ORIGINAL ARTICLE

A Randomized Effectiveness Trial of Stepped Collaborative Care for Acutely Injured Trauma Survivors

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Context: Although posttraumatic stress disorder (PTSD) and alcohol abuse frequently occur among acutely injured trauma survivors, few real-world interventions have targeted these disorders.

Objective: We tested the effectiveness of a multifaceted collaborative care (CC) intervention for PTSD and alcohol abuse.

Design: Randomized effectiveness trial.

Participants: We recruited a population-based sample of 120 male and female injured surgical inpatients 18 or older at a level I trauma center.

Intervention: Patients were randomly assigned to the CC intervention (n=59) or the usual care (UC) control condition (n=61). The CC patients received stepped care that consisted of (1) continuous postinjury case management, (2) motivational interviews targeting alcohol abuse/dependence, and (3) evidence-based pharmacotherapy and/or cognitive behavioral therapy for patients with persistent PTSD at 3 months after injury.

Main Outcome Measures: We used the PTSD symptomatic criteria (PTSD Checklist) at baseline and 1, 3, 6, and 12 months after injury, and alcohol abuse/dependence (Composite International Diagnostic Interview) at baseline and 6 and 12 months after injury.

Results: Random-coefficient regression analyses demonstrated that over time, CC patients were significantly less symptomatic compared with UC patients with regard to PTSD ($P=.01$) and alcohol abuse/dependence ($P=.048$). The CC group demonstrated no difference (–0.07%; 95% confidence interval [CI], –4.2% to 4.3%) in the adjusted rates of change in PTSD from baseline to 12 months, whereas the UC group had a 6% increase (95% CI, 3.1%-9.3%) during the year. The CC group showed on average a decrease in the rate of alcohol abuse/dependence of –24.2% (95% CI, –19.9% to –28.6%), whereas the UC group had on average a 12.9% increase (95% CI, 8.2%-17.7%) during the year.

Conclusions: Early mental health care interventions can be feasibly and effectively delivered from trauma centers. Future investigations that refine routine acute care treatment procedures may improve the quality of mental health care for Americans injured in the wake of individual and mass trauma.

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INJURED SURVIVORS OF INDIvidual and mass trauma receive their initial treatment in acute care settings.[1] Within 48 hours after the September 11, 2001, attack on the World Trade Center, 1103 physically injured survivors were triaged through 5 acute care facilities in Manhattan, NY.[2] Each year approximately 2.5 million Americans are so severely injured that they require inpatient hospital admission.[3]

Symptoms consistent with a diagnosis of posttraumatic stress disorder (PTSD) may develop in 10% to 40% of hospitalized injured patients in the United States.[4-7] Approximately 20% to 40% of injured patients admitted to trauma centers have current or lifetime alcohol abuse/dependence diagnoses.[8] Alcohol intoxication at the time of injury is associated with an increased risk of injury recurrence.[9]

Efficacy research suggests that individuals with PTSD respond to psychotherapeutic and psychopharmacological treatments.[10-12] Growing randomized clinical trial evidence suggests that early cognitive behavior therapy (CBT) interventions delivered in the days and weeks after injury can help to diminish PTSD symptom development.[13-16] Selective serotonin reuptake inhibitors and tricyclic antidepressants are efficacious treatments for PTSD.[11,17-21] Efficacy studies suggest that motivational interviewing (MI) interventions can decrease alcohol use across a va-

riety of clinical populations,[22-25] including injured trauma survivors.[26]

Recent consensus guidelines from the National Institute of Mental Health identify acutely injured trauma survivors as a group at high risk for development of PTSD and related comorbid conditions and recommend the development of early evaluation procedures that are adaptable to real-world treatment settings.[27] As is true for many Americans with psychiatric disorders,[28] injured patients appear to receive fragmented care, and most are not engaged in mental health services at strategic postinjury points.[29,30] Previous investigations of psychological debriefing suggest that although this intervention may be feasibly delivered to representative samples of patients receiving acute care,[31,32] debriefing interventions are not effective in reducing PTSD symptoms and may actually be associated with poorer outcomes.[33,34]

During the past decade, collaborative care (CC) has been developed as a comprehensive treatment delivery model for patients with medical and psychiatric disorders.[35-43] Collaborative care is a disease management strategy that uses multifaceted interventions (eg, combined case management, pharmacotherapy, and psychotherapy) with the aim of integrating mental health interventions into general medical care. Just as collaborative models have improved mental health outcomes for patients with major depression and panic disorder in primary care, the introduction of CC interventions within trauma care systems may link acute injury care with evidence-based mental health interventions. Collaborative interventions have the potential to reduce posttraumatic symptoms and trauma recidivism while improving functional recovery.

We developed and tested a multifaceted CC intervention targeting PTSD and alcohol use for acutely injured trauma survivors. The primary hypothesis was that patients receiving the CC intervention would demonstrate significant reductions in PTSD and alcohol abuse during the year after injury.

METHODS

RESEARCH SETTING AND SUBJECTS

Subjects were recruited from the Harborview level I trauma center of the University of Washington, Seattle. Each year Harborview admits approximately 5000 survivors of intentional (eg, injuries associated with human malice such as physical assaults) and unintentional (eg, injuries associated with motor vehicle crashes and job-related injuries) injuries of all ages. Eligible patients were English-speaking survivors of intentional and unintentional injuries, 18 years and older, who lived within 50 miles of the trauma center. Harborview trauma registry data documenting injury, demographic, and clinical variables were available for screening each patient admitted during the study period. The University of Washington institutional review board approved all trauma registry analyses and informed consent procedures before the initiation of the study.

RECRUITMENT PROCEDURE

On weekdays from March 30, 2001, through January 10, 2002, a research associate downloaded an automated list of all injured patients admitted for acute injuries to Harborview's trauma surgical services. Eligible, newly admitted patients were approached using random number assignments from a computer-generated algorithm. With regard to cognitive status, patients approached in the ward were required to have a Glasgow Coma Scale score[44] of 15 and a score of at least 7 on the 2 Mini-Mental State Examination items that assess orientation to location and date.[45] Patients with severe injuries that prevented participation were excluded from the study. Patients who had self-inflicted injuries or active psychosis, who were currently incarcerated, or who had recent histories of violence were also excluded.

Hospitalized inpatients received a 2-phased evaluation. First, we administered the PTSD Checklist Civilian Version (PCL)[46] and the Center for Epidemiological Studies Depression Scale (CES-D)[47] to each inpatient. We included patients in the study who were symptomatic with PTSD (PCL score, $\geq$45)[48] and/or depression (CESD-D score, $\geq$16).[49] Second, patients who met symptomatic criteria for the study were administered the remainder of the surgical ward interview that consisted of the Composite International Diagnostic Interview (CIDI) alcohol abuse/dependence modules[50] and other items assessing various aspects of preevent- and event-related symptoms, functioning, and use of health care services.

