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The effect of early psychological symptom severity on long-term functional recovery: A secondary analysis of data from a cohort study of minor injury patients

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Abstract

Background—The mental health consequences of injuries can interfere with recovery to pre-injury levels of function and long term wellbeing.

Objectives—The purpose of this study was to explore the relationship between psychological symptoms after minor injury and long-term functional recovery and disability.

Design—This exploratory study uses secondary data derived from a longitudinal cohort study of psychological outcomes after minor injury.

Setting—Participants were recruited from the Emergency Department of an urban hospital in the United States.

Participants—A cohort of 275 patients was randomly selected from 1100 consecutive emergency department admissions for minor injury. Potential participants were identified as having sustained minor injury by the combination of three standard criteria including: presentation to the emergency department for medical care within 24 hours of a physical injury, evidence of anatomical injury defined as minor by an injury severity score between 2 and 8 and normal physiology as defined by a triage-Revised Trauma Score of 12. Patients with central nervous system injuries, injury requiring medical care in the past 2 years and/or resulting from domestic violence, and those diagnosed with major depression or psychotic disorders were excluded.

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Methods—Psychological symptom severity was assessed within 2 weeks of injury, and outcome measures for functional limitations and disability were collected at 3, 6 and 12 months. A quasi-least squares approach was used to examine the relationship between psychological symptom scores at intake and work performance and requirement for bed rest in the year after injury.

Results—Adjusting for demographic and injury covariates, depression symptoms at the time of injury significantly predicted ($p \leq 0.05$) both poorer work performance and increased number of days in bed due to health in the year after injury. Anxiety symptoms significantly predicted ($p \leq 0.05$) bed days at 3, 6, and 12 months and work performance at 3 months.

Conclusions—Depression and anxiety soon after minor injury may help predict important markers of long-term recovery. With further research, simple assessment tools for psychological symptoms may be useful to screen for patients who are at higher risk for poor long-term recoveries and who may benefit from targeted interventions.

Keywords

Injuries; Depressive symptoms; Anxiety; Recovery of function

Introduction

Nurses across multiple healthcare settings including emergency departments, acute care units, and rehabilitation facilities are at the forefront of the care for injured people. Often the attention given to the health consequences of injury is not commensurate with how common, resource-intensive, and dangerous injury is for the health and wellbeing of individuals. Injuries cause over 10% of worldwide mortality and accounts for more deaths each year than malaria, tuberculosis and HIV/AIDS combined (World Health Organization (WHO), 2010). Mortality is only one dimension of the public health consequence of injury. Millions of people survive injuries and require costly hospitalization, emergency care, and other forms of treatment for disability and limitations in daily function (World Health Organization (WHO), 2010). The medical costs incurred during acute hospitalization and rehabilitation are only a small fraction of the total cost of injury to society. The physical and psychological limitations that impede an injured person's daily economic and social wellbeing and hinder recovery to pre-injury levels of function are the less visible and potentially most significant costs of injury (Corso, Finkelstein, Miller, Fiebelkorn, & Zaloshnja, 2006; Leigh, 2011).

Most research focuses on severe injuries because they are associated with the highest risk for mortality and long-term disability. Minor injuries, however, are far more common, accounting for the vast majority of injuries treated at healthcare institutions each year (Centers for Disease Control and Prevention, 2013). If the burden of injury were illustrated as a pyramid, the peak of the pyramid would represent fatalities, the center of the pyramid as hospitalizations, and the wide base of the pyramid as emergency department visits for minor injuries (from both intentional and unintentional causes) where evaluation, treatment, and discharge occur within a relatively short period of time (Sahai, Ward, Zmijowskyj, & Rowe, 2005; Wadman, Muelleman, Coto, & Kellermann, 2003). Minor injuries contribute to 37.3% of disability adjusted life years, exceeding the contribution of serious injuries (33.3%) and fatalities (29.6%) (Polinder, Haagsma, Toet, & Van Beeck, 2012). The high volume of minor

injury combined with the associated medical costs, loss of work and income, and psychological effects raises minor injury to a public health problem of considerable consequence.

The severity of physical injury has limited influence on long-term disability following non-central nervous system injury (Holbrook, Anderson, Sieber, Browner, & Hoyt, 1999; Richmond, Kauder, Hinkle, & Shults, 2003). Residual impairments after injury (e.g., limited range of motion, pain, weakness), together with age and gender account for only a small percentage (12%) of the variance in work-related disability (MacKenzie et al., 1993). Given that injury severity and residual physical impairments insufficiently explain the presence of and variation in post-injury disability, it is essential to examine other factors.

