ARTICLE

Persistence of Posttraumatic Stress in Violently Injured Youth Seen in the Emergency Department

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Objective: To determine if symptoms of posttraumatic stress, initially evaluated in the emergency department (ED) setting, persist over time.

Design: Prospective cohort study.

Setting: Two urban, academic medical center EDs.

Patients: Sixty-nine injured patients, aged 12 to 24 years, were assessed for acute posttraumatic stress symptoms at the time of their enrollment in an ongoing ED-based study of intentional youth violence, and assessed for posttraumatic stress symptoms up to 5 months later.

Main Outcome Measures: The Immediate Stress Reaction Checklist, administered during the ED visit, and the Symptom Checklist of the Child and Adolescent Trauma Survey, administered during routine telephone follow-up.

Results: Patients in the emergency department reported a range of acute stress symptoms on the Immediate Stress Reaction Checklist, with 25% reporting clinically significant distress. On follow-up assessment, 15% reported significant posttraumatic stress symptoms. The severity of acute stress symptoms was strongly associated with the severity of posttraumatic stress symptoms at follow-up ($r=0.55$, $P<.005$). Age, sex, injury type, and time from injury to follow-up were not associated with the degree of acute stress or posttraumatic stress symptom severity at initial or follow-up assessment.

Conclusion: This study provides preliminary evidence that acute stress symptoms, assessed in the ED in the immediate aftermath of a traumatic injury, are useful indicators of risk for later posttraumatic stress.

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INTENTIONAL VIOLENCE is defined as "a threatened or actual use of physical force against a person or group that either results in or is likely to result in injury or death."[1] Guidelines for the care of violently injured youth suggest that we thoroughly evaluate the emotional status of these patients as well as the need for psychological or psychiatric services.[2] The psychological sequelae of acute injuries can often be more severe than the injuries themselves. One outcome of concern is posttraumatic stress disorder (PTSD), a constellation of symptoms (reexperiencing a trauma, avoiding reminders of it, and hyperarousal)[3] that has been documented in youth injured by or exposed to community violence.[4,5] After a traumatic event, such as a violent injury, many individuals experience acute distress and a significant minority go on to develop the full clinical syndrome of PTSD.[6-9] Because traumatic exposure alone does not invariably result in persistent traumatic stress symptoms (ie, not every person who experiences a traumatic event develops PTSD), other predictors and screening assessments may be useful in identifying individuals at greatest risk.

Often, the only point of medical contact for violently injured urban youth is the emergency department (ED). It has been shown that self-reported acute stress disorder (ASD) symptoms in the ED setting are fairly common in children, adolescents, and young adults in the immediate aftermath of violent injury.[10] Acute stress disorder consists of early posttraumatic symptoms, including dissociation, reexperiencing, avoidance, and hyperarousal.[3] A better understanding of the relationship between early distress symptoms and persistent posttraumatic distress in violently injured adolescents and young adults would enhance the ability of pediatric clinicians to assess these youths' mental health and emotional needs.

The objective of this study was to determine if symptoms of posttraumatic stress, initially evaluated in the ED, persist over time, and whether the degree of

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PARTICIPANTS, MATERIALS, AND METHODS

We enrolled a convenience sample of adolescents and young adults between the ages of 12 and 24 years who had come to the EDs of an urban children's hospital and an urban adult hospital for treatment between September 1999 and April 2000. Participants were enrolled as part of the Violence Intervention Project (VIP), an ongoing intervention study that surveys violently injured youth (excluding victims of child abuse and domestic violence) residing in the 8 ZIP codes surrounding the 2 hospitals. The median annual household income in these ZIP codes ranges from $22 000 to $35 000. The racial/ethnic background of residents in the neighborhoods encompassed by the 8 ZIP codes is as follows: 70% black, 22% white, 6% Asian, and 2% Hispanic (personal communication, University of Pennsylvania Health System Market Research Office, 2001 data). The VIP also provided assessment and referral services to a subset of these patients, when needed. Patients were excluded if they did not speak English, were too ill or injured to answer a detailed questionnaire, or resided outside the predetermined ZIP code areas. We reviewed all ED records during the enrollment period at both hospitals to determine the proportion of eligible patients successfully enrolled in the study.

