

## Original Investigation

# Collaborative Care Intervention Targeting Violence Risk Behaviors, Substance Use, and Posttraumatic Stress and Depressive Symptoms in Injured Adolescents

## A Randomized Clinical Trial

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**IMPORTANCE** Violence and injury risk behaviors, alcohol and drug use problems, and posttraumatic stress disorder (PTSD) and depressive symptoms occur frequently among adolescents presenting to acute care medical settings after traumatic physical injury.

**OBJECTIVE** To test the effectiveness of a stepped collaborative care intervention targeting this constellation of risk behaviors and symptoms in randomly sampled hospitalized adolescents with and without traumatic brain injury.

**DESIGN, SETTING, AND PARTICIPANTS** A pragmatic randomized clinical trial was conducted at a single US level I trauma center. Participants included 120 adolescents aged 12 to 18 years randomized to intervention (n = 59) and control (n = 61) conditions.

**INTERVENTIONS** Stepped collaborative care intervention included motivational interviewing elements targeting risk behaviors and substance use as well as medication and cognitive behavioral therapy elements targeting PTSD and depressive symptoms.

**MAIN OUTCOMES AND MEASURES** Adolescents were assessed at baseline before randomization and 2, 5, and 12 months after injury hospitalization. Standardized instruments were used to assess violence risk behaviors, alcohol and drug use, and PTSD and depressive symptoms.

**RESULTS** The investigation attained more than 95% adolescent follow-up at each assessment point. At baseline, approximately one-third of the participants endorsed the violence risk behavior of carrying a weapon. Regression analyses demonstrated that intervention patients experienced significant reductions in weapon carrying compared with controls during the year after injury (group × time effect,  $F_{3,344} = 3.0$ ;  $P = .03$ ). At 12 months after the injury, 4 (7.3%) intervention patients vs 13 (21.3%) control patients reported currently carrying a weapon (relative risk, 0.31; 95% CI, 0.11-0.90). The intervention was equally effective in reducing the risk of weapon carrying among injured adolescents with and without traumatic brain injury. Other treatment targets, including alcohol and drug use problems and high levels of PTSD and depressive symptoms, occurred less frequently in the cohort relative to weapon carrying and were not significantly affected by the intervention.

**CONCLUSIONS AND RELEVANCE** Collaborative care intervention reduced the risk of adolescent weapon carrying during the year after the injury hospitalization. Future investigation should replicate this preliminary observation. If the finding is replicated, orchestrated investigative and policy efforts could systematically implement and evaluate screening and intervention procedures targeting youth violence prevention at US trauma centers.

**TRIAL REGISTRATION** clinicaltrials.gov identifier: NCT00619255

*JAMA Pediatr.* 2014;168(6):532-539. doi:10.1001/jamapediatrics.2013.4784  
Published online April 14, 2014.

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Injury is the leading cause of death and disability for children and adolescents in the United States and constitutes a major public health challenge.<sup>1,2</sup> Estimates suggest that each year approximately 4.3 million adolescents present to acute care medical emergency department and trauma center settings after incurring traumatic physical injuries.<sup>1,3</sup> Traumatic physical injury accounts for approximately 12% of medical expenditures in the United States<sup>4,5</sup> and approximately 16% of the world's burden of disease.<sup>6,7</sup>

A series of investigations<sup>8-13</sup> now suggests that the constellation of violence and injury risk behaviors, alcohol and drug use problems, and posttraumatic stress disorder (PTSD) and depressive symptoms are endemic among adolescents presenting to acute care medical settings after traumatic physical injury. Pediatric and adult patients with traumatic brain injury (TBI) may be particularly vulnerable to the development of post-traumatic mental health symptoms and risk behaviors.<sup>14-17</sup> This constellation of risk behaviors and symptoms is associated with marked functional impairment and societal costs.<sup>10</sup>

Commentary<sup>18,19</sup> has encouraged the conduct of pragmatic clinical trials with increasing applied relevance to “real world” treatment contexts, such as acute care medical emergency department and trauma center settings. Pragmatic trials are characterized by broad participant eligibility criteria, flexible treatment delivery, and nonspecialist provider interventionists.<sup>18-20</sup> Recent commentary<sup>20-22</sup> has also encouraged the conduct of effectiveness-implementation hybrid clinical trials that take policy context into consideration to maximize overall trial public health and population impact.