For patients with severe injuries (without central nervous system involvement or burns >20% of body surface area), post-traumatic stress symptoms and psychological distress have been shown to impact health-related quality of life in the year after hospital discharge. (Aitken, L. M., Chaboyer, W., Schedutz, M., Joyce, C., Macfarlane, B., 2012) In a cohort of patients with mixed levels of injury severity (without serious head injuries or self-inflicted injuries), factors that predicted successful return to pre-injury work status a year after injury were low injury severity, absence of head injury, low levels of depressive symptom severity and an optimistic life orientation (Toien, Skogstad, Ekeberg, Myhren, & Schou Bredal, 2012). The severity of psychological symptoms in the weeks immediately after a minor injury has not been examined in relation to long-term recovery.

The purpose of this study is to describe the relationship between psychological symptom severity soon after minor injury and variations in outcomes in the post-injury year. If this relationship is better understood, nurses and other health care providers would be able to focus on those patients who may be at higher risk for excess challenges in recovery. When recovery is incomplete, individuals become functionally impaired and unable to carry out the activities that fulfill their multiple life roles (Verbrugge & Jette, 1994). We understand long-term disablement as the end consequence of a pathway that includes pathology, impairment, functional limitations, and disability. With these factors in mind, functional limitations can progress to disability, which is broadly defined as persistent difficulty in the activities that are typically performed by adults in society. Therefore, in this study, we examine two components of recovery: functional limitations (number of days spent in bed due to health) and disability (ability to return to work) and how each is predicted by the severity of acute psychological symptoms measured shortly after injury.

Our team has already demonstrated that patients meeting diagnostic criteria (using DSM IV-TR) for depression and post-traumatic stress disorder do not return to pre-injury levels of function in the year after injury (BLINDED). Yet emergency department clinicians lack the time and expertise to perform comprehensive diagnostic evaluation for depression and other psychiatric illnesses and to our knowledge the utility of psychological symptom severity to screen for patients at high risk for poorer recoveries has not been explored in the minor injured population. Thus, in this secondary analysis we seek to assess whether acute psychological symptom severity that can be measured using brief validated instruments can predict poorer outcomes in patients with minor injuries in the post-injury year. Specifically,

we hypothesize that individuals with higher symptom severity for depression and anxiety shortly after injury will have poorer work performance and will spend more days in bed for health reasons in the year post-injury than individuals with lower symptom severity.

Materials and Methods

Study Design

We performed a secondary analysis of an existing data set to examine the relationship between psychological symptom severity soon after injury and long-term recovery. The data set was derived from a longitudinal cohort study that examined the effect of post-injury major depression diagnosis on return to pre-injury levels of function. Psychological symptom severity measures were collected at intake, 3, 6 and 12 months. Outcome measures that included work performance and days spent in bed for health reasons were collected at 3, 6, and 12 months. The parent study and this secondary analysis were both approved by the Institutional Review Board of the University of (BLINDED).

Target Population and Sampling

Parent Study—A cohort was randomly drawn from all patients (n=1110) presenting to an urban emergency department in the United States between October 2002 and March 2007 for treatment of minor injury. Potential participants were identified as having sustained minor injury by the combination of three standard criteria (Kilgo, Meredith, & Osler, 2006). These criteria included: presentation to the emergency department for medical care within 24 hours of a physical injury, evidence of anatomical injury defined as ‘minor’ by an injury severity score between 2 and 8 (Baker & O’Neill, 1976) and normal physiology as defined by a triage-Revised Trauma Score of 12 (Champion et al., 1989). The Injury Severity Score is a widely used standard medical score based on the extent of anatomic injury. A single score between 0 and 75 is generated for injuries across body systems and a higher score represents more severe injury (Baker & O’Neill, 1976). The triage-Revised Trauma Score of 12 represents normal physiology after injury as assessed by systolic blood pressure, respiratory rate, and Glasgow Coma Scale (Champion et al., 1989). Patients were excluded for central nervous system injuries (defined as head or spinal cord injury), traumatic injury requiring medical care in the past 2 years, and injury due to a concurrent medical illness (e.g. pathological fracture) or domestic violence. Patients who were being treated for major depression or any Axis I psychotic disorder at the time of injury or who met criteria at the intake psychiatric interview were excluded.