Participants were enrolled in accordance with a study protocol approved by the institutional review boards of both hospitals. Participants were recruited only during the times that research assistants staffed the EDs, which includes various shifts between the hours of 8 AM and midnight, 7 days per week. After verbal consent was obtained, the research assistants administered a verbal questionnaire to patients in treatment rooms during their ED visits. This questionnaire asked about event circumstances, weapon use, and factors associated with interpersonal violence, such as school attendance, alcohol use, drug use, and weapon carrying. The patient was then asked to complete the Immediate Stress Response Checklist (ISRC), as described in a previous report.[10] Demographic and medical information were obtained at the time of the visit or by review of the medical record. During routine follow-up calls as part of the larger VIP study, the symptom checklist of the Child and Adolescent Trauma Survey (CATS) was administered over the telephone. Trained research assistants attempted telephone contact at least 6 times with each youth during a 20-month period. Patients who were reached by telephone and completed a follow-up assessment within 5 months of initial ISRC assessment were included in the primary analysis. Each participant may have completed more than 1 telephone follow-up assessment with the CATS during the course of participation in the VIP study. Unless otherwise specified, the first follow-up for each participant was used in each analysis presented. At the completion of each telephone interview, the research assistant obtained consent for further follow-up and offered general assistance with regard to the study and study-related issues.

MEASURES

The ISRC[10] is a 26-item, verbal questionnaire designed to evaluate the key features of acute stress responses in the immediate posttrauma period (dissociation, reexperiencing, avoidance, and hyperarousal). The ISRC is not intended to provide a diagnosis of ASD because this is not possible to accomplish in an immediate fashion (the diagnosis requires a 2-day minimum duration of symptoms). Respondents rate each item on a 3-point scale: 0 = "not true," 1 = "somewhat or sometimes true," or 2 = "very or often true." Item ratings on the ISRC were summed to form a total acute stress symptom severity score (ISRC score). In addition,

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early distress is predictive of continued posttraumatic symptoms weeks to months later. We hypothesized that there would be a moderate correlation between acute stress symptom scores in the ED and posttraumatic stress symptoms assessed on telephone follow-up.

RESULTS

During the enrollment period, 396 patients aged 12 to 24 years were seen in the 2 EDs for treatment of a violence-related injury. Two hundred three patients were eligible for the study because they were seen during the hours staffed by research assistants. We recruited 112 (55%) of the 203 patients into the current study during their ED visit. Forty-two patients refused participation and 9 were unable to be enrolled because of severity of illness. Forty patients were recruited into the larger violence intervention study but were not included in the current study analyses because they did not complete the acute stress assessment while in the ED. Sixty-nine (62%) of the 112 enrolled patients were subsequently reached by telephone to complete a CATS assessment within 5 months of the initial event. When the 69 participants were compared with the 43 eligible youths who were assessed in the ED but did not complete a follow-up assessment within 5 months, there were no significant differences in age, sex, injury type, or degree of acute stress symptom severity in the ED (initial ISRC score). There was a statistically significant difference in the distribution of race/ethnicity between the 2 groups since only 1 of 7 white patients initially assessed in the ED completed a follow-up assessment.

Participants ranged in age from 12 to 24 years (mean [SD] age, 15.1 [2.8] years). Sixty-three (91%) were adolescents (aged 12-17 years), and 6 (9%) were young adults (aged 18-24 years). Forty-seven (68%) of the 69 participants were male. Sixty-two (90%) of the participants in this study were black, 3 (4%) were Asian, and 1 participant (1%) was white. Race or ethnicity was undeclared for 3 (4%) of the participants. The most significant type of injury sustained by study participants was contusion (43 patients, [62%]), laceration (8 [12%]), fracture (6 [9%]), bite injury (6 [9%]), and cavitation including gunshot (3 [4%]). Type of injury was undetermined in 2 [3%] and listed as "other" in 1 [1%] of participants. The most common "weapons" causing in-

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we computed a dichotomous score for "broad acute stress responses" that was positive if the individual reported at least 1 symptom in every one of the symptom subcategories that compose the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV)* criteria for ASD (peritrauma or posttrauma dissociation, reexperiencing, avoidance, and hyperarousal). Symptoms are counted as present only when rated by the respondent as "very or often true" (an item rating of 2). Psychometric analyses indicate that the ISRC has strong internal consistency ($\alpha = .86$), and that in adolescents, the ISRC correlates strongly with an adult measure of ASD and moderately with parent reports of adolescents' acute stress reactions (J.A.F. and N.K.A., unpublished data, 2002).