Patients were randomized to the CC intervention or the usual care (UC) control condition immediately after completion of the surgical ward assessment. Randomization was stratified according to PTSD symptom levels (PCL score, $\geq$45 vs $<$45), depressive symptom levels (CES-D score, $\geq$16 vs $<$16), and results of alcohol and stimulant admission toxicology (positive vs negative).

INTERVENTION

The CC intervention combined case management and psychopharmacological and psychotherapeutic treatments. The intervention team included a full-time master's level case manager, the trauma support specialist (TSS) (R.D.), and part-time psychiatrist (D.Z.) and psychologist (A.W.) interventionists who delivered the medication and CBT components. The intervention procedure has been manualized, and the component modules have been published.[51-53]

The intervention was designed as a stepped-care procedure. For the first 6 months after injury, all CC patients received continuous case management delivered by the TSS. The TSS was the frontline provider in the treatment of the injured CC patient and provided readily accessible, continuous trauma support in the weeks and months after the injury.

The TSS began treatment with each injured CC patient at the bedside in the surgical ward. Prior investigation suggested that case management facilitated engagement in mental health intervention among ethnically diverse low-income patients.[54] In previous studies, injured trauma survivors demonstrated multiple posttraumatic concerns (eg, physical health, work, and finance) that extended beyond PTSD and alcohol-related symptoms.[55,56] Thus, to engage injured patients, the TSS elicited, tracked, and targeted for improvement each injured patient's unique constellation of posttraumatic concerns.

The TSS coordinated care across surgical inpatient, primary care outpatient, specialty mental health, and community service settings. With the other members of the intervention team, the TSS developed a comprehensive postinjury care plan that simultaneously addressed the medical and psychosocial complications of the injury and coordinated linkages to primary care and community services. In these activities, the TSS interfaced with patients and their families, surgical and primary care providers, staff at community agencies, and outside mental health care professionals. The case management pager

was covered by members of the intervention team 24 hours a day, 7 days a week, to provide care that was responsive to the spontaneous questions and needs of injured patients.[57] These combined trauma support activities established a therapeutic alliance that facilitated the delivery of evidence-based interventions for alcohol abuse and PTSD.

All patients with positive alcohol toxicology test results on admission, or who at any point during the trial demonstrated postinjury alcohol abuse that could be considered hazardous and risked injury recurrence, received the evidence-based MI intervention.[26,52,58] The TSS was trained by the team's expert MI consultant (C.D.) to deliver MI targeting alcohol abuse in trauma wards.[59] The MI intervention consisted of an initial surgical ward session followed by as-needed booster sessions. The surgical ward session lasted approximately 30 minutes, and the follow-up booster sessions had variable lengths ranging from 10 to 60 minutes. The intervention components included feedback about inpatient blood alcohol toxicology test results, exploration of the pros and cons of alcohol consumption, discussion of the importance of change, clarification of specific goals for alcohol use, and negotiation of action plans to bring about change. Any patient who requested MI booster sessions received them; patients who had exacerbations of alcohol use were also offered booster sessions.

Patients who demonstrated high levels of immediate posttraumatic distress (eg, severe anxiety, pain, and/or insomnia) received early psychiatric evaluations.[53] Because immediate posttraumatic distress can spontaneously resolve in the weeks and months after injury, only patients with sustained high levels of early distress were offered evidence-based PTSD pharmacological interventions (eg, selective serotonin reuptake inhibitors) in the first 3 months after the event. Sustained high levels of distress were operationalized as (1) objectively observed high levels of distress such as extreme emotional reactions (eg, fear, rage, and dissociation) that lasted at least 24 hours and were so severe as to limit verbal interchanges and/or (2) sustained subjective distress lasting days that prompted repetitive patient requests for more intensive treatment. Based on these criteria, 4 (7%) of the 59 CC patients received PTSD pharmacological intervention before the 3-month postinjury time point.

Three months after the injury, each CC patient was administered the Structured Clinical Interview for *DSM-IV* PTSD module by the case manager.[60] All patients who received a PTSD diagnosis at this assessment were given their preference of CBT, pharmacotherapy, or combined treatment. Evidence-based PTSD treatments were delivered by the team's expert psychotherapy and pharmacotherapy consultants. The CBT intervention included psychoeducation, muscle relaxation, cognitive restructuring, and graded exposure.[13,51] The psychopharmacological intervention consisted of an initial psychiatric evaluation and medication targeting PTSD.[61,62]

When care for PTSD was stepped up at the 3-month postinjury point, the TSS provided education about the diagnosis and facilitated the entry of patients into evidence-based treatments. During the evidence-based PTSD intervention, the TSS had the key role of performing brief assessments of adherence to medication therapy and symptom relapse, outside scheduled psychotherapy or medication sessions.

The stepped-care procedure included relapse prevention and community integration components. From 6 to 12 months after the injury, all patients who remained symptomatic with PTSD and/or demonstrated evidence of alcohol abuse/dependence or alcohol consumption behaviors that risked injury recurrence received combinations of ongoing trauma support and evidence-based MI and PTSD treatments. In this phase of the protocol, the TSS remained in contact with the patient and periodically reassessed symptoms, function, and rehabilitation.

The collaborative team members maintained detailed logs documenting the nature and duration of all intervention activities.[56] The collaborative team held weekly meetings to review cases and protocol procedures.

USUAL CARE

Patients assigned to the control condition received care as usual. Previous investigations have documented that injured trauma survivors typically receive care from a heterogeneous group of clinicians including surgical practitioners, emergency department caregivers, and primary care providers.[63] Acute posttraumatic distress is infrequently detected and treated in the surgical inpatient setting,[64] and less than 15% of injured trauma survivors report receiving specialty mental health and/or substance-related care during the year after injury.[52,63] In this investigation all patients received a list of community referrals immediately after their surgical ward assessment; 21% of UC controls (11 of the 53 with self-report health service utilization data) endorsed 1 or more visits with mental health specialty providers (ie, at the doctoral level) during the course of the year after injury.

INTERVIEWS AND MEASURES

The principal investigator, a consultation liaison psychiatrist (D.Z.), oversaw the training procedure for the surgical ward and telephone follow-up interviews. A research associate made morning rounds with the principal investigator during an initial 1-month pilot phase and then for the following 3 months of active protocol recruitment. During this period all recruitment, consent, and interview procedures were observed and critiqued by the principal investigator. Training of research associates for structured clinical assessments and telephone interviews included the use of practice interviews and manuals. These interviews were monitored for reliability by the principal investigator and senior coinvestigators.

Posttraumatic Stress Disorder

Symptoms consistent with a diagnosis of PTSD were assessed with the PCL, a 17-item self-report questionnaire that elicits graded responses (range, 1-5) for the intrusive, avoidant, and arousal PTSD symptom clusters.[46] A series of investigations have demonstrated the reliability and validity of the PCL across trauma-exposed populations.[46,48,65-68]

Responses are recorded on a scale from "not at all" (grade 1) through "moderately" (grade 3) to "extremely" (grade 5). Symptoms consistent with the *DSM-IV* diagnosis were determined by adherence to the recommended algorithm that considers a score of 3 or greater a symptom and follows the diagnostic rules requiring at least 1 intrusive symptom, 3 avoidant symptoms, and 2 arousal symptoms.[46,69] Symptoms of PTSD were assessed in reference to the index injury (eg, "How bothered have you been by repeated, disturbing memories, thoughts, or images of the event in which you were injured?"). We used the PCL to screen for symptoms in the surgical ward and to reassess for PTSD at the 1-, 3-, 6-, and 12-month telephone follow-up interviews.

Alcohol and Substance Use

The *DSM-IV* diagnoses of alcohol abuse and dependence were assessed with the CIDI Alcohol module.[70] The CIDI, a structured diagnostic interview developed by the World Health Organization and the US Alcohol, Drug Abuse, and Mental Health

Administration, has established reliability and validity for the *DSM* diagnoses of alcohol abuse/dependence.[70] The CIDI alcohol abuse/dependence modules were administered at baseline in the surgical ward and again 6 and 12 months after the injury. The baseline CIDI assessed alcohol consumption behaviors during the 12 months before the injury, whereas the 6- and 12-month telephone follow-up CIDI evaluations assessed each preceding 6-month period.

Alcohol and stimulant (amphetamine and cocaine) intoxication at the time of admission to the hospital was assessed with toxicology screens. Because opiates and benzodiazapines are frequently administered to trauma patients, only stimulant results were included as positive results of drug screens.

Injury Severity and Medical Comorbidities

We determined injury severity from the medical record *International Classification of Disease, Ninth Version, Clinical Modification* (*ICD-9-CM*)[71] codes using the Abbreviated Injury Scale and Injury Severity Score.[72] Comorbid chronic medical conditions were also derived from *ICD-9-CM* diagnostic codes. Eleven conditions, including diabetes, hypertension, chronic liver and renal diseases, carcinomas, ischemic heart disease, degenerative nervous conditions, stroke, epilepsy, obesity, and coagulation defects were included.[73]

STATISTICAL ANALYSES

To assess the representativeness of the study sample, we first compared the characteristics of patients included in the investigation with the characteristics of all injured patients admitted to Harborview during the study period who met study eligibility criteria. We also compared baseline data for patients in the CC and UC conditions.

We used mixed-effects random-coefficient regression models with the intent-to-treat sample to determine whether patients in the 2 groups manifested different patterns of PTSD and alcohol symptom change over time. Longitudinal data collected prospectively from injured trauma survivors is characterized by correlated intraindividual observations, missing data, and dropouts.[4] Mixed-effects random-coefficient regression methods were selected because of their superior ability to model longitudinal data with these characteristics.[74] The procedure uses maximum likelihood estimates to evaluate treatment group, time, and treatment group × time interaction effects. Baseline symptom status, age, sex, medical comorbidity, and injury severity were used as covariates in all these regression procedures.

When significant interaction or main effects were detected by the random-coefficient regressions, post hoc logistic regressions for each follow-up assessment point were performed. On the basis of these logistic regressions, we calculated the average rates of PTSD and alcohol abuse/dependence at each assessment point for the CC and UC groups adjusted for the covariates. These adjusted average proportions are presented in our figures. To interpret any significant statistical interactions of treatment with time, we used logistic regressions to calculate adjusted probabilities of PTSD and alcohol abuse/dependence for each patient at each assessment. Next, changes in the adjusted probabilities from baseline to the 6- and 12-month assessments were calculated along with their 95% confidence intervals (CIs). Finally, we used 2-tailed unpaired *t* tests to examine the differential rates of change in the adjusted probabilities across time for the treatment groups. Significant differences in the CC and UC groups would indicate differences in the rates of change in adjusted probabilities over time.

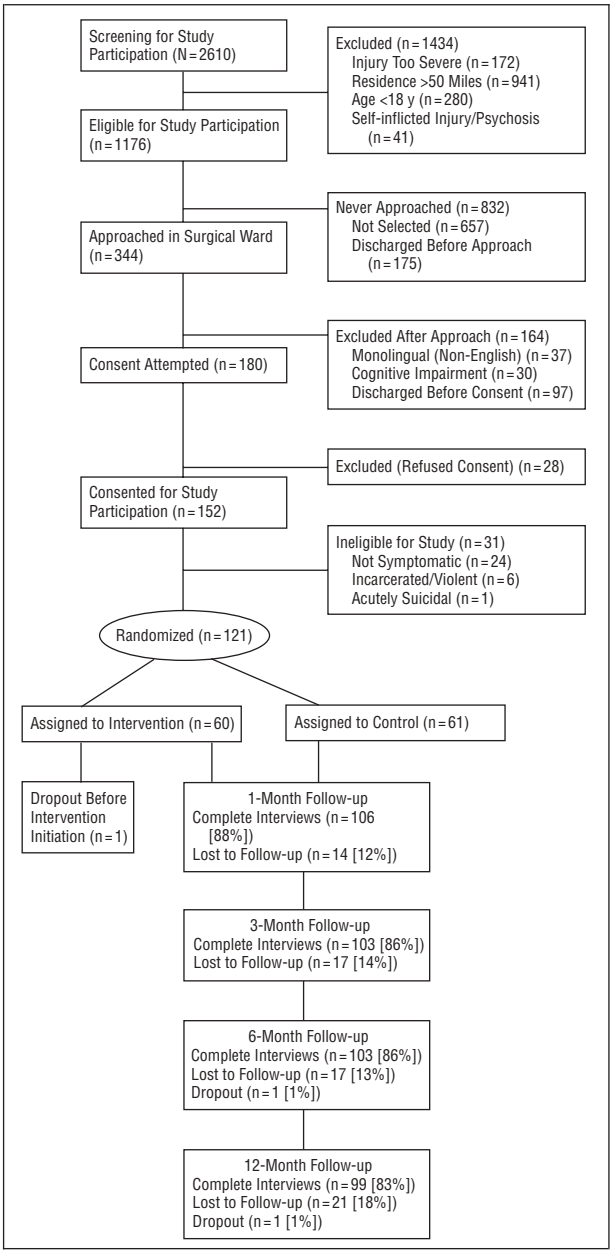

Figure 1. Patient flow through the clinical trial. Percentages have been rounded and may not total 100.