All study participants provided informed consent. The sample from the parent study has been previously described (BLINDED). Of the eligible 1110 injured patients, 944 consented to inclusion from which 368 were randomly selected to enter the study. During recruitment follow-up 93 refused participation and an additional 3 were excluded for diagnosis of major depression or schizophrenia yielding a study cohort of 275. With a sample size of 250 participants, the parent study was powered at 80% to detect a difference at an effect size of 0.44 standard deviations between those who met diagnostic criteria for major depression and those who did not with 95% confidence. Data on pre-injury function, including work status was obtained when the patient was medically stable. Psychological symptom severity was

collected during an intake interview within approximately one week of the injury. The intake interview and the 3, 6, 12-month follow-up interviews were conducted in person at a research office or at participants' homes.

Current Study—This secondary study is an exploratory inquiry to examine the role of the severity of psychological symptoms, irrespective of diagnoses, on long term outcomes after minor injury. All participants of the parent study cohort (n=275) were included. From the parent study's full de-identified dataset we extracted data for each cohort member on demographic and injury characteristics at intake, and psychological symptom severity, work status scores, and days spent in bed due to health from baseline, 3 months, 6 months and 12 months after injury.

Variables and Instruments

As the primary predictor variables, psychological symptom severity was measured by the Hamilton Depression Rating Scale (HAM-D) and the Hamilton Anxiety Rating Scale (HAM-A) at baseline. These variables were also measured at all follow up points: 3, 6 and 12 months after injury. The HAM-D is a publically available, well-validated 17-item, clinician-rated instrument that is used to assess depressive symptoms from any psychiatric or non-psychiatric cause; a score of 0 to 13 indicates no to mild symptoms and 14 or greater indicates severe symptoms (Hamilton, 1960). The HAM-D has demonstrated reliability across different racial and ethnic groups (Akpaffiong, 1999) albeit with variations in certain symptoms (Wohi, Lesser, & Smith, 1997). The HAM-A is a publically available, well-validated 21-item, clinician-rated scale used to measure anxiety symptoms; a score of 0 to 17 indicates no to mild symptoms and 18 or greater indicates severe symptoms (Hamilton, 1959). Both instruments together take about 15 minutes to complete. Instruments were administered according to the structured interview guide developed by Williams (1988), but modified to retain the original order of items.

Work performance and requirement for bed rest were selected as primary outcome variables to examine the impact of psychological symptoms on an injured individual's functional recovery. These variables were obtained for analysis from the work performance sub-scale and bed-day items of the Functional Status Questionnaire (FSQ). The FSQ is a widely used self-report instrument that assesses key dimensions of functional status. The work performance subscale in the FSQ operationalizes both employment status (whether a participant is working or not) and the social/role function among employed individuals. The social/role items ask the respondent to qualify any changes in the type or quantity of work they perform as a result of their health in comparison to others in similar jobs over their past month of employment. The 6 item work performance subscale has demonstrated reliability and validity across diseases and in patient populations of diverse backgrounds (Cleary & Jette, 2000). This subscale of the FSQ is transformed to a standardized score from 0 to 100, with 100 indicating optimal work performance. Requirement for bed rest was collected as a single item in the FSQ defined as the number of days the person spent more than one-half day in bed due to health, when recalling the previous 30 days (month). Bed days are a standard measure of days of lost productivity with established validity and reliability across a variety of ambulatory patient populations (Verbrugge, 1995; Yassin, 2007).

Variables collected in the parent study with theoretical and clinical potential to act as confounders and effect modifiers in the current study were included in multivariate models. These included time since injury (3, 6, and 12 month follow-up), age, gender, race, income, marital status, and injury severity score.

Data Analysis

In the course of the parent study, t-tests, analysis of variance, chi-square and Fisher's exact tests were used to compare participants who completed the study and those who were lost to follow-up. All analyses for the current study were conducted in SPSS 20.0 and STATA 13.0 with two-sided tests of hypotheses and a p-value < 0.05 as the criterion for statistical significance. First, symptom severity for depression and anxiety were described using means, medians, and standard deviations. Second, the association between intake HAM-A and HAM-D scores and number of work performance and bed days at each follow-up was assessed using Spearman correlations. To test the strength of these associations, quasi-least squares (QLS) (Shults & Hilbe, 2014) were used to fit regression models with the outcomes of work performance and bed days in separate models. The QLS approach is a method in the framework of generalized estimating equations (GEE). Like GEE, QLS fits separate models for the marginal means (i.e. expected work performance and bed days) and pattern of association amongst the repeated measurements on each participant. QLS thereby adjusts for the correlation between the repeated work performance (and number of bed days) measurements for each participant. We fit QLS using the xtqls command in STATA 13.0 (Shults, Ratcliffe, & Leonard, 2007) that allows for implementation of a Markov correlation structure that is appropriate for unequally spaced measurements. This structure also allows inclusion of participants who had intermittently missing values (i.e. if they were unavailable at the second follow-up but returned for the third follow-up).