Large-scale randomized clinical trials<sup>23-27</sup> have established the effectiveness of collaborative care interventions that integrate care management, evidence-based pharmacotherapy, and cognitive behavioral therapy (CBT) in the treatment of depressive and anxiety disorders in primary care patients. Initial investigation<sup>28,29</sup> suggested that collaborative care interventions may be effective for pediatric primary care patients. Other investigations<sup>30-34</sup> suggested that trauma-exposed youth presenting to acute care medical trauma center and emergency department settings may respond to early postinjury motivational interviewing interventions targeting violence risk behaviors and alcohol use problems. Fewer trials<sup>35</sup> targeting PTSD and depressive symptoms among injured youth have been conducted. Two investigations<sup>36,37</sup> successfully used collaborative care interventions to treat alcohol use problems and PTSD symptoms in adult injury survivors with and without TBI. However, no investigations have tested the effectiveness of collaborative care for injured adolescents presenting to acute care medical settings.

The present investigation was a pragmatic randomized clinical trial designed to assess whether injured adolescents participating in a collaborative care intervention would demonstrate reductions in violence and injury risk behaviors, alcohol and drug use problems, and PTSD and depressive symptoms. The investigation hypothesized that injured adolescent patients receiving the collaborative care intervention would demonstrate clinically and statistically significant reductions in targeted risk behaviors, substance use problems, and PTSD and depressive symptoms compared with adolescents

randomized to a usual care control condition. A secondary hypothesis was that the intervention would be equally effective in patients with and without TBI.

## Methods

### Design, Setting, and Participants

Patients included in the study were adolescent survivors of intentional (eg, injuries associated with human malice, such as physical assaults) and unintentional (eg, motor vehicle crashes) injuries who were admitted to the University of Washington's Harborview level I trauma center (Harborview) inpatient surgical ward or emergency department for 24 hours or more. All informed consent procedures were approved by the University of Washington's institutional review board, and full written informed consent was obtained prior to data collection. For patients younger than 18 years, both adolescent assent and parental consent were obtained, and participants and parents received financial compensation. Recruitment for the study occurred between March 1, 2008, and October 31, 2009.

During active recruitment, a research associate downloaded a daily list of all newly admitted injury survivors between the ages of 12 and 18 years from the Harborview electronic medical record. Random number assignments for each adolescent inpatient were generated daily, and each youth was approached in the order dictated by the random number assignments.

Adolescents with severe injuries that prevented participation were excluded from the study, as were adolescents with self-inflicted intentional injuries. Also, any adolescent who was either non-English speaking or for whom both parents were non-English speaking was excluded. Adolescents approached in the surgical ward were evaluated with the Glasgow Coma Scale score<sup>38</sup> and were required to have a cumulative score of 15 at the time of the evaluation, indicating mild brain injury. Adolescent patients were also required to score at least 7 out of 10, indicative of normal on the 2 Mini-Mental State Examination items that assess orientation to location and date.<sup>39</sup>

### Assessments

All patients received evaluations of violence and injury risk behaviors, alcohol and drug use, and PTSD and depression symptoms, as well as functional impairments and health service use, at baseline in the emergency department or surgical ward before randomization and again after randomization at 2, 5, and 12 months after discharge during telephone follow-up interviews. The baseline adolescent interview occurred in the days and weeks immediately following the acute injury (mean [SD], 10 [17] days after injury).