The symptom checklist of the CATS[11] is a 12-item tool designed as a brief measure of posttraumatic stress symptom severity in children and youth. Items are rated on a 4-point Likert-type scale (scored as 0, 1, 2, and 3) and address the core symptom categories of PTSD (reexperiencing, avoidance, and hyperarousal). The CATS is not intended to provide a formal PTSD diagnosis but does serve as a useful indicator of the severity of PTSD symptoms. The summed total score of 12 items forms a symptom severity score (CATS score). In addition, we computed a dichotomous score for "significant posttraumatic stress responses" that was positive if the individual reported at least 1 symptom in every symptom category included in the *DSM-IV* criteria for PTSD (reexperiencing, avoidance, and hyperarousal). Symptoms were counted as present only when rated by the respondent as occurring "often" (an item rating of 3). The CATS score correlates highly with other measures of PTSD and with clinician assessment, and a CATS score of 27 or higher has been associated with the presence of diagnostic PTSD.[11] The instrument was selected as a brief measure with excellent psychometric properties. It is also practical for use in telephone follow-up assessment to give an indication of posttraumatic stress outcome.

STATISTICAL ANALYSES

Descriptive statistics were computed for the frequency of various demographic and injury circumstance characteristics. Characteristics of participants and nonparticipants (those patients who completed an acute stress assessment but could not be reached for follow-up) were compared using χ^2 tests for categorical variables and an independent-sample t test for age. Prevalence rates and 95% confidence intervals were computed for broad acute stress responses, significant later posttraumatic stress responses, and for the prevalence of each symptom category. The relationship between ISRC and CATS scores was explored using nonparametric correlations (Spearman ρ), first for the sample as a whole and then separately for those assessed before or after their 1-month postinjury date.

In secondary analyses, we examined the relationship between severity of posttraumatic stress responses and a range of potential demographic or situational correlates. We also explored the potential that acute stress symptoms in the ED may usefully predict longer-term posttraumatic stress, by examining the correlation between acute symptoms and posttraumatic stress more than 5 months postinjury. These analyses included only the participants with a follow-up assessment later than 5 months and used the latest CATS assessment available for each participant. An independent-sample t test or analysis of variance was used to assess variation in mean ISRC and CATS scores on categorical variables (sex, injury type, and inclusion in the assessment/referral or the control conditions of the larger VIP study). Nonparametric correlations were used to compare the association of symptom severity with age and with time since injury. SPSS 10.0 (SPSS Inc, Chicago, Ill) was used for all analyses. Sample size calculations were based on the study's primary objective of estimating the correlation between ISRC and CATS scores. A sample size of 69 is adequate to detect a correlation of 0.30 or greater (setting α at $P<.05$), with 80% power.

jury to participants were fists, feet, or hands (42 patients [61%]), followed by blunt objects (6 [9%]), teeth (5 [7%]), guns (4 [6%]), and knives or other piercing objects (3 [4%]). For 3 (4%) of participants, the weapon was not identified and 6 (9%) of participants reported that no weapon was involved (eg, pushing, shoving). Each violent incident was categorized on the basis of participant-reported event characteristics. The incidents were categorized as "assault/mugging" of the patient (29 patients [42%]) or a "fight/argument" in which the patient was involved (40 [58%]). Follow-up CATS data were obtained during routine follow-up calls, ranging from 11 days to 5 months after the ISRC. Of the 69 participants, 25 were first surveyed with the CATS within 1 month of the violent injury and 44 between 1 and 5 months after the injury (31 of these between 1 and 2 months postinjury, 8 between 2 and 3 months, 3 between 3 and 4 months, and 2 between 4 and 5 months).