Successively complex models were developed. First, bivariable models were fit to regress the outcomes (work performance or bed days) on intake symptom severity scores to assess the correlation between intake depression (or anxiety) and outcomes without adjusting for time or additional variables. The model was then adjusted to include covariates for: age, gender, years of education, ISS, income level, marital status and race, to determine if the relationship between outcome and intake depression (or anxiety) persisted after adjustment for demographic and injury characteristics. Indicator variables were created to permit for the inclusion of categorical variables in the multivariable models. For income level, income levels below $20,000, between $20,000 and $40,000, and between $40,000 and $60,000, respectively, were compared to income above $60,000 (the reference category). Marital status compared married participants to non-married participants (reference category). Race compared those who claimed Black racial identity with those who claimed a non-Black racial identity (reference category).

The final models included indicator variables for visits at 3, 6, and 12 months, so that intake was the reference category. In addition, interactions of follow-up visit and intake anxiety and depression (constructed by taking the product of intake psychological symptoms and each indicator variable for visit) were added to the previous models. This allowed for assessment of time by intake depression (or anxiety) interactions. Significant interactions would indicate

that the association between depression (or anxiety) at intake and outcomes depends on the time of measurement (follow-up visit).

Results

Sample Characteristics

Sample characteristics are described in Table 1. Follow-up data through the 12 month follow-up visit were obtained from 248 (90%) of the original sample of 275. Individuals lost to follow-up were more likely ($p<.05$) to be male, injured via motor vehicle crash, have a less severe injury, and have a mean of 1.5 years less education than those who completed the study. Data on the burden of psychological symptoms, work performance score and bed days are summarized in Table 2. As the predictor variable of interest, over 90% (91.6%, n=252) of participants reported no to mild symptom severity for depression and 8.4% (n=23) reported moderate to severe symptom severity for depression at intake as assessed by the HAM-D scale. Approximately 90% (89.9% n=247) reported no to mild symptom severity for anxiety at intake, as assessed by the HAM-A scale and 10.2% (n=28), of participants reported moderate to severe symptom severity for anxiety.

There was substantial variation in the outcome variables of interest in the year after injury. Most participants (n=192) were employed at the time of injury. The extent of employment and respective work performance changed in the year after injury; 124 participants were working at 3 months after injury, 133 participants were working at 6 months after injury and 145 participants were working at 12 months after injury. Participants reported an average 0.7 days (SD=2.0 days) of required bed rest in the month previous to injury. At 3 months, 240 participants reported an average of 0.8 (SD=2.8) bed days. At 6 months, 232 participants reported an average of 1.0 (SD=3.2) bed days. At 12 months, 235 participants reported an average of 1.6 (SD=6.4) bed days.

Bivariate and Multivariable Models

The analytic goal was to test the hypothesis that depression and anxiety symptom severity soon after injury is associated with and predicts work performance and bed days in the year after injury. Correlation models demonstrate statistically significant moderate associations between depression and anxiety symptoms at intake, and work performance and bed days at all follow-up visits in the post-injury year with the exception of anxiety symptoms and bed days at 12 months (Table 3). As is shown in Table 4, unadjusted quasi-least square regression models demonstrate statistically significant associations between the psychological symptom burden of depression and anxiety at the time of injury and work performance scores and bed days in the year after injury.

To examine the strength of these associations, successive models adjusted for potential confounders, change over time (3, 6, and 12 month follow-up) and effect modifiers (the interaction between time and intake symptoms). We generated separate models for HAM-D and HAM-A scores at injury on outcome variables, potential confounders and effect modifiers to reduce multicollnearity. HAM-D and HAM-A at intake and all follow up time points are highly correlated ($R>0.79$).

Significant interaction between time and intake symptom severity suggests that the influence of intake symptom severity on work performance or requirement for bed rest changes over time. Tables 5 and 6 describe the final adjusted models. Adjusted models demonstrate significant interactions for HAM-D at injury and work score at all follow up time points, and HAM-A at injury and work performance at 3 the month follow up. Interactions between intake symptoms and time of follow up were not significant for HAM-D or HAM-A scores at intake and bed days at any time point.