Ten items from the National Longitudinal Study of Adolescent Health<sup>40</sup> were used to assess a full spectrum of adolescent violence and injury risk behaviors. Risk behaviors assessed included not wearing seat belts, riding motorcycles, drinking and driving, arrests, lawsuits, and weapon carrying. At baseline in the surgical ward, risk behavior items were anchored to the year before the injury event (ie, “During the past year before your injury, did you ever carry a weapon on you

[eg, knife, club, or gun]?”). At each follow-up assessment adolescents were queried about risk behaviors occurring in the past month.

The Composite International Diagnostic Index<sup>41</sup> was used to assess adolescent alcohol abuse and dependence criteria. The Alcohol Use Disorders Identification Test,<sup>42</sup> a 3-item self-report screening measure used for early identification of problem alcohol use in the acute care setting, was used to augment the Composite International Diagnostic Index. Both measures have established reliability, validity, and responsiveness to change. Adolescent drug use, including amphetamines, cocaine, marijuana, and opiates, was assessed with single-item screens.<sup>43</sup> Because of infrequent use of some substances, alcohol and drug use was collapsed into a single any use (yes/no) variable.

Adolescent posttraumatic stress symptoms were assessed with the adolescent version of the University of California, Los Angeles, PTSD Reaction Index (PTSD-RI)<sup>44</sup> for the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV)*.<sup>45</sup> The PTSD-RI includes 20 items that evaluate the PTSD *DSM-IV* intrusion, avoidance, and arousal symptoms. At the initial interview, adolescents were asked to anchor all symptom reports to the injury event (eg, “How much of the time since your injury did you have dreams about the event in which you were injured or other bad dreams?”). The PTSD-RI can be used to create an algorithm consistent with a diagnosis of PTSD by rating 1 intrusive, 3 avoidant, and 2 arousal symptoms with a rating of moderate severity.<sup>45</sup> This algorithm was used to identify patients with high PTSD symptom levels consistent with a diagnosis of PTSD.

The 9-item Patient Health Questionnaire (PHQ-9) depression screen<sup>46</sup> was used to assess depressive symptoms. The PHQ-9 has been used previously to assess depressive symptoms in adolescents<sup>47</sup> and has excellent internal consistency and convergent validity.<sup>46</sup> The PHQ-9 can be used to create an algorithm consistent with a *DSM-IV* diagnosis of depression,<sup>45</sup> and this algorithm was used to identify patients with high depressive symptom levels consistent with a diagnosis of depression.

Previously developed items assessing postinjury health service use were administered at baseline and at the 2-, 5-, and 12-month follow-up interviews.<sup>48,49</sup> Interview items contained self-report descriptions of current medication use (ie, name, dosage, and duration). The investigation determined injury severity at baseline during the index admission from the *International Classification of Diseases, 9th Revision, Clinical Modification* medical record codes using the Abbreviated Injury Scale and Injury Severity Score.<sup>50</sup> Traumatic brain injury was prospectively identified in the medical record, and TBI severity was coded based on a previously validated algorithm for hospitalized inpatients.<sup>16,51</sup> Insurance status, length of hospital and intensive care unit stays, and other clinical characteristics were abstracted from the trauma registry and electronic medical record.

### Randomization

Randomization occurred in a 1:1 ratio according to random assignments of blocks of 4 or 6 patients that were computer generated by the investigation's biostatisticians (J.R. and J.W.). Ran-

domization was conducted by an intervention team member (D.Z.) and research associates performing all baseline assessments, and follow-up interviewers were blinded to block sizes and intervention or control group status.<sup>52</sup>

### Stepped Collaborative Care Intervention

Patients randomized to the intervention condition received care from a social work and nurse practitioner trauma center-based care management team for 12 months after the injury. The intervention included care management and evidence-based motivational interviewing targeting risk behaviors and substance use as well as pharmacotherapy and CBT elements targeting high levels of PTSD and depressive symptoms.<sup>36,37,53-59</sup>

### Usual Care Control Condition

Prior investigation<sup>36,37</sup> suggests that usual postinjury care includes routine outpatient surgical, primary care, and emergency department visits. Specialty mental health services are occasionally used.