ACUTE POSTTRAUMATIC STRESS SYMPTOMS

In the ED, each type of acute stress symptom was reported (at the moderate to severe level) by a fairly large percentage of patients (**Table**). The 69 patients in this sample endorsed between 0 and 23 acute stress symptoms during the ED visit (mean [SD], 9.2 [5.5]). Seventeen patients (25%) reported broad acute stress responses, with at least 1 significant symptom in every category (dissociation, reexperiencing, avoidance, and arousal). Age ($r = 0.08$, $P = .50$), sex ($t = .05$, $P = .96$), type of injury (analysis of variance: $F = .44$, $P = .82$), and assignment to the assessment/referral or control group ($t = 1.12$, $P = .27$) were not associated with the degree of acute stress symptom severity as reported in the ED.

POSTTRAUMATIC STRESS SYMPTOMS AT FOLLOW-UP

On telephone follow-up, each type of posttraumatic stress symptom was reported (at the moderate to severe level) by a smaller but still substantial percentage of youth (Table). Four (6%) of the 69 patients scored 27 or higher on the CATS. All of the patients meeting this cutoff were among those assessed more than 1 month postinjury, suggesting that they may have met diagnostic criteria for PTSD.

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Individuals Reporting at Least 1 Moderate-to-Severe Symptom, by Symptom Category*

	Acute Stress Symptoms		Posttraumatic Stress Symptoms	
	No. of Patients	% (95% CI)	No. of Patients	% (95% CI)
Fear, helplessness, or horror at time of incident	47	68 (56-79)	. . .	. . .
Peritrauma dissociation	62	90 (80-95)	. . .	. . .
Posttrauma dissociation	26	38 (26-50)	. . .	. . .
Reexperiencing	51	74 (62-84)	27	39 (26-50)
Avoidance	39	57 (44-68)	34	49 (37-62)
Hyperarousal	27	39 (26-50)	17	25 (15-36)

*N = 69. CI indicates confidence interval; ellipses, not applicable.

Several more patients were experiencing clinically significant (albeit subsyndromal) PTSD symptoms at follow-up: 10 participants (15%) reported significant posttraumatic stress responses, with at least 1 significant symptom in every symptom category (reexperiencing, avoidance, and arousal) (Table). Age ($r=-0.09$, $P=.48$), time since injury ($r=0.13$, $P=.30$), sex ($t=-1.36$, $P=.17$), type of injury (analysis of variance: $F=0.43$, $P=.83$), and assignment to the assessment/referral or control group ($t=1.71$, $P=.09$) were not associated with the degree of posttraumatic stress symptom severity at follow-up.

RELATIONSHIP BETWEEN ACUTE AND LATER POSTTRAUMATIC STRESS SYMPTOMS

The ISRC score (acute stress symptom severity) in the ED was strongly associated with the CATS score (posttraumatic stress symptom severity) at follow-up ($r=0.55$, $P<.001$). The association between the ISRC and CATS scores was comparably strong in the 25 patients who were assessed within 1 month of injury ($r=0.64$, $P=.001$) and in those who were assessed between 1 and 5 months of injury ($r=0.50$, $P=.001$). Secondary analysis of the 42 participants whose latest follow-up assessment was more than 5 months postinjury (range, 5.5-20 months) revealed that the length of time between injury and assessment was not associated with the CATS score. Participants' ISRC score and their latest CATS score showed a moderate association ($r=0.39$, $P=.01$).

COMMENT

Acute stress symptoms seem to be common among urban youth seen in the ED for violent injury, with more than 80% reporting some symptoms and about one third reporting significant acute posttraumatic distress.[10] Our prospective study investigated whether symptoms reported by youth in the immediate aftermath of a violent injury persist over time, and whether the severity of early symptoms is predictive of continued posttraumatic stress symptoms. This study demonstrates that symptoms of acute stress reported by violently injured urban patients in the ED correlate with future reporting of posttraumatic stress weeks to months after the event. Variables such as demographic and event circumstances did not affect these results. Not surprisingly, correlations were higher for posttraumatic stress symptoms reported closer to the time of injury, but the association with acute symptom severity persisted even when posttraumatic symptoms were assessed more than 5 months later. This substantiates the discovery of acute stress in the immediate postinjury period as a marker for continued emotional and psychological distress in a substantial proportion of violently injured adolescents and young adults.