The models for the predictive value of depression symptoms on work performance and bed days are shown in Table 5. To interpret the association of depression symptoms on work performance based on the time of follow up, we added the significant interaction terms for HAM-D at intake by time (3, 6, 12 months) to the HAM-D coefficient at intake. We interpret that every additional point in a HAM-D score at intake predicts a 2.10 point decrease in work performance score (0.59 + −2.69) at 3 months. Similarly, each point increase in HAM-D score at intake predicts a decrease in work performance score by 1.21 points at 6 months and 0.99 points at 12 months. In this model, 3 month and 6 month time since injury, younger age, more years of education and an income of above $20,000 year are also significantly associated with work performance score in the year after injury.

Depression symptoms at intake also predict bed days across the post-injury year, and the impact of intake depression symptoms is not influenced by the time of follow-up. For each additional point in HAM-D score at intake there is an increase of 0.17 bed days. In this model, 3, 6, and 12 month time since injury are the only covariates that are significantly associated with increased bed days in the year after injury.

The models for the predictive value of anxiety symptoms on work performance and bed days are presented in Table 6. For work performance in the year after injury, the adjusted model only includes a significant interaction between HAM-A scores at intake and the earliest (3 month) follow up. This model demonstrates that a point increase in HAM-A score at intake predicts a 1.23 point (0.34 + −1.57) reduction in work performance score at 3 months. In this model, 3, 6, and 12 month time since injury, younger age, more years of education and an income of above $20,000 year are significantly associated with a higher work performance score in the year after injury.

Severity of anxiety symptoms at intake predicts bed days the year after injury. Each point increase in the HAM-A score at intake, predicts a relatively small (0.08) increase in bed days in the year following injury. In this model, the only other covariate that predicts bed days is the follow-up time (3 months) closest to the injury event.

Discussion

Minor injuries have only been recognized as a public health issue of consequence in recent years and the evidence to support our understanding of the complex relationships between injury and psychological vulnerability in this population is in its early emergence. The findings of this study suggest that the severity of depression and anxiety symptoms measured soon after a minor injury may predict two important markers of recovery: self-

assessed work performance and number of days spent in bed for health reasons in the post-injury year. The relationship between psychological symptoms and functional recovery in the year after injury appears concordant with what is known about psychological distress and long-term outcomes in severely injured individuals. Psychological symptoms of anxiety and depression predict long-term functional status and recovery in severely injured patients (Vles et al., 2005; O'Donnell et al., 2009). At a year after a severe traumatic injury, for example, approximately one-quarter of all survivors do not return to work and many report persistent difficulties with mobility, daily activities, pain, anxiety and depression, and cognitive function (Vles et al., 2005). Psychological comorbidity, in particular, can have negative effects on long-term post-injury recovery (Kempen, Sanderman, Scaf-Klomp, & Ormel, 2003; Rapoport, Kiss, & Feinstein, 2006; Richmond et al., 2009). In fact, the severity of post-traumatic psychological distress more profoundly and directly affects post-injury disability than the severity of physical injury (Holbrook et al., 1999). The current analysis demonstrates not only that the severity of depression and anxiety symptoms after injury predict poorer work performance and days spent in bed due to health- it does so long after the physical manifestations of injury have resolved.

While we know that psychiatric diagnoses like major depression worsen functional recovery in the year after injury (BLINDED), the diagnostic process requires extensive clinical interviews and it is likely that many more people will have high burden of psychological symptoms for depression and anxiety after injury than would meet diagnostic criteria. We also know that after minor injury, early psychological symptom severity predicts subsequent psychological diagnoses (Mason, Turpin, Woods, Wardrope, & Rowlands, 2006). Screening for psychological symptom severity soon after injury may simultaneously help identify patients who are at higher risk for poor functional recovery as well as those more likely to develop debilitating psychological illnesses.

With future research we hope to learn the predictive utility and ideal structure for screening patients with minor injuries for symptoms of depression and anxiety. Screening for psychological symptoms after severe injuries has been shown to be a feasible and acceptable practice which can be used to inform the allocation of scarce mental health resources (Russon, Katon, & Zatzick, 2013), even in the dyads of young patients and their parents in a the context of a pediatric trauma center (Winston, Kassam-Adams, Garcia-Espana, Ittenbach, & Cnaan, 2003). Though not specific to psychological symptoms, post-injury screening for physical and emotional needs has been effectively implemented via nurse-delivered telephone follow-up (Franzen, Bjornstig, Brulin, & Lindholm, 2009). This or similar approaches might offer an appropriate mechanism for identification of patient symptoms immediately following emergency department care which then may provide avenues of referral to primary care or entrée to evidence-based stepped care interventions (O'Donell et al., 2012; Zatzick et al., 2013).