### Statistical Analysis

The investigation first examined the extent to which the clinical injury and demographic characteristics of randomly sampled adolescent patients included in the trial were significantly different from or similar to the characteristics of all injured adolescent trauma patients admitted during the study period. Next, the investigation assessed the dichotomized occurrence of violence and injury risk behaviors, alcohol and drug use, and high levels of PTSD and depressive symptoms at baseline and longitudinally for the intent-to-treat sample of 120 randomized adolescents.

To determine whether patients in the 2 groups manifested different patterns of change in risk behaviors, substance use, and PTSD and depressive dichotomous outcomes over the year after injury, we used Poisson regression analysis with robust error variance to estimate relative risks and 95% CIs.<sup>60,61</sup> For all dependent variables we fit models containing time categories, intervention, and intervention-by-time interactions. To examine the effect of TBI on any observed treatment effects, we fit additional models that included the presence or absence of TBI and the interaction with treatment group and time. When significant interactions or main effects were detected in any of the regression models, change score analyses for each assessment point were performed. The final models presented include no covariates. Finally, we performed sensitivity analyses to assess the effect of including covariates and use of alternative regression formats on the longitudinal outcome assessments. We used SAS, version 9.2 (SAS Institute Inc), and SPSS, version 18.0 (SPSS Inc), for all analyses.

Because no prior investigations of collaborative care interventions had been conducted in injured adolescents, we used previous adult collaborative care interventions targeting alcohol use problems to derive sample size estimates for the current investigation.<sup>32,37</sup> With 60 patients in each group and a 2-tailed  $\alpha = .05$ , there would be greater than 80% power to detect a 22% difference in alcohol use problems between groups (ie, 42% in the control group vs 20% in the intervention group).<sup>37</sup>

## Results

Adolescent patients included in the study did not differ significantly from all other adolescent patients admitted with regard to age (study patients mean [SD], 15.4 [1.9] vs 15.4 [1.8] years;  $P = .84$ ), female sex (25.0% vs 26.2%;  $P = .79$ ), injury severity score (15.7 [11.3] vs 16.3 [13.2];  $P = .06$ ), and length of stay (6.4 [10.0] vs 5.9 [11.0] days; natural logarithm-transformed  $P = .09$ ). Compared with all other adolescents admitted to the trauma center, the 120 study patients were less likely to be intentionally injured (4.2% vs 12.0%) and have a positive blood alcohol concentration (2.5% vs 9.8%). The investigation attained more than 95.0% follow-up of the participants at 2, 5, and 12 months (Figure 1).

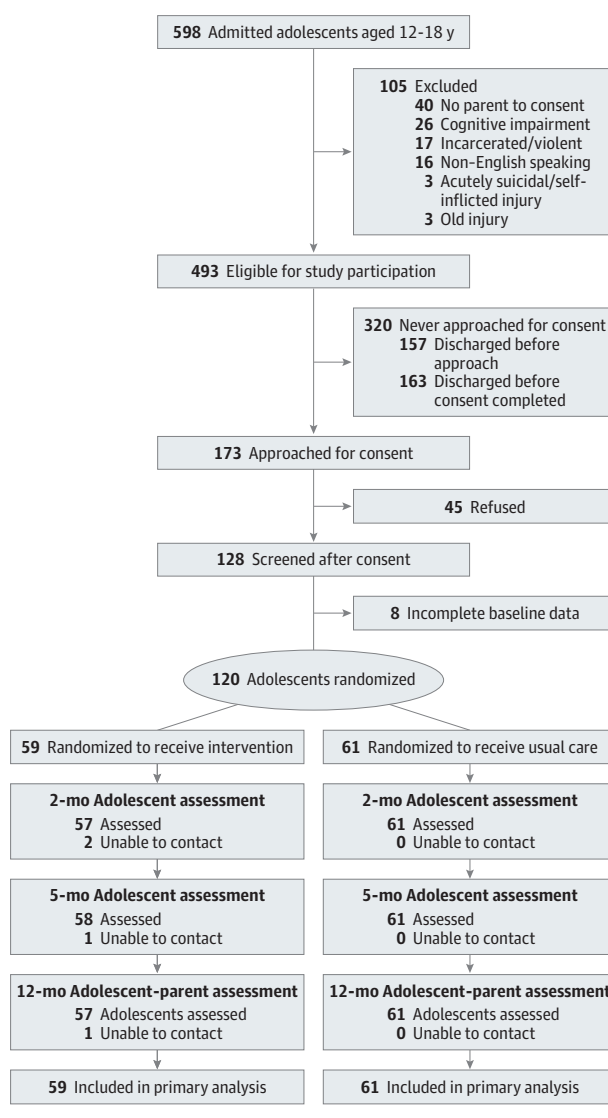
Adolescents randomized to the intervention and control conditions did not substantially differ with regard to injury, clinical, and demographic characteristics, including percentage of patients with TBI (Table 1). A total of 47.5% of the adolescents had incurred head injuries, with 16.7% experiencing mild, 10.0% moderate, and 20.8% severe TBI.

With regard to the frequency of adolescent outcomes for targeting by the intervention, the highest prevalence risk behavior at baseline was the report of carrying a weapon; 32.8% of adolescents reported this violence risk behavior (Table 1). All other individual risk behaviors (eg, not wearing seat belts) were reported by less than 25.0% of the participants. At baseline in the year before the injury, 10.9% of the adolescents reported alcohol use consistent with an abuse and/or dependence diagnosis. The mean Alcohol Use Disorders Identification Test score for the participants was 1.4 (2.5). With regard to drug use, 35.8% of the adolescents reported using marijuana at least once in the year before the injury, 2.5% amphetamine or cocaine, and 0.8% prescription opiates. Symptoms consistent with a diagnosis of PTSD occurred in less than 20.0% of the patients, and symptoms consistent with a diagnosis of depression occurred in 10.0% of adolescents at baseline in the surgical ward (Table 1). In total, 64.2% of the adolescents reported alcohol or drug use, high PTSD or depressive symptom levels, or weapon carrying at baseline. There were no significant differences between intervention and control group patients in any risk behaviors, alcohol and drug use, and high levels of PTSD and depressive symptoms (Table 1).

### Intervention Implementation

The mean total time spent with each intervention participant was 13.1 (9.5) hours. Time intensity in the stepped-care procedure gradually decreased during the year after the injury. Seventy-five percent of all intervention activity (9.8 [6.4] hours) occurred within the first 6 months after the injury. Approximately two-thirds of intervention patients ( $n = 39$ ) received 1 or more motivational interviews targeting either substance use or risk behaviors; 22 intervention patients (37.3%) received at least 1 motivational interview session targeting alcohol and drugs, and 29 (49.2%) received at least 1 motivational interview session targeting weapon carrying or other risk behaviors. Thirty intervention patients (50.8%) received nurse practitioner medication evaluations, 17 patients (28.8%) were offered pharmaco-

Figure 1. Flow of Adolescent Participants Through the Randomized Clinical Trial



therapy targeting high levels of PTSD and depressive symptoms, and 10 (16.9%) adhered to their medication regimens during the study. Thirty-five patients (59.3%) were assessed for multisession CBT, and 19 (32.2%) received 1 or more CBT elements delivered during routine care management. Only 1 (0.2%) individual entered and completed 5 CBT sessions.<sup>62</sup>

### Treatment Outcomes During the Year After Injury

Intervention patients had clinically and statistically significant reductions in self-reports of carrying a weapon during the year after injury compared with controls (Figure 2 and Table 2) (group  $\times$  time effect,  $F_{3,344} = 3.0$ ;  $P = .03$ ). At each follow-up assessment point, intervention patients had a significantly diminished risk of carrying a weapon compared with control patients (Table 3). At 12 months after the injury, 4 (7.3%) intervention patients vs 13 (21.3%) control patients reported currently carrying a weapon (relative risk, 0.31; 95% CI, 0.11-0.90).