RESULTS

PATIENT CHARACTERISTICS

A total of 2610 surgical inpatients underwent screening for the investigation during the 10-month study (**Figure 1**). Injured trauma survivors recruited into the investigation did not significantly differ from all patients admitted to Harborview surgical services during the study period with regard to injury type (intentional injury, 21% vs 19%; $\chi^2_1=0.18$; $P=.67$), Injury Severity Score (mean, 10.8 [SD, 6.6] vs 10.8 [SD, 9.4]; $t_{2157}=0.01$; $P=.99$), sex (percentage female, 33% vs 27%; $\chi^2_1=1.2$; $P=.27$), or alcohol toxicology test status (percentage with positive results, 28% vs 28%; $\chi^2_2=1.88$; $P=.39$). On average, study patients were younger (mean age, 38.7 years [SD, 14.8

Table 1. Baseline Demographic, Injury, and Clinical Characteristics of Patients Randomized to the Collaborative Care Intervention vs Usual Care

Variable	Patient Groups: CC Intervention (n = 59)	Patient Groups: UC (Control) (n = 61)	Test Statistic	*P* Value
Demographics				
Age, mean (SD), y	37.1 (13.2)	44.4 (16.3)	$t_{118} = 1.24$	.22
Female, %	32.2	32.8	$\chi^2_1 = 0.00$	>.99
Education ≤high school, %	59.3	50.8	$\chi^2_1 = 0.57$	.45
Income <$15 000/y, %	72.9	70.5	$\chi^2_1 = 0.01$	.93
Nonwhite, %	32.2	36.1	$\chi^2_1 = 0.06$	.80
Married, %	27.1	34.4	$\chi^2_1 = 0.45$	.50
Injury				
Intentional type, %	22.0	18.0	$\chi^2_1 = 0.10$	.75
ISS score mean (SD)	9.9 (6.8)	10.5 (7.0)	$t_{118} = 0.48$	.63
Clinical characteristics				
No. of previous traumas (CIDI), %			$\chi^2_4 = 6.76$	.15
0	16.9	9.8		
1	23.7	9.8		
2	15.3	19.7		
3	13.6	21.3		
≥4	30.5	39.3		
PCL score, mean (SD)	36.2 (12.2)	33.1 (10.0)	$t_{118} = 1.51$	.13
CES-D score, mean (SD)	26.5 (9.4)	24.8 (8.1)	$t_{118} = 1.07$	.29
PCS score, mean (SD)	53.1 (8.4)	52.6 (8.6)	t_{118}=–0.33	.75
Admission blood alcohol toxicologic test result, %			$\chi^2_2 = 1.48$	.48
Positive	25.4	31.1		
Negative	66.1	55.7		
Not tested	8.5	13.1		
Baseline CIDI alcohol abuse and/or dependence finding, % positive	39	21	$\chi^2_1 = 3.66$	.06
≥1 Medical condition, %	13.6	13.1	$\chi^2_1 = 0.00$	>.99
Inpatient length of stay, mean (SD), d	6.2 (7.0)	6.2 (4.9)	$t_{118} = 0.39$*	.70
Days on surgical ward before study enrollment, mean (SD)	2.8 (1.9)	3.0 (2.2)	$t_{115} = 0.16$*	.87

Abbreviations: CC, collaborative care intervention; CES-D, Center for Epidemiological Studies Depression Scale[47]; CIDI, Composite International Diagnostic Interview[50]; ISS, Injury Severity Score; PCL, PTSD [posttraumatic stress disorder] Checklist Civilian Version[46]; PCS, Medical Outcomes Short-Form Health Survey 12-Item Physical Components Summary[75]; UC, usual care.

*The *t* tests for length-of-stay variables are logarithm transformed.

years] vs 41.7 years [SD, 18.2 years]; t_{2509}=0.01; *P*=.07) and significantly less likely to have 1 or more chronic medical conditions (14% vs 26%; χ^2_1=6.9; *P*=.01) when compared with the population of trauma center patients.

Injured patients included in the investigation (n=120) were heterogeneous with regard to demographic and clinical characteristics (**Table 1**). Sixty-six percent of patients were white; 12%, African American; 10%, Hispanic; 8%, Native American; and 5%, Asian. Thirty-six percent of patients had individual incomes less than $15 000 per year; 34%, from $15 000 to $40 000 per year; and 30%, greater than $40 000 per year. Eleven percent of patients reported not having a permanent home or living situation. Less than 10% of patients had positive findings for stimulants on admission, and the number of patients with stimulant-positive results was not significantly different across the 2 groups. Twelve (48%) of the 25 patients who met *DSM-IV* symptomatic criteria for PTSD in the surgical ward had comorbid alcohol abuse/dependence. Although the proportions of CC and UC patients with positive alcohol admission toxicologic findings were similar, stratification based on this crude screen failed to evenly distribute patients with regard to alcohol abuse/dependence (Table 1).

PARTICIPATION IN THE COLLABORATIVE INTERVENTION

The stepped-care procedure involved gradually decreasing case manager time intensity during the weeks and months after the injury and gradually increasing time commitments from doctoral-level practitioners. The case manager began each intervention with a bedside visit, and during the course of the year spent an average of 10.7 hours (SD, 9.8 hours; median, 7.6 hours; range, 1-56 hours) with each CC patient. On average, the case manager spent 4.3 hours (SD, 2.9 hours) with each patient in the first month after the injury, 3.1 hours (SD, 3.65 hours) per patient from months 1 through 3, 2.0 hours (SD, 3.4 hours) per patient from months 4 to 6, and 1.3 hours (SD, 3.2 hours) per patient during months 7 to 12 after injury. Thirty (51%) of 59 CC patients received the brief MI intervention targeting alcohol abuse, and more than half of these patients received 1 or more MI booster sessions during the year.

At the 3-month assessment with the Structured Clinical Interview for *DSM-IV*, 12 (24%) of 50 CC patients received a diagnosis of PTSD. Evidence-based pharmacotherapy and psychotherapy were offered to these patients. Almost all of the intervention time (38.9 [95.8%]

Table 2. Random-Coefficient Regression Results for PTSD and Alcohol Abuse/Dependence

Variable	Estimate (SE)*	*P* Value
PTSD†		
Time	0.30 (0.20)	.13
Injury Severity Score	−0.09 (0.06)	.14
Age	−0.05 (0.04)	.21
Female	1.63 (0.91)	.07
Chronic illness	1.43 (1.21)	.23
Baseline alcohol consumption	2.05 (0.91)	.02
Baseline PTSD	3.38 (1.00)	.001
Treatment group	1.72 (1.01)	.09
Treatment group × time	−0.67 (0.27)	.01
Alcohol Abuse/Dependence‡		
Time	1.85 (0.79)	.02
Injury Severity Score	−0.08 (0.05)	.09
Age	−0.05 (0.03)	.14
Female	−0.74 (0.69)	.28
Chronic illness	1.91 (0.88)	.03
Baseline alcohol consumption	2.30 (0.85)	.007
Treatment group	2.01 (1.79)	.26
Treatment group × time	−2.12 (1.07)	.048

Abbreviation: PTSD, posttraumatic stress disorder.
*Estimates are unstandardized.
†Posttraumatic stress disorder was assessed with the PTSD Checklist Civilian Version[46] 1, 3, 6, and 12 months after injury.
‡Alcohol abuse dependence was assessed with the Composite International Diagnostic Interview[50] 6 and 12 months after injury.

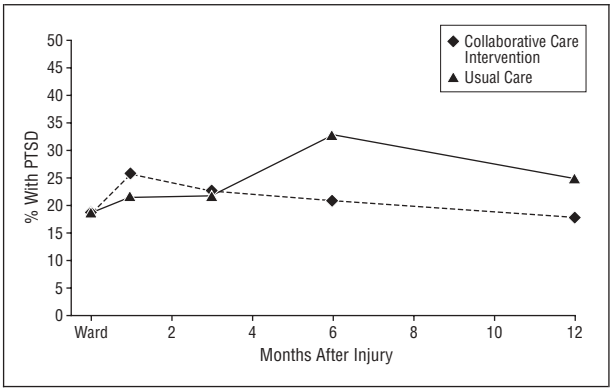

Figure 2. Percentage of patients who met *DSM-IV* symptomatic criteria for posttraumatic stress disorder (PTSD) during the year after injury. Symptoms consistent with a diagnosis of PTSD were assessed with the PTSD Checklist Civilian Version.[46] Percentages are adjusted for injury severity, sex, age, chronic illness, baseline PTSD, and baseline alcohol abuse/dependence. Baseline PTSD was assessed in the surgical ward (n=120). Follow-up rates were 88% at 1 month, 86% at 3 months, 86% at 6 months, and 83% at 12 months.

of 40.6 total hours) of the expert doctoral-level therapist was spent delivering a course of CBT (range, 5-12 sessions) to 5 CC patients from 3 to 12 months after injury.

In total, the psychiatrist participated in the evaluation and/or treatment of 38 (64%) of the 59 CC patients (average time per patient, 2.7 hours; SD, 3.4 hours; median, 0.67 hours; range, 0.1-14.5 hours). The psychiatrist participated in an average of 0.60 visits of 30 to 60 minutes' duration in the first 3 months (SD, 1.00; range, 0-5), and 1.0 visits from months 3 to 12 (SD, 2.1; range, 0-8). With regard to patient-related telephone calls, in the first 3 months the psychiatrist averaged 1.0 telephone contacts per patient (SD, 1.9; range, 0-9 calls), and from 3 to 12 months, 1.4 telephone contacts (SD, 2.3; range, 0-9). In the first 3 months immediately after the injury, the psychiatrist evaluated 22 (37%) of 59 CC patients for high levels of immediate posttraumatic distress, pain, insomnia, or other injury-related complications. Also, for 4 (7%) of 59 patients, no in-person evaluation was performed; however, the psychiatrist participated in care coordination/referral activities with surgical and primary care providers. Twenty (34%) of the 59 CC patients were offered PTSD pharmacotherapy; 10 (50%) of these 20 patients accepted and maintained their medication regimes.

INTERVENTION OUTCOMES

The random regression procedure showed a significant treatment group × time interaction effect for PTSD (**Table 2**). The intervention effect coincided with the initiation of evidence-based medication and psychotherapy interventions at 3 months (**Figure 2**). The significant treatment group × time interaction was due to treatment group differences in the adjusted rates of change in PTSD for the CC and UC groups. At 6 months, the CC and UC groups had trend level differences in rates of change from baseline (t_{118}=1.83; *P*=.07). The CC group had on average a 5.5% increase in the rate of PTSD (95% CI, 0.1%-10.8%), whereas the UC group had on average twice the rate of increase in the first 6 months (12.0%; 95% CI, 7.3%-16.7%). However, at 12 months, the differences in rates of PTSD from baseline were statistically different (t_{118}=2.40; *P*=.02), with the CC group showing no change in the rate of PTSD (a decrease of 0.07%; 95% CI,−4.2% to 4.3%) and the UC group showing on average a 6% increase in the rate of PTSD during the year (95% CI, 3.1%-9.3%).

A significant treatment group × time interaction effect was observed for CIDI-diagnosed alcohol abuse/dependence (Table 2). The intervention appears to have maintained reductions of alcohol consumption beyond 6 months (**Figure 3**). The significant treatment group × time interaction was due to treatment group differences in the adjusted rates of change in alcohol abuse/dependence for the CC and UC groups. At 6 months, the CC and UC groups had significantly different rates of change from baseline (t_{118}=3.37; *P*=.001). The CC group had on average a 20.4% decrease in the rate of alcohol abuse/dependence (95% CI, −14.3% to −26.5%), whereas the UC group had on average only a 7% decrease (95% CI, −2.8% to −12.2%). At 12 months, the differences in rates of alcohol abuse/dependence were also statistically different (t_{118}=11.53; *P*<.001), with the CC group showing on average a decrease in the rate of alcohol abuse/dependence of 24.2% during the year (95% CI, −19.9% to −28.6%) and the UC group showing on average a 12.9% increase in the rate of alcohol abuse/dependence during the year (95% CI, 8.2%-17.7%).

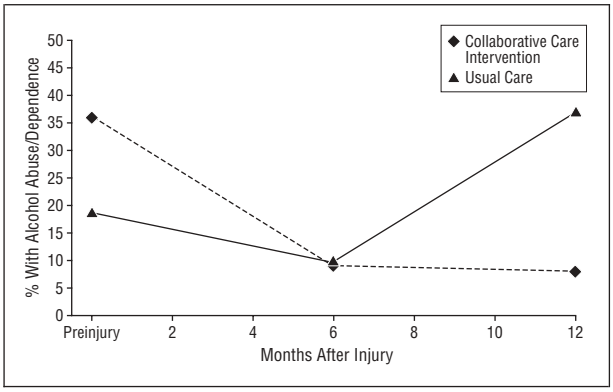

Figure 3. Percentage of patients who met *DSM-IV* criteria for alcohol abuse/dependence during the year after injury. Alcohol abuse/dependence was assessed with the Composite International Diagnostic Interview.[50] Percentages are adjusted for injury severity, sex, age, chronic illness, and baseline alcohol abuse/dependence (ie, abuse or dependence in the year before the injury). Preinjury assessment occurred during surgical ward interview (n=120). Follow-up rates were 86% at 6 months and 83% at 12 months.

COMMENT

This investigation establishes the feasibility of delivering a multifaceted CC intervention to acutely injured trauma survivors. We successfully recruited, intervened with, and followed up a representative sample of injured trauma survivors, some of whom had alcohol abuse/dependence and acute posttraumatic distress. Early case management intervention successfully engaged acutely traumatized patients, a population that in the past has demonstrated a reluctance to participate in ongoing mental health interventions.[76-78] The CC intervention differed from previous trials of debriefing in that early case management activities established an ongoing relationship with patients, who were later offered evidence-based treatment.

The investigation demonstrated that a stepped CC delivery model effectively reduces alcohol abuse/dependence during the year after injury. At 6 and 12 months after the injury, clinically and statistically significant reductions in alcohol use were apparent for patients who received the CC intervention.