Limitations

The findings of this study should be interpreted with three major limitations in mind. First, this study is a secondary data analysis and thus, cohort inclusion criteria, predictive and outcome variables, and follow-up time frames, are limited to that which was determined to

suit the needs of the parent study. Second, we are limited to the follow-up measures that were collected by the parent study. There are outcome variables of importance to patients and providers other than work performance and requirement for bed rest. In addition, variables that require retrospective evaluation of outcomes like bed rest over the previous month may be affected by recall bias and other subjectivities. However, given the available data, work performance and days in bed due to health were deemed to be outcomes with significant social and economic ramifications to patients and their families. Finally, the study uses data that were collected several years prior to analysis. Given the relative stability of both clinical approaches to the care of patients with minor injuries and the socio-demographic and injury characteristics of the United States' emergency department population relative to the study population (National Center for Health Statistics, 2014), it is likely that time effects do not exert undue influence on the exploratory value of study findings.

Clinical Application

Nurses who work in acute and outpatient settings are essential to the identification and management of injured patients who have excess and persistent psychological symptoms that can influence their recovery. With further research that confirms the findings of this exploratory study and demonstrates the pathway through which psychological symptoms challenge functional recovery, screening for psychological symptom severity may be a simple, feasible, and cost-effective intervention to link high risk patients with resources and services. Patients can be assessed using short standardized and reliable questionnaires such as the HAM-D and HAM-A in the emergency department, at early follow-up clinic visits or through telephone/remote screening. Instruments such as the HAM-D and HAM-A are available for public use, require minimal training to appropriately administer, and take approximately 15 minutes to complete. There is a panoply of other short symptom severity measures (Beck Depression and Anxiety Inventories, Patient Health Questionnaire 9) that could be tested and applied in this setting as well. Enhanced screening may promote early referral to psychological care professionals and increase participation in evidence based programs that treat psychological sequelae in injured people (Bisson, Shepherd, Joy, Probert, & Newcombe, 2003; O'Donell et al., 2012; Zatzick et al., 2013). The emergency department may not be the ideal clinical space to manage psychological symptoms but it presents an important setting for identifying patients at risk and referral, particularly for injured patients who are not frequent users of the primary healthcare system.

Conclusion

The finding of this exploratory study suggests that the burden of psychological symptoms soon after an injury may predict how well minor injured patients recover their pre-injury function and role performance in the year after their injuries. Future research should focus on understanding the pathways through which psychological symptoms influence long-term recovery processes in the minor injury population. The predictive value of psychological symptoms at the time of an emergency department visit may also extend to the recovery experiences of patients with other illnesses. This too warrants further study. With enhanced evidence, health care systems may be able to systematically integrate short assessments that

will determine which patients presenting to the emergency department for treatment have psychological symptom severity that place them at higher risk for poorer long term recovery.

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Contribution of the paper

What is already known about the topic?

- The severity of traumatic injury and residual physical impairments explain only a small proportion of the presence of and variation in long-term post-injury disability.
- Mental health diagnoses such as posttraumatic stress disorder and major depression that are concomitant to minor and major injury predict poorer long-term functional recovery and quality of life in injured patients.

What this paper adds

- This secondary analysis of longitudinal data from a cohort of minor injured patients demonstrates that severity of psychological symptoms for depression and anxiety at the time of injury predicts two important markers of long-term recovery: self-assessed work performance and the number of health-related days of bed rest in the post-injury year.
- Nurses and other clinicians caring for injured patients in the emergency or primary care setting, who lack the time and expertise to administer mental health diagnostic exams, can use short standardized psychological symptomatology assessments to screen for patients at highest risk for suboptimal recovery.

Table 1

Demographic and injury characteristics of cohort at time of injury (n=275)

Age (years), mean [SD]	**40.4 (16.8)**
Gender, % (n)	
Male	52% (142)
Female	48% (133)
Marital Status, % (n)	
Single	55% (151)
Married	25% (69)
Divorced/Separated	15% (41)
Widowed	5% (14)
Race, % (n)	
Black	57% (157)
White	40% (109)
Asian	3% (9)
Employment Status, % (n)	
Employed	70% (192)
Unemployed	6% (17)
Retired/Disabled	12% (32)
Home worker/Student	13% (34)
Education (years), mean [SD]	13.7 (2.6)
Income, % (n)	
Under $20,000	27% (76)
$20,000–39,000	25% (69)
$40,000–59,000	14% (38)
Over $60,000	20% (54)
Undisclosed	14% (38)
Injury Severity Score, mean [SD]	4.07(1.03)
Mechanism of Injury, % (n)	
Fall	49%(135)
Auto/Pedestrian/Bike Collision	27%(74)
Sport Accident	10%(27)
Assault	9%(25)
Other	5%(14)