Approximately two thirds of urban youths report victimization by physical violence, and almost 90% of these youths report witnessing such events in their home, school, or neighborhood.[12] The prevalence of these experiences is substantially lower, but still of concern, for suburban youths.[5,12] Studies have demonstrated that a single and sudden traumatic event, such as a motor vehicle crash, pedestrian injury, or violent crime can lead to PTSD in a significant number of cases.[8,13,14] Although individuals whose symptoms merit a formal diagnosis of PTSD are of greatest concern, the risk of persistent subsyndromal but significant posttraumatic symptoms also warrants attention.[15]

Several studies of adults injured by violence and those injured in motor vehicle crashes have suggested a link between acute distress, assessed within the first month of injury, and posttraumatic stress symptoms 6 months to 2 years later.[8,16,17] Our study extends this work to a younger age group and examines the utility of assessing acute stress symptoms in the ED. The latter is an especially practical investigation for identification and treatment of posttraumatic psychological sequelae in urban youth, as the ED visit is often the only point of contact for young people who sustain a violent injury.

There are some limitations to this study. The convenience sampling allows for the possibility that the 112 patients enrolled and assessed in the ED do not adequately represent the population of young patients who come to the ED for violent injuries. It is encouraging that those enrolled in the VIP study were selected only because of research assistant availability and the ability to complete a lengthy questionnaire in the ED and not necessarily for reasons that would likely affect the main outcome measures. Importantly, the 61% of initially enrolled patients who completed a follow-up assessment were similar in almost all measured demographic and event-related characteristics to those enrolled patients who did not complete a follow-up assessment. Because the measures used in this study do not provide for a formal diagnosis of ASD or PTSD, these results should be inter-

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What This Study Adds

This prospective study demonstrates that symptoms of acute stress reported by violently injured urban youth in the ED are associated with future reporting of posttraumatic stress weeks to months after the event. Correlations were higher for posttraumatic stress symptoms reported closer to the time of injury but the association with acute symptom severity persisted even when posttraumatic symptoms were assessed more than 5 months later. This substantiates the evaluation of acute stress in the immediate postinjury period as a possible indicator of longer-term emotional distress experienced by violently injured youth. Early detection in the immediate postinjury period may offer clinicians the opportunity to connect high-risk youth with family, community, and professional support that may prevent long-term psychological ramifications.

preted as reflecting general posttraumatic stress symptom severity rather than the presence or absence of either of these psychiatric disorders. It should also be noted that this study did not measure prior or ongoing traumatic experiences or pre-event levels of distress symptoms, which can affect the severity of event-related stress reactions.[18] It is possible that the assessment of acute stress reactions in the ED captured symptoms that were present prior to the index violent event. Although detailed information on a patient's exposure to prior traumatic events is rarely discovered in the acute care setting, it may be worthwhile to investigate how this exposure affects acute stress responses and how knowledge of prior trauma exposure can supplement other data, such as acute stress scores or physiologic indicators to better predict PTSD development.[19] Although 1 month's duration of symptoms is required to fit the present criteria for diagnosis of PTSD, for some participants in our study, the only available follow-up assessment was performed earlier than 1 month. Future investigations, using larger and more varied samples of youths in various clinical settings and follow-up measures that comprehensively assess PTSD symptoms and provide a reliable and valid formal diagnosis of PTSD, are needed to further generalize our findings and to determine if there are distinct subtypes of self-reported symptoms or other indicators that can more accurately predict the development of PTSD in these patients.

Extending studies of injured adults, the results of this study support the link between acute stress symptoms after violent injury and posttraumatic stress many weeks or months later. Although the best therapies for prevention and treatment of posttraumatic stress symptoms are still being investigated, early detection in the immediate postinjury period offers physicians the opportunity to connect high-risk youth with family, community, and professional support that may prevent long-term psychological ramifications.[20,21]

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