Table 1. Baseline Adolescent Patient Characteristics

Characteristic	Patients, No. (%)		
	Total (N = 120) <sup>a</sup>	Collaborative Care (n = 59)	Usual Care (n = 61)
Age, mean (SD), y	15.5 (1.9)	15.6 (1.9)	15.4 (1.9)
Female sex	30 (25.0)	14 (23.7)	16 (26.2)
Nonwhite race	46 (38.3)	25 (42.4)	21 (34.4)
Insurance			
None	9 (7.5)	3 (5.1)	6 (9.8)
Commercial	57 (47.9)	29 (50.0)	28 (45.9)
Medicaid/Medicare	19 (16.0)	11 (19.0)	8 (13.1)
Other	34 (28.6)	15 (25.9)	19 (31.1)
Acute care injury/medical			
Injury severity category			
0-8	27 (22.7)	12 (20.3)	15 (25.0)
9-15	37 (31.1)	18 (30.5)	19 (31.7)
≥16	55 (46.2)	29 (49.2)	26 (43.3)
Traumatic brain injury			
No	63 (52.5)	27 (45.8)	36 (59.0)
Yes	57 (47.5)	32 (54.2)	25 (41.0)
Intentional injury	7 (5.8)	3 (5.1)	4 (6.6)
Intensive care	56 (47.1)	26 (44.8)	30 (49.2)
Hospital stay, mean (SD), d	6.4 (10.0)	7.1 (11.5)	5.8 (8.2)
Serious prior trauma before injury admission, mean (SD), No.	2.0 (1.6)	1.9 (1.5)	2.0 (1.7)
Clinical/psychiatric			
Carrying a weapon	39 (32.8)	20 (34.5)	19 (31.1)
Any alcohol or drug use	53 (44.2)	28 (47.5)	25 (41.0)
High-level PTSD symptoms <sup>b</sup>	21 (17.5)	9 (15.3)	12 (19.7)
High-level depressive symptoms <sup>c</sup>	12 (10.0)	4 (6.8)	8 (13.1)

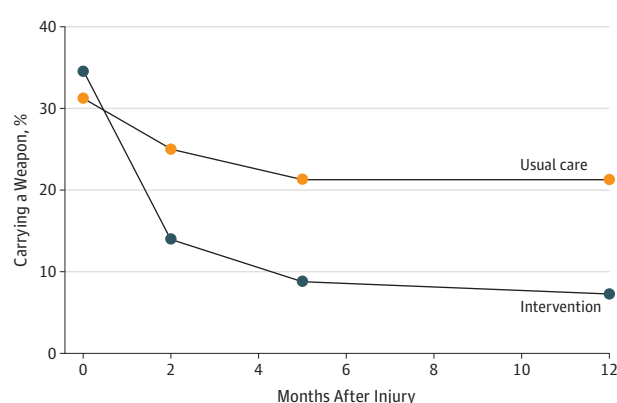
Abbreviation: PTSD, posttraumatic stress disorder.

<sup>a</sup> Baseline observations for some characteristics included 119 patients (58 patients in collaborative care).

<sup>b</sup> Symptoms consistent with a diagnosis of PTSD on the University of California, Los Angeles, PTSD Reaction Index.<sup>44</sup>

<sup>c</sup> Symptoms consistent with a diagnosis of depression on the 9-item Patient Health Questionnaire depression screen.<sup>46</sup>

Figure 2. Self-reports of Carrying a Weapon by Treatment Group



Baseline time point (0 months) assesses weapon carrying in the year before the injury admission.