For PTSD, CC patients demonstrated essentially no change in symptoms during the course of the year, whereas UC patients manifested a significant worsening of symptoms. Early evaluation and supportive intervention was not associated with reductions in PTSD for patients in the CC condition. Prevention of the development of PTSD in CC patients relative to UC patients coincided with the initiation of evidence-based PTSD medication and CBT treatments 3 months after injury.

There are a number of possible explanations for the CC intervention's relatively small PTSD treatment effect. The investigation was limited by an initial screening procedure that recruited some patients with minimal PTSD symptoms. Also, previous investigations of injured trauma survivors hospitalized at level I trauma centers in the United States suggest that this patient population experiences multiple recurrent traumatic life events, including a substantial burden of traumatic injuries requiring hospitalization, some of which follow an index injury admission.[4,9,26,79-81] Our investigation is limited in that we did not specifically assess PTSD in relation to these multiple prior and subsequent traumatic life events. It may be that the CC intervention buffers CC patients from the full symptomatic impact of recurrent traumatic life events, relative to UC patients. These preliminary observations will require more refined study in future investigations.

There are other important considerations in interpreting the results of this investigation. The design of this study builds on a series of effectiveness trials for depressive and anxiety disorders delivered in real-world treatment settings.[37-42,82] The trade-offs relevant to the effectiveness approach apply to the current investigation.[83] Because this was a multifaceted intervention, it did not yield information regarding which components of the treatment are efficacious. For instance, although PTSD prevention was temporally associated with the initiation of evidence-based treatments, we cannot rule out the possibility that continuing trauma support activities also contributed to the prevention of PTSD. Finally, as is typical of many effectiveness trials, we relied on symptom screens and lay interviews rather than clinician-administered diagnostic assessments.

CONCLUSIONS

This investigation contributes to a developing literature regarding early intervention for posttraumatic distress in acutely traumatized patients. A stepped CC intervention furthers the delivery of high-quality posttraumatic care by tailoring treatment needs to the individual trauma survivor while delivering evidence-based mental health interventions.[57] Collaborative care is a multifaceted disease management strategy into which future psychotherapeutic and pharmacological advances for the treatment of PTSD can be incorporated.[84,85] Future larger-scale CC trials should assess functional outcome improvements and the cost-effectiveness of the intervention.[86]

The September 11, 2001, attack on American civilians provides an additional impetus for the ongoing development of multifaceted acute care mental health screening and intervention procedures. Injured trauma survivors triaged through acute care in the immediate aftermath of a mass attack represent a high-risk subgroup of patients who are rapidly transported to central points of contact within the health care system.[87] Commentaries that have followed the September 11 attack suggest that the health care system in the United States should be better prepared for mass civilian trauma.[27,88] Future investigations that refine routine acute care evaluation and treatment procedures have the potential to improve the quality of mental health care for Americans injured in the wake of individual and mass trauma.