Table 2

Psychological Symptoms, Work Performance, and Bed days in the year after injury

	Baseline Mean (SD)	3 Months Mean (SD)	6 Months Mean (SD)	12 Months Mean (SD)
Hamilton Depression Rating Scale Score	6.96 (4.57)	5.36 (4.92)	4.71 (5.04)	5.05 (5.38)
Hamilton Anxiety Rating Scale Score	8.32 (6.10)	6.34 (6.35)	5.73 (6.47)	5.63 (6.15)
FSQ Work Score	93.84 (10.70)	44.81 (44.63)	70.31 (40.16)	74.69 (38.51)
Bed days in prior month	0.66 (2.02)	0.81 (2.75)	0.97 (3.18)	1.61 (6.39)

FSQ Work Score = Functional Status Questionnaire Work Subscale Score standardized from 0–100, 100= optimal work performance; Hamilton Depression Rating Scale Score ranges from 0–54, 0–13= no to mild symptoms and ≥14= moderate to severe symptoms; Hamilton Anxiety Rating Scale Score ranges from 0–56, 0–17= no to mild symptoms and ≥18= moderate to severe symptoms

Table 3

Spearman correlation for work scores and bed days by psychological symptom burden

	HAM-D at injury	p-value	HAM-A at injury	p-value
FSQ Work Score intake	−0.14	0.422	−0.31	0.001
FSQ Work Score 3 months	−0.24	0.000	−0.17	0.001
FSQ Work Score 6 months	−0.24	0.000	−0.16	0.001
FSQ Work Score 12 months	−0.17	0.000	−0.12	0.495
Bed Days intake	0.30	0.000	0.26	0.000
Bed Days 3 months	0.21	0.000	0.18	0.000
Bed Days 6 months	0.18	0.000	0.18	0.000
Bed Days 12 months	0.22	0.000	0.20	0.000

FSQ Work Score = Functional Status Questionnaire Work Subscale Score; HAM-D= Hamilton Depression Rating Scale; HAM-A = Hamilton Anxiety Rating Scale

Table 4

Unadjusted QLS Bivariate relationships between psychological symptoms at intake on work performance and bed rest in the year after injury

	FSQ Work Score				Bed Days			
	B	**SE**	**95% CI**	**p-value**	***B***	**SE**	**95% CI**	**p-value**
HAM-D at injury	−1.20	0.38	−1.95 – −0.45	0.002	0.23	0.05	0.13 – 0.33	0.000
HAM-A at injury	−0.60	0.30	−1.19 – −0.01	0.045	0.11	0.26	0.06 – 0.17	0.000

FSQ Work Score = Functional Status Questionnaire Work Subscale Score standardized from 0–100, 100= optimal work performance; Hamilton Depression Rating Scale Score ranges from 0–54, 0–13= no to mild symptoms and ≥14= moderate to severe symptoms; Hamilton Anxiety Rating Scale Score ranges from 0–56, 0–17= no to mild symptoms and ≥18= moderate to severe symptoms

Table 5

Adjusted QLS models for severity of depression symptoms and covariates at intake on work performance and bed rest in the year after injury

	FSQ Work Score			Bed Days		
	B	**95% CI**	**p-value**	***B***	**95% CI**	**p-value**
HAM-D at injury	0.59	0.09 – 1.08	0.021	0.17	.084 – 0.245	0.000
3 months after injury	−24.76	−33.77 – −15.75	0.000	−1.37	−2.20 – −0.55	0.001
6 months after injury	−11.26	−21.65 – −0.86	0.034	−1.81	−2.87 – −0.75	0.001
12 month after injury	−7.70	−18.29 – 2.89	0.154	−1.87	−2.92 - −0.82	0.000
Interaction between:						
HAM-D at injury* 3 months	−2.69	−3.69 – −1.68	0.000	−0.56	−0.17 – 0.06	0.349
HAM-D at injury* 6 months	−1.80	−3.03 – −0.58	0.004	0.14	−0.09 – 0.37	0.232
HAM-D at injury* 12 months	−1.58	−2.83 – −0.34	0.012	0.14	−0.08 – 0.37	0.216
Age	−0.49	−0.70 – −0.27	0.000	0.01	−0.01 – 0.03	0.289
Years of education	2.18	0.98 – 3.39	0.000	−0.01	−0.17 – 0.15	0.923
Injury Severity Score	−1.02	−3.39 – 1.36	0.401	0.05	−0.32 – 0.43	0.783
Income						
More than $60,00	ref			ref		
Less than $20,000	−23.35	−32.58 – −14.13	0.000	0.02	−1.18 – 1.23	0.969
$20,000 – $40,000	−8.29	−17.37 – 0.78	0.073	−0.48	−1.48 – 0.53	0.351
$40,000 – $60,000	−0.84	−9.36 – 7.69	0.847	0.17	−1.65 – 1.99	0.854
Race						
Non-Black	ref			ref		
Black	−4.02	−10.67 – 2.63		0.06	0.86 – 0.98	0.902
Gender						

