Published in final edited form as:

J Nurs Scholarsh. 2014 March ; 46(2): 116–124. doi:10.1111/jnu.12064.

The Effect of Post-injury Depression on Quality of Life following Minor Injury

Therese S. Richmond, PhD, CRNP, FAAN¹, Wensheng Guo, PhD², Theimann Ackerson, MSSW³, Judd Hollander, MD⁴, Vicente Gracias, MD⁵, Keith Robinson, MD⁶, and Jay Amsterdam, MD⁷

¹Xi, Andrea B. Laporte Professor of Nursing, University of Pennsylvania School of Nursing, Philadelphia, PA, USA

²Professor of Biostatistics, University of Pennsylvania Perelman School of Medicine, Philadelphia, PA, USA

³Program Administrator, Centre for Executive & Professional Education, University of Windsor, Windsor, Ontario, Canada

⁴Professor of Emergency Medicine, University of Pennsylvania Perelman School of Medicine, Philadelphia, PA, USA

⁵Professor of Surgery, Robert Wood Johnson University Hospital, New Brunswick, NJ, USA

⁶Associate Professor of Physical Medicine & Rehabilitation, University of Pennsylvania Perelman School of Medicine, Philadelphia, PA, USA

⁷Professor of Psychiatry, University of Pennsylvania Perelman School of Medicine, Philadelphia, PA, USA

Abstract

Purpose—To describe quality of life (QoL) in the year following minor injury and to test the hypothesis that individuals with depression in the postinjury year experience lower QoL than do individuals with no depression.

Design—Prospective, longitudinal, cohort design. A total of 275 adults were randomly selected from injured patients presenting to an urban emergency department.

Methods—All participants underwent structured psychiatric diagnostic interviews immediately after injury and at 3, 6, and 12 months. The primary outcome, QoL, was measured using the Quality of Life Index. Covariates included demographics, injury status, preinjury functional status, preinjury social support, and anticipation of problems postdischarge. The General Estimating Equation was used to compare changes in QoL between participants with and without depression over 3, 6, and 12 months, adjusting for covariates.

Results—An 18.1% proportion (95% confidence interval [CI] 13.3, 22.9%) of the sample met criteria for a mood disorder in the postinjury year. The depressed group reported a QoL that was 4.2 points (95% CI 2.8–5.6) lower in the year postinjury compared with that of the nondepressed group.

Conclusions—Depression after minor injury negatively affects QoL even a full year postinjury.

Clinical Relevance—The findings of this study show that patients who have injuries that are treated and discharