 (Steinberg et al., 2004). In this investigation Chronbach’s alpha for the measure was .87. An RI cutoff score of 38 or greater has a sensitivity of 0.93 and specificity of 0.87 when compared to the gold standard Clinician-Administered PTSD Scale (CAPS) (Blanchard et al., 1996); this cutoff was used in this investigation to assess for high levels of PTS symptoms.

**Adolescent and Parent Depressive Symptoms**

The Center for Epidemiological Studies Depression Scale (CES-D) (Radloff, 1977), a 20-item self-report Likert response (0–3) instrument, was used to assess adolescent and parent depressive symptoms. The scale has been used extensively to assess depressive symptoms in adolescents (Wight, Sepulveda, & Aneshensel, 2004) and has excellent internal consistency and convergent validity (Radloff, 1977). In this investigation, Chronbach’s alpha for adolescents was .88 and .92 for parents. A score of 27 or greater has been suggested as a conservative indicator of high levels of depressive symptoms (McDowell & Newell, 1996); this cutoff was used in this investigation to assess for high levels of depressive symptoms.

**Adolescent and Parent Preinjury Alcohol Use**

Alcohol consumption in the year before the index injury was assessed with the Alcohol Use Disorders Identification Test (AUDIT), a 10 item self-report screening measure used for early identification of problem drinking in the acute care setting (Babor & Grant, 1989; Gentilello, Donovan, Dunn, & Rivara, 1995). The measure has established reliability, validity, and responsiveness to change (Bradley et al., 1998). In this investigation the Chronbach’s alpha for the AUDIT was .86 for adolescents and .88 for parents. A cutoff of ≥8 was used as an indicator of high levels of preinjury alcohol consumption (Gentilello et al., 1995).

**Adolescent and Parent Preinjury Trauma**

Traumatic life events that predated the adolescent’s index injury admission were screened for using a modified version of the RI trauma history screen (Steinberg et al., 2004). The version of the RI trauma screen that was used assessed lifetime exposure to natural disasters, motor vehicle crashes, war zones, physical assault, witnessing violence or death, sudden unexpected loss of a loved one, and life threatening medical conditions.

To assess prior traumatic life events in parents, we used a modified version of the traumatic event inventory
that accompanies the Composite International Diagnostic Interview (CIDI) (World Health Organization, 1997). The CIDI was developed by the World Health Organization to be used by lay interviewers to assess mental disorders including PTSD (Kessler et al., 1995). The 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 (The Johns Hopkins Health Services Research and Development Center, 1989) that transforms recognized International Classification of Disease Ninth Version Clinical Modification (ICD-9CM) codes into Abbreviated Injury Scale (AIS) and subsequently injury severity scores (ISS) (The Committee on Injury Scaling, 1985).

Other Demographic and Injury Characteristics
We used self-report and/or trauma registry data to ascertain injury type and admit insurance status. Based on adolescent and parent retrospective reports, we created a variable documenting any adolescent history of psychiatric diagnosis, psychotropic medication use, or mental health visits in the year before injury. We examined insurance status as a readily identifiable acute care proxy for socioeconomic status (Brewin et al., 2000).

Statistical Analyses
To assess the representativeness of the sample we compared the demographic, injury, and clinical characteristics of patients included in the investigation with the characteristics of all eligible adolescent patients admitted to Harborview trauma surgery services during the time period of the study. Next, we ascertained the frequencies of high levels of PTS and depressive symptoms, preinjury alcohol consumption, and preinjury trauma for adolescents, parents, and adolescent–parent dyads.

We examined the bivariate associations between adolescent and parent demographic, injury, and clinical characteristics, and adolescent RI and CES-D scale scores. To assess which clinical, injury, and demographic characteristics were independently and significantly associated with the development of increased levels of adolescent PTSD and depressive symptoms, we developed four linear regression models. Two regressions that included only adolescent clinical characteristics (n = 97) identified variables independently associated with greater RI and CES-D scale scores. Adolescent and/or parent characteristics that demonstrated significant bivariate (p < .05) associations with either RI or CESD scores were tested in the regression models. The final linear regression models retained only those adolescent and parent clinical variables that demonstrated significant independent associations with increased levels of adolescent PTS and depressive symptoms.

Results
Adolescent patients included in the study did not significantly differ from all adolescent patients admitted to Harborview surgical services with regard to gender (percent female in study sample 32% vs. percent female all other admissions 30%; χ²(1) = 0.23, p = .63), age (mean = 15.9, standard deviation (SD) = 1.9 vs. 15.8 (1.9); t(677) = 1.3, p = .20), injury type (study sample intentional injury 12% vs. all others 9%; χ²(1) = 0.66, p = .42), injury severity (ISS mean = 9.7 (6.2) vs. 11.0 (10.2), t(669) = 1.1, p = .27), alcohol toxicology status (percent positive 8 vs. 7%; χ²(2) = 0.38, p = .83), or inpatient length of stay (mean = 5 days (6.1) = 5.0 days (7.3); logarithm transformed t(677) = 0.68, p = .27).

Study adolescents were admitted after heterogeneous traumatic events. These included motor vehicle related injuries 47% (n = 46, i.e., automobile, motorcycle, bicycle, or pedestrian vs. motor vehicle), falls 18% (n = 17), physical assaults 8% (n = 8), sports injuries 7% (n = 7), intentional or unintentional stabblings 5% (n = 5) and gunshots 4% (n = 4), burn injuries 5% (n = 5), and other miscellaneous injury events 5% (n = 5, e.g., near-drowning).

Adolescents were interviewed a median of 7 days after the injury (range 0–28 days) and parents were interviewed a median of 6 days after the injury (range 0–28 days). Of the parents interviewed 75% (n = 62) were the adolescent’s biological mother, 24% (n = 19) were biological fathers, and 2% were adopted (n = 1) or foster (n = 1) mothers.

The mean RI score for adolescents was 37.8 (SD = 12.9). The mean CES-D score for adolescents was 17.4 (SD = 11.0). Adolescent RI and CES-D scores were significantly correlated (r = .68, p < .001). Forty-one percent (n = 40) of adolescents had RI scores ≥38, 17% (n = 16) had CES-D scores ≥27, and 13% (n = 13) had AUDIT scores ≥8. In total, 47% (n = 46) of adolescents had either high levels of PTS and depressive symptoms and/or high preinjury alcohol consumption.
The mean parent PCL score was 35.8 (SD = 16.2) and the mean parent CES-D score was 18.2 (SD = 12.1) (Table I) Parent PCL and CES-D scores were significantly correlated ($r = .76, p < .001$). Twenty-eight percent ($n = 23$) of parents had PCL scores $\geq 45$, 23% ($n = 20$) had CES-D scores $\geq 27$, and 16% ($n = 13$) had AUDIT scores 28. All together 58% ($n = 48$) of parents had either high levels of PTS and depressive symptoms and/or high preinjury alcohol consumption. In total 70% ($n = 58$) of adolescent–parent dyads had high symptom levels and/or high preinjury alcohol consumption.

Thirty percent ($n = 29$) of adolescents endorsed experiencing four or more serious prior traumatic life events that predated the index injury. Forty percent of parents ($n = 33$) endorsed experiencing four or more prior traumas. Adolescent and parent prior trauma were significantly correlated ($r = .28, p = .01$).

In bivariate analyses, adolescent gender (female) and ethnicity (non-white), greater levels of exposure (PTSD A1 criteria) and subjective distress (PTSD A2 criteria), greater prior trauma, and preinjury alcohol use were significantly associated with increased RI and CES-D scale scores (Table I). Parent PTS and depressive symptoms were also associated with significantly increased adolescent RI and CES-D scores.

Adolescent female gender, greater subjective distress, and greater preinjury trauma were significant independent predictors of both adolescent PTS and depressive symptoms in linear regression models that included adolescent characteristics (Table II). Female gender, greater subjective distress, greater preinjury trauma, and parental depressive symptoms were significant independent predictors of both adolescent PTS and depressive symptoms in linear regression models that included adolescent and parent characteristics.

### Conclusions

To our knowledge this is the first investigation to document a scope of impairment that includes PTS, but also extends to high levels of postinjury depressive symptoms, high preinjury alcohol use, and preinjury histories of recurrent traumatic life events in a representative sample of hospitalized injured adolescents and their parents. This investigation found that 70% of adolescent–parent dyads endorsed high levels of PTS and depressive symptoms and/or high preinjury alcohol consumption.

### Table I. Demographic, Injury, and Clinical Characteristics of Study Patients and Associations with Adolescent Posttraumatic Stress (PTS) and Depressive Symptoms

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Mean (SD)</th>
<th>n (%)</th>
<th>Association with RI</th>
<th>Association with CESD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Adolescent demographics</strong></td>
<td></td>
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</tr>
<tr>
<td>Age</td>
<td>15.9 (1.9)</td>
<td>0.04</td>
<td>0.21*</td>
<td></td>
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<tr>
<td>Female</td>
<td>32 (33)</td>
<td>4.32***</td>
<td>3.49**</td>
<td></td>
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<tr>
<td>Non-White</td>
<td>27 (28)</td>
<td>2.61**</td>
<td>2.12*</td>
<td></td>
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<tr>
<td>Public Insurance</td>
<td>24 (25)</td>
<td>0.67</td>
<td>0.51</td>
<td></td>
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<tr>
<td>Injury characteristics</td>
<td></td>
<td>0.08</td>
<td>0.03</td>
<td></td>
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<tr>
<td>Injury severity (ISS)</td>
<td>9.8 (6.3)</td>
<td>0.08</td>
<td>0.03</td>
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<tr>
<td>Exposure to traumatic elements of the injury event (PTSD A1 criteria)</td>
<td>2.6 (1.5)</td>
<td>0.31**</td>
<td>0.29**</td>
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<tr>
<td>Unintentional injury</td>
<td>86 (89)</td>
<td>0.59</td>
<td>0.86</td>
<td></td>
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<tr>
<td><strong>Adolescent clinical characteristics</strong></td>
<td></td>
<td></td>
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<tr>
<td>Emergency Department Heart Rate</td>
<td>94.0 (22.8)</td>
<td>0.10</td>
<td>0.12</td>
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<tr>
<td>Adolescent’s subjective response to injury event (PTSD A2 criteria)</td>
<td>2.3 (1.4)</td>
<td>0.50***</td>
<td>0.40***</td>
<td></td>
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<tr>
<td>Pre-injury trauma</td>
<td>2.5 (1.8)</td>
<td>0.22*</td>
<td>0.25*</td>
<td></td>
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<tr>
<td>Pre-injury alcohol use (AUDIT)</td>
<td>2.5 (4.7)</td>
<td>0.29*</td>
<td>0.29*</td>
<td></td>
</tr>
<tr>
<td>Prior psych meds, DX, or service use</td>
<td>13 (13)</td>
<td>0.34</td>
<td>1.27</td>
<td></td>
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<tr>
<td><strong>Parental clinical characteristics</strong></td>
<td></td>
<td></td>
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<tr>
<td>PTS symptoms</td>
<td>35.4 (16.1)</td>
<td>0.40***</td>
<td>0.26*</td>
<td></td>
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<tr>
<td>Depressive symptoms</td>
<td>18.2 (12.0)</td>
<td>0.40***</td>
<td>0.41***</td>
<td></td>
</tr>
<tr>
<td>Pre-injury trauma</td>
<td>3.2 (2.1)</td>
<td>0.17</td>
<td>0.25*</td>
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</table>

AUDIT, Alcohol Use Disorders Identification Test (Babor & Grant, 1989); CES-D, Center for Epidemiologic Studies Depression Scale (Radloff, 1977); PTSD, posttraumatic stress disorder; RI, PTSD Reaction Index (Steinberg et al., 2004).

*Pearson's correlations or t-test (df = 95 for adolescent variables, df = 81 for parent variables).

*p < .05, **p < .01, ***p < .001.
Whereas, only 11% of American civilians ages 15–54 report experiencing four or more lifetime traumas (Kessler et al., 1995), 40% of parents and 30% of injured adolescents endorsed four lifetime traumas before the index injury admission. On average, adolescents experienced 2.5 serious traumatic life events before the event in which they were injured. These findings contextualize the current injury care episode within a developmental trajectory that may potentially include a history of recurrent traumatic life events.

Our results corroborate and extend observations from previous investigations as prior studies have identified female gender, greater adolescent subjective distress, greater preinjury trauma, and greater parental distress as predictors of early and prolonged PTS in youth after injury (Daviss, Mooney et al., 2000; Daviss, Racusin et al., 2000; Mirza et al., 1998; Stallard et al., 1998; Winston et al., 2003). To our knowledge, this is the first investigation in injured youth to identify similar independent predictors of PTS and depressive symptoms (O'Donnell et al., 2004). In terms of negative findings, because we limited our sample to the population of adolescents admitted to the hospital, this may have restricted the range and severity of injuries and may in part explain why injury severity was not identified as a significant predictor of early symptomatic distress. Also, we found no association between acute physiological response and early symptomatic distress; recent investigation suggests that longitudinal assessment of PTS in the weeks and months postinjury may be required to identify this association (Zatzick, Russo, Pitman, et al., 2005). Also, the prior psychiatric diagnoses variable was derived exclusively from self-reports and may not have fully captured psychiatric histories.

This study has some limitations. The RI and CES-D cutoffs used to identify high levels of PTS and depressive symptoms were developed in outpatient samples and may not generalize to acute care inpatient evaluations. We did not assess PTS and depressive symptom levels beyond the 30-day postinjury time point; symptom levels are known to decline in the weeks and months postinjury. Thus, the frequencies of high symptom levels reported may be accurate estimates of individuals who will screen positive in acute care inpatient settings, but may overestimate the number of individuals who will ultimately develop chronic PTSD and depression. The results of the investigation may not generalize to less severely injured youth who present to the emergency department but are not admitted. Finally, approximately half of the subjects were interviewed after hospital discharge.