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REFERENCES

1. MacKenzie EJ, Hoyt DB, Sacra JC, Jurkovich GJ, Carlini AR, Teitelbaum SD, Teter H Jr. National inventory of hospital trauma centers. *JAMA.* 2003;289:1515-1522.
2. Centers for Disease Control and Prevention. Rapid assessment of injuries among survivors of the terrorist attack on the World Trade Center—New York City, September 2001. *MMWR Morb Mortal Wkly Rep.* 2002;51:1-5.
3. Bonnie RJ, Fulco CE, Liverman CT. *Reducing the Burden of Injury: Advancing Prevention and Treatment.* Washington, DC: National Academy Press; 1999.
4. Zatzick DF, Kang SM, Muller HG, Russo JE, Rivara FP, Katon W, Jurkovich GJ, Roy-Byrne P. Predicting posttraumatic distress in hospitalized trauma survivors with acute injuries. *Am J Psychiatry.* 2002;159:941-946.
5. Blanchard EB, Hickling EJ, Taylor AE, Loos W. Psychiatric morbidity associated with motor vehicle accidents. *J Nerv Ment Dis.* 1995;183:495-504.
6. 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.
7. Michaels AJ, Michaels CE, Moon CH, Smith JS, Zimmerman MA, Taheri PA, Peterson C. Posttraumatic stress disorder after injury: impact on general health outcome and early risk assessment. *J Trauma.* 1999;47:460-467.
8. Soderstrom CA, Smith GS, Dischinger PC, McDuff DR, Hebel JR, Gorelick DA, Kerns TJ, Ho SM, Read KM. Psychoactive substance use disorders among seriously injured trauma center patients. *JAMA.* 1997;277:1769-1774.
9. Rivara FP, Koepsell TD, Jurkovich GJ, Gurney JG, Soderberg R. The effects of alcohol abuse on readmission for trauma. *JAMA.* 1993;270:1962-1964.
10. Shalev AY, Bonne O, Eth S. Treatment of posttraumatic stress disorder: a review. *Psychosom Med.* 1996;58:165-182.
11. Solomon SD, Gerrity ET, Muff AM. Efficacy of treatments for posttraumatic stress disorder. *JAMA.* 1992;268:633-638.
12. Foa EB, Meadows EA. Psychosocial treatments for posttraumatic stress disorder: a critical review. *Annu Rev Psychol.* 1997;48:449-480.
13. Bryant RA, Harvey AG, Dang ST, Sackville T, Basten C. Treatment of acute stress disorder: a comparison of cognitive-behavioral therapy and supportive counseling. *J Consult Clin Psychol.* 1998;66:862-866.
14. Bryant RA, Moulds M, Guthrie R, Nixon RD. Treating acute stress disorder following mild traumatic brain injury. *Am J Psychiatry.* 2003;160:585-587.
15. Foa EB, Hearst-Ikeda D, Perry KJ. Evaluation of a brief cognitive-behavioral program for the prevention of chronic PTSD in recent assault victims. *J Consult Clin Psychol.* 1995;63:948-955.
16. Ehlers A, Clark D, Hackmann A, McManus F, Fennell M, Herbert C, Mayou R. A randomized controlled trial of cognitive therapy, a self-help booklet, and repeated assessments as early interventions for posttraumatic stress disorder. *Arch Gen Psychiatry.* 2003;60:1024-1032.
17. Brady K, Pearlstein T, Asnis GM, Baker D, Rothbaum B, Sikes CR, Farfel GM. Efficacy and safety of sertraline treatment of posttraumatic stress disorder: a randomized controlled trial. *JAMA.* 2000;283:1837-1844.
18. Hidalgo RB, Davidson JRT. Selective serotonin reuptake inhibitors in posttraumatic stress disorder. *J Psychopharmacol.* 2000;14:70-76.
19. Connor KM, Sutherland SM, Tupler LA, Malik ML, Davidson JR. Fluoxetine in post-traumatic stress disorder: randomised, double-blind study. *Br J Psychiatry.* 1999;175:17-22.
20. Davidson J, Pearlstein T, Londborg P, Brady KT, Rothbaum B, Bell J, Maddock R, Hegel MT, Farfel G. Efficacy of sertraline in preventing relapse of posttraumatic stress disorder: results of a 28-week double-blind, placebo-controlled study. *Am J Psychiatry.* 2001;158:1974-1981.
21. Marshall RD, Beebe KL, Oldham M, Zaninelli R. Efficacy and safety of paroxetine treatment for chronic PTSD: a fixed-dose, placebo-controlled study. *Am J Psychiatry.* 2001;158:1982-1988.
22. Project MATCH Research Group. Matching alcoholism treatments to client heterogeneity: Project MATCH posttreatment drinking outcomes. *J Stud Alcohol.* 1997;58:7-29.
23. Chick J, Lloyd G, Crombie E. Counseling problem drinkers in medical wards: a controlled study. *BMJ.* 1985;290:965-967.
24. Heather N, Rollnick S, Bell A, Richmond R. Effects of brief counselling among male heavy drinkers identified on general hospital wards. *Drug Alcohol Rev.* 1996; 15:29-38.
25. Miller WR, Sovereign RG, Krege B. Motivational interviewing with problem drinkers, II: the Drinker's Check-up as a preventive intervention. *Behav Psychother.* 1988;16:251-268.
26. Gentilello LM, Rivara FP, Donovan DM, Jurkovich GJ, Daranciang E, Dunn CW, Villaveces A, Copass M, Ries RR. Alcohol interventions in a trauma center as a means of reducing the risk of injury recurrence. *Ann Surg.* 1999;230:473-480.
27. National Institute of Mental Health. *Mental Health and Mass Violence: Evidence-Based Early Psychological Intervention for Victims/Survivors of Mass Violence: A Workshop to Reach Consensus on Best Practices.* Washington, DC: National Institute of Mental Health; 2002.
28. Satcher D. *Mental Health: A Report of the Surgeon General.* Rockville, Md: US Dept of Health and Human Services; 1999.
29. Chesnut RM, Carney N, Maynard H, Patterson P, Mann NC, Helfand M. *Rehabilitation for Traumatic Brain Injury.* Rockville, Md: Agency for Healthcare Policy and Research; 1999.
30. Horowitz L, Kassam-Adams N, Bergstein J. Mental health aspects of emergency medical services for children: summary of a consensus conference. *Acad Emerg Med.* 2001;8:1187-1196.
31. Bisson JI, Jenkins PL, Alexander J, Bannister C. Randomised controlled trial of psychological debriefing for victims of acute burn trauma. *Br J Psychiatry.* 1997; 171:78-81.
32. Hobbs M, Mayou R, Harrison B, Worlock P. A randomised controlled trial of psychological debriefing for victims of road traffic accidents. *BMJ.* 1996;313:1438-1439.
33. Rose S, Bisson J. Brief early psychological interventions following trauma: a systematic review of the literature. *J Trauma Stress.* 1998;11:697-710.
34. van Emmerik A, Kamphuis JH, Hulsbosch AM, Emmelkamp P. Single session debriefing after psychological trauma: a meta-analysis. *Lancet.* 2002;360:766-771.
35. Wagner EH, Austin BT, Von Korff M. Organizing care for patients with chronic illness. *Milbank Q.* 1996;74:511-543.
36. Von Korff MJG, Schaefer J, Curry SJ, Wagner EH. Collaborative management of chronic illness. *Ann Intern Med.* 1997;127:1097-1102.
37. Katon W, Von Korff M, Lin E, Simon G, Walker E, Unutzer J, Bush T, Russo J, Ludman E. Stepped collaborative care for primary care patients with persistent depression: a randomized trial. *Arch Gen Psychiatry.* 1999;56:1109-1115.
38. Katon W, Von Korff M, Lin E, Unutzer J, Simon G, Walker E, Ludman E, Bush T. Population-based care of depression: effective disease management strategies to decrease prevalence. *Gen Hosp Psychiatry.* 1997;19:169-178.
39. Katon W, Von Korff M, Lin E, Walker E, Simon GE, Bush TB, Robinson P, Russo J. Collaborative management to achieve treatment guidelines: impact on depression in primary care. *JAMA.* 1995;273:1026-1031.
40. Katon W, Rutter C, Ludman E, Von Korff M, Lin E, Simon G, Bush T, Walker E, Unutzer J. A randomized trial of relapse prevention of depression in primary care. *Arch Gen Psychiatry.* 2001;58:241-247.
41. Roy-Byrne P, Katon W, Cowley D, Russo J. A randomized effectiveness trial of collaborative care for patients with panic disorder in primary care. *Arch Gen Psychiatry.* 2001;58:869-876.
42. Wells KB, Sherbourne C, Schoenbaum M, Duan N, Meredith L, Unutzer J, Miranda J, Carney MF, Rubenstein LV. Impact of disseminating quality improvement programs for depression in managed primary care: a randomized controlled trial. *JAMA.* 2000;283:212-220.
43. Unutzer J, Katon W, Callahan CM, Williams JW Jr, Hunkeler E, Harpole L, Hoffing M, Della Penna RD, Noel PH, Lin EH, Arean PA, Hegel MT, Tang L, Belin TR, Oishi S, Langston C, IMPACT Investigators. Collaborative care management of late-life depression in the primary care setting: a randomized controlled trial. *JAMA.* 2002;288:2836-2845.
44. Teasdale G, Jennet B. Assessment of coma and impaired consciousness: a practical scale. *Lancet.* 1974;2:81-84.
45. Folstein MF, Folstein SE, McHugh PR. "Mini-Mental State": a practical method for grading the cognitive state of patients for the clinician. *J Psychiatr Res.* 1975; 12:189-198.
46. Weathers F, Ford J. *Measurement of Stress, Trauma and Adaptation: Psychometric Review of PTSD Checklist (PCL-C, PCL-S. PCL-M, PCL-PR).* Towson, Md: Sidran Press; 1996:250-261.
47. Radloff LS. The CES-D Scale: a self-report depression scale for research in the general population. *Appl Psychol Meas.* 1977;1:385-401.
48. Blanchard EB, Jones-Alexander J, Buckley TC, Forneris CA. Psychometric properties of the PTSD Checklist. *Behav Res Ther.* 1996;34:669-773.
49. Williams JW Jr, Pignone M, Ramirez G, Perez Stellato C. Identifying depression in primary care: a literature synthesis of case-finding instruments. *Gen Hosp Psychiatry.* 2002;24:225-237.