Observation of individual case trajectories revealed that 11 (18.0%) adolescents in the control group began new weapon-carrying behaviors after their injury hospitalization compared with 2 (3.4%) intervention patients ( $P = .048$ ). Regression analyses revealed no significant interaction of TBI by treatment group ( $F_{1,347} = 0.28$ ;  $P = .60$ ), suggesting that patients with TBI responded equally well to the intervention.

Substance use outcomes demonstrated a pattern of symptomatic improvement in intervention patients compared with controls over time (Table 2), but these comparisons did not achieve statistical significance. High PTSD and depressive symptoms occurred at lower frequencies in the cohort and were not significantly affected by the intervention (Table 2). Finally, sensitivity analyses did not substantially alter the magnitude, pattern, or significance of the observed treatment effects.

## Discussion

This investigation documents the effectiveness of a collaborative care intervention in reducing the violence risk behavior of weapon carrying in randomly sampled, acutely hospitalized adolescents. The intervention reduced adolescent weapon carrying during the year after acute care injury admission. Patients with and without TBI were equally likely to demonstrate reduced weapon carrying. No significant group differences were observed for alcohol or drug use problems or for PTSD and depressive symptom levels.

In concert with the aims of a pragmatic trial, adolescents were randomly selected for participation in the study from a clinical population of hospitalized injured youth, and the demographic and clinical characteristics of study patients did



Table 2. Outcomes for Adolescents in Collaborative Care vs Usual Care Control Over Time<sup>a</sup>

Outcome	Baseline		2 mo		5 mo		12 mo	
	CC	UC	CC	UC	CC	UC	CC	UC
Carrying a weapon	20 (34.5)	19 (31.2)	8 (14.0)	15 (25.0)	5 (8.8)	13 (21.3)	4 (7.3)	13 (21.3)
Any alcohol or drug use	28 (47.5)	25 (41.0)	18 (31.6)	14 (23.3)	19 (32.8)	21 (34.4)	22 (38.6)	26 (42.6)
High-level PTSD symptoms <sup>b</sup>	9 (15.3)	12 (19.7)	11 (19.3)	12 (20.0)	9 (15.5)	13 (21.3)	12 (21.1)	9 (14.8)
High-level depressive symptoms <sup>c</sup>	4 (6.8)	8 (13.1)	3 (5.3)	4 (6.7)	2 (3.5)	4 (6.7)	7 (12.3)	6 (9.8)

Abbreviations: CC, collaborative care; PTSD, posttraumatic stress disorder; UC, usual care.

<sup>a</sup> Data are presented as number (percentage) of patients. Outcomes included for 120 patients: 59 CC and 61 UC.

<sup>b</sup> Symptoms consistent with a diagnosis of PTSD on the University of California, Los Angeles, PTSD Reaction Index.<sup>44</sup>

<sup>c</sup> Symptoms consistent with a diagnosis of depression on the 9-item Patient Health Questionnaire depression screen.<sup>46</sup>

Table 3. Comparisons of Collaborative Care and Usual Care Control Patient Reports of Carrying a Weapon Over Time<sup>a</sup>

Carrying a Weapon	Change, RR (95% CI)					
	Baseline to 2 mo		Baseline to 5 mo		Baseline to 12 mo	
	Change	Net Difference	Change	Net Difference	Change	Net Difference
Usual care control	0.80 (0.53-1.20)	1 [Reference]	0.68 (0.40-1.16)	1 [Reference]	0.68 (0.40-1.16)	1 [Reference]
Collaborative care	0.41 (0.24-0.70) <sup>b</sup>	0.51 (0.26-1.00) <sup>c</sup>	0.21 (0.08-0.54) <sup>b</sup>	0.38 (0.15-0.96) <sup>c</sup>	0.21 (0.08-0.54) <sup>b</sup>	0.31 (0.11-0.90) <sup>c</sup>

Abbreviation: RR, relative risk.