Beyond these limitations, the investigation's findings have important implications for the development of acute care screening and intervention procedures for populations of injured adolescents and their families. Between 13 and 30% of injured adolescents suffered from high levels of preinjury alcohol consumption and/or high levels of preinjury recurrent traumatic life events. Other investigations have demonstrated that trauma exposed youth are at risk for increased posttraumatic

### Table II. Demographic, Injury, and Clinical Characteristics Associated with Adolescent Posttraumatic Stress (PTS) and Depressive Symptoms: Linear Regression Results

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>PTS: adolescent variables (N = 97)</th>
<th>PTS: adolescent and parent variables (N = 83)</th>
<th>Depressive symptoms: adolescent variables (N = 97)</th>
<th>Depressive symptoms: adolescent and parent variables (N = 83)</th>
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<tbody>
<tr>
<td></td>
<td>Standardized β</td>
<td>SE</td>
<td>Standardized β</td>
<td>SE</td>
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<tr>
<td>Adolescent demographics</td>
<td></td>
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<tr>
<td>Female gender</td>
<td>0.32***</td>
<td>2.23</td>
<td>0.31***</td>
<td>2.27</td>
</tr>
<tr>
<td>Adolescent clinical characteristics</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Adolescent’s subjective response to injury event (PTSD A2 criteria)</td>
<td>0.44***</td>
<td>0.77</td>
<td>0.40***</td>
<td>0.81</td>
</tr>
<tr>
<td>Pre-injury trauma</td>
<td>0.21*</td>
<td>0.58</td>
<td>0.17*</td>
<td>0.60</td>
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<tr>
<td>Parent clinical characteristics</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Depressive symptoms</td>
<td>0.25**</td>
<td>0.09</td>
<td>0.29**</td>
<td>0.09</td>
</tr>
</tbody>
</table>

Adolescent PTS symptoms, posttraumatic stress disorder (PTSD) A2 criteria, and pre-injury trauma were assessed with the PTSD Reaction Index (Steinberg et al., 2004). Depressive symptoms in adolescents and parents were assessed with the Center for Epidemiological Studies Depression Scale (CES-D; Radloff, 1977). 

*Adjusted R² = 0.37, F = 20.15, df = 3, 93, p < .001.

*Adjusted R² = 0.44, F = 17.12, df = 4, 78, p < .001.

*Adjusted R² = 0.27, F = 12.88, df = 3, 93, p < .001.

*Adjusted R² = 0.37, F = 12.82, df = 4, 78, p < .001.

*p < .05  **p < .01  ***p < .001
alcohol consumption (Reijneveld et al., 2003) and recurrent posttraumatic life events including reinjury (Johnston, Grossman, Connell, & Koepsell, 2000; Litaker, 1996; Taylor, MacIntyre, & Forgeron, 1999). Future prospective investigations of injured youth should assess whether high preinjury alcohol consumption is a risk factor for reinjury after an index injury hospital admission (Rivara, Koepsell, Jurkovich, Gurney, & Soderberg, 1993). Findings of an association between preinjury alcohol consumption and recurrent traumatic injury would suggest the development of combined intervention procedures that target both postinjury PTS and postinjury alcohol consumption. In this case, combined interventions could productively address primary and secondary PTS prevention (Gentilello et al., 1999; Kazdin, 1996; Zatzick et al., submitted for publication; Zatzick, Roy-Byrne et al., 2004).

The finding that depressive symptoms are highly prevalent in populations of injured adolescents informs the selection of intervention components for clinical trials that target the secondary prevention of PTS (Kazdin, 1996; Zatzick & Roy-Byrne, 2003; Zatzick, Roy-Byrne et al., 2004). Although secondary prevention trials of antidepressant trials have been initiated for injured youth with PTS (Robert, Blakeney, Villareal, Rosenberg, & Meyer, 1999), the question of safety of anti-depressant medications for youth with depressive spectrum disorders is currently being debated (Glass, 2004; Riba, 2004; Varley, 2003). The findings of the current investigation could favor initial trials of cognitive behavioral psychotherapy interventions with established safety and efficacy in other populations of trauma exposed youth (Taylor & Chemtob, 2004).

Finally, pragmatically oriented, time pressured acute care providers have demonstrated a reluctance to systematically implement mental health screening and intervention procedures (Zatzick, Russo, Rivara et al., 2005). Future research efforts may need to be linked to changes in acute care policy surrounding the delivery of high quality mental health care for injured youth and their families.

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