50. World Health Organization. *Composite International Diagnostic Interview (CIDI) Version 2.1.* Geneva, Switzerland: World Health Organization; 1997.
51. Wagner A. Cognitive-behavioral therapy for PTSD: applications to injured trauma survivors. *Semin Clin Neuropsychiatry.* 2003;8:175-187.
52. Dunn C. Brief motivational interviewing interventions targeting substance abuse in the acute care medical setting. *Semin Clin Neuropsychiatry.* 2003;8:188-196.
53. Zatzick DF, Roy-Byrne P. Psychopharmacological approaches to the management of posttraumatic stress disorders in the acute care medical sector. *Semin Clin Neuropsychiatry.* 2003;8:168-174.
54. Miranda J, Azocar F, Organista KC, Dwyer E, Areane P. Treatment of depression among impoverished primary care patients from ethnic minority groups. *Psychiatr Serv.* 2003;54:219-225.
55. Zatzick DF, Kang SM, Hinton WL, Kelly RH, Hilty DM, Franz CE, Le L, Kravitz RL. Posttraumatic concerns: a patient-centered approach to outcome assessment after traumatic physical injury. *Med Care.* 2001;39:327-339.
56. Zatzick DF, Roy-Byrne P, Russo J, Rivara FP, Koike A, Jurkovich GJ, Katon W. Collaborative interventions for physically injured trauma survivors: a pilot randomized effectiveness trial. *Gen Hosp Psychiatry.* 2001;23:114-123.
57. Committee on Quality of Health Care in America. *Crossing the Quality Chasm: A New Health System for the 21st Century.* Washington, DC: National Academy Press; 2001.
58. Gentilello LM, Donovan DM, Dunn CW, Rivara FP. Alcohol interventions in trauma centers: current practice and future directions. *JAMA.* 1995;274:1043-1048.
59. Johnston BD, Rivara FP, Droesh RM, Dunn C, Copass MK. Behavior change counseling in the emergency department to reduce injury risk: a randomized, controlled trial. *Pediatrics.* 2002;110:267-274.
60. First MB, Spitzer RL, Gibbon M, Williams JBW. *Structured Clinical Interview for* DSM-IV *Axis I Disorders–Clinician Version (SCID-CV).* Washington, DC: American Psychiatric Press; 1997.
61. Foa EB, Keane TM, Friedman MJ. *Effective Treatments for PTSD.* New York, NY: Guilford Publications; 2000.
62. Expert Consensus Panels for PTSD. The expert consensus guideline series: Treatment of Posttraumatic Stress Disorder. *J Clin Psychiatry.* 1999;60(suppl 16):3-76.
63. Zatzick D, Russo J, Katon W. Somatic, posttraumatic stress and depressive symptoms among injured patients treated in trauma surgery. *Psychosomatics.* 2003; 44:479-484.
64. Zatzick DF, Kang S, Kim S, Leigh P, Kravitz R, Drake C, Sue S, Wisner D. Patients with recognized psychiatric disorders in trauma surgery: incidence, inpatient length of stay, and cost. *J Trauma.* 2000;49:487-495.
65. Asmundson GJ, Frombach I, McQuaid J, Pedrelli P, Lenox R, Stein MB. Dimensionality of posttraumatic stress symptoms: a confirmatory factor analysis of *DSM-IV* symptom clusters and other symptom models. *Behav Res Ther.* 2000; 38:203-214.
66. Walker EA, Newman E, Dobie DJ, Ciechanowski P, Katon W. Validation of the PTSD Checklist in an HMO sample of women. *Gen Hosp Psychiatry.* 2002;24: 375-380.
67. Dobie DJ, Kivlahan DR, Maynard C, Bush KR, McFall M, Epler AJ, Bradley KA. Screening for post-traumatic stress disorder in female Veteran's Affairs patients: validation of the PTSD Checklist. *Gen Hosp Psychiatry.* 2002;24:367-374.
68. Walker E, Katon W, Russo J, Ciechanowski P, Newman E, Wagner A. Health care costs associated with posttraumatic stress disorder symptoms in women. *Arch Gen Psychiatry.* 2003;60:369-374.
69. American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition.* Washington, DC: American Psychiatric Association; 1994.
70. 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.
71. Johns Hopkins Health Services Research and Development Center. *Determining Injury Severity From Hospital Discharges: A Program to Map ICD-9-CM Diagnoses Into AIS and ISS Severity Scores.* Baltimore, Md: Johns Hopkins University Press; 1989.
72. Committee on Injury Scaling. *The Abbreviated Injury Scale, 1985 Revision.* Morton Grove, Ill: American Association for the Advancement of Automotive Medicine; 1985.
73. MacKenzie EJ, Morris JA, Edelstein SL. Effect of pre-existing disease on length of hospital stay in trauma patients. *J Trauma.* 1989;29:757-764.
74. Gibbons RD, Hedeker D, Elkin I, Waternaux C, Kraemer HC, Greenhouse JB, Shea MT, Imber SD, Sotsky SM, Watkins JT. Some conceptual and statistical issues in analysis of longitudinal psychiatric data. *Arch Gen Psychiatry.* 1993;50:739-750.
75. Ware JE, Kosinski M, Keller SD. A 12-item Short-Form Health Survey: construction of scales and preliminary tests of reliability and validity. *Med Care.* 1996; 34:220-223.
76. Weisaeth L. Acute posttraumatic stress: nonacceptance of early intervention. *J Clin Psychiatry.* 2001;62(suppl 17):35-40.
77. Pitman RK, Sanders KM, Zusman RM, Healy AR, Cheema F, Lasko NB, Cahill L, Orr SP. Pilot study of secondary prevention of posttraumatic stress disorder with propranolol. *Biol Psychiatry.* 2002;51:189-192.
78. Schwarz ED, Kowalski JM. Malignant memories: reluctance to utilize mental health services after a disaster. *J Nerv Ment Dis.* 1992;180:767-772.
79. Smith RS, Fry WR, Morabito DJ, Organ CHJ. Recidivism in an urban trauma center. *Arch Surg.* 1992;127:668-670.
80. Poole GV, Griswold JA, Thaggard VK, Rhodes RS. Trauma is a recurrent disease. *Surgery.* 1993;113:608-611.
81. Sims DW, Bivins BA, Obeid FN, Horst HM, Sorensen VJ, Fath JJ. Urban trauma: a chronic recurrent disease. *J Trauma.* 1989;29:940-947.
82. Unutzer J, Katon W, Williams JW, Callahan CM, Harpole L, Hunkeler EM, Hoffing M, Arean P, Hegel MT, Schoenbaum M, Oishi SM, Langston CA. Improving primary care for depression in late life: the design of a multicenter randomized trial. *Med Care.* 2001;39:785-799.
83. Wells KB. Treatment research at the crossroads: the scientific interface of clinical trials and effectiveness research. *Am J Psychiatry.* 1999;156:5-10.
84. Friedman MJ. Future pharmocotherapy for post-traumatic stress disorder: prevention and treatment. *Psychiatr Clin North Am.* 2002;25:427-441.
85. Ehlers A, Clark D. Early psychological interventions for adult survivors of trauma: a review. *Biol Psychiatry.* 2003;53:817-826.
86. Katon WJ, Roy-Byrne P, Russo J, Cowley D. Cost-effectiveness and cost offset of a collaborative care intervention for primary care patients with panic disorder. *Arch Gen Psychiatry.* 2002;59:1098-1104.
87. 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.* New York, NY: Cambridge University Press; 2003:189-205.
88. Ursano RJ. Post-traumatic stress disorder. *N Engl J Med.* 2002;346:130-132.