	FSQ Work Score			Bed Days		
	B	**95% CI**	**p-value**	***B***	**95% CI**	**p-value**
Male	ref			ref		
Female	2.53	−3.44 – 8.50	0.406	0.56	−0.20 – 1.33	0.150
Marital status						
Unmarried	ref					
Married	6.14	−0.84 – 13.11	0.085	−0.03	−1.21 – 1.27	0.966

FSQ Work Score = Functional Status Questionnaire Work Subscale Score standardized from 0–100, 100= optimal work performance; Hamilton Depression Rating Scale Score ranges from 0–54, 0–13= no to mild symptoms and ≥14= moderate to severe symptoms; Hamilton Anxiety Rating Scale Score ranges from 0–56, 0–17= no to mild symptoms and ≥18= moderate to severe symptoms

Table 6

Adjusted QLS models for severity of anxiety symptoms and covariates at intake on work performance and bed rest in the year after injury

	FSQ Work Score			Bed Days		
	B	**95% CI**	**p-value**	***B***	**95% CI**	**p-value**
HAM-A at injury	0.34	−0.04 – 0.72	0.079	0.08	0.02– 0.14	0.006
3 months after injury	−30.35	−39.46 – −21.24	0.000	−1.70	−2.49 – −0.92	0.000
6 months after injury	−16.38	−26.63 – −6.12	0.002	−1.24	−2.31 – −0.17	0.024
12 month after injury	−11.64	−22.06 – −1.22	0.029	−1.29	−2.36 – −0.23	0.017
Interaction between:						
HAM-A at injury* 3 months	−1.57	−2.39– −0.74	0.000	−0.01	−0.09 – 0.08	0.878
HAM-A at injury* 6 months	−0.88	−1.86 – 0.09	0.076	0.05	−0.60 – 0.15	0.395
HAM-A at injury* 12 months	−0.84	−1.84 – 0.16	0.100	0.05	−0.06 – 0.15	0.363
Age	−0.48	−0.70 – −0.27	0.000	0.01	−0.13 – 0.03	0.398
Years of education	2.30	1.08 – 3.53	0.000	−0.4	−0.22 – 0.13	0.642
Injury Severity Score	−1.08	−3.50– 1.34	0.381	0.07	−0.33 – 0.47	0.721
Income						
More than $60,00	ref			ref		
Less than $20,000	−23.36	−32.62 – −14.10	0.000	−0.12	−1.27 – 1.21	0.984
$20,000 – $40,000	−8.49	−17.57 – 0.58	0.067	−0.43	−1.43 – 0.58	0.405
$40,000 – $60,000	−0.57	−8.99 – 7.85	0.895	−0.11	−1.74 – 1.95	0.907
Race						
Non-Black	ref			ref		
Black	−3.94	−10.61 – 2.73	0.248	0.04	−0.89 – 0.92	0.937
Gender						

	FSQ Work Score			Bed Days		
	B	**95% CI**	**p-value**	***B***	**95% CI**	**p-value**
Male	ref					
Female	1.98	−3.95 – 7.91	0.514	0.76	−0.14 – 1.66	0.096
Marital status						
Unmarried	ref			ref		
Married	6.43	−0.56- 13.42	0.072	−0.05	−1.34 – 1.24	0.942

FSQ Work Score = Functional Status Questionnaire Work Subscale Score standardized from 0–100, 100= optimal work performance; Hamilton Depression Rating Scale Score ranges from 0–54, 0–13= no to mild symptoms and ≥14= moderate to severe symptoms; Hamilton Anxiety Rating Scale Score ranges from 0–56, 0–17= no to mild symptoms and ≥18= moderate to severe symptoms