<sup>a</sup> Outcome results were derived from mixed Poisson regression models that include treatment group, time, and group-by-time interaction terms.

<sup>b</sup>  $P < .01$ .

<sup>c</sup>  $P < .05$ .

not differ substantially from the population of admitted youth. Also, real-world nonspecialist providers were trained in flexible intervention approaches, such as motivational interviewing, that targeted a full spectrum of violence and injury risk behaviors and substance use problems. Rather than targeting specific symptomatic or risk behaviors required by study entry criteria, nonspecialist interventionists were instructed to identify and treat risk behaviors, substance use problems, and symptoms that were most prevalent and/or concerning in their patient population. A strength of this pragmatic implementation trial approach is the potential identification of robust intervention targets such as the violence risk behavior of carrying a weapon.

The investigative approach also has limitations. First, our principal intervention target, adolescent weapon carrying, was not listed as a primary outcome in the initial study design. We were surprised to find that, in our random sampling procedure, one-third of adolescents recruited into the trial reported carrying a weapon in the year before the index injury admission. For alcohol, PTSD, and depression, low base rates in the adolescent patient population may have limited the power to detect significant treatment effects. For more prevalent intervention targets, such as adolescent marijuana use, there is a limited evidence base supporting the effectiveness

of motivational interviewing interventions.<sup>63</sup> Also, the TBI results can be seen as preliminary because the overall sample size combined with a rate of TBI of approximately 50% limited our ability to assess TBI interaction effects.<sup>18,19,21,22</sup>

Beyond these considerations, this investigation contributes to an evolving literature on early preventive interventions for adolescents treated in acute care medical settings. A series of investigations has established that carrying a weapon is a major risk factor for serious injury in male and female adolescents.<sup>64-66</sup> The American College of Surgeons<sup>67</sup> has demonstrated the capacity to mandate screening and intervention procedures for alcohol use problems at US trauma centers based on the results of empirical investigations.<sup>32,37,68</sup>

## Conclusions

Collaborative care intervention reduced the risk of adolescent weapon carrying during the year after injury hospitalization. Future investigation should replicate this preliminary observation. If the finding is replicated, orchestrated investigative and policy efforts could systematically implement and evaluate screening and intervention procedures targeting youth violence prevention at US trauma centers.<sup>67,68</sup>

## ARTICLE INFORMATION

**Accepted for Publication:** October 21, 2013.

**Published Online:** April 14, 2014.

doi:10.1001/jamapediatrics.2013.4784.

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*Drafting of the manuscript:* Zatzick, Russo, Wang, Whiteside.

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*Statistical analysis:* Zatzick, Russo, Wang.

*Obtained funding:* Zatzick.

*Administrative, technical, or material support:*

Zatzick, Lord, Varley, Jurkovich.

*Study supervision:* Zatzick, Lord, Varley, Jurkovich.

**Conflict of Interest Disclosures:** None reported.

**Funding/Support:** This work was supported by the Health Resources and Services Administration grant H34/MC08508-01-00 and the National Institute of Mental Health grant K24/MH086814 (Dr Zatzick).

**Role of the Sponsor:** The sponsors had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication.

**Disclaimer:** Dr Rivara is the editor of *JAMA Pediatrics*. He was not involved in the editorial evaluation or decision to accept this article for publication.

**Additional Contributions:** Chris Dunn, PhD, trained care managers in motivational interviewing, Amy Wagner, PhD, trained and supervised care managers in cognitive behavioral therapy, and Roselyn Peterson, BA, contributed to the preparation of the references and proofreading the manuscript. They are currently employed by and/or faculty at the University of Washington in the Department of Psychiatry and Behavioral Sciences and received no additional compensation for their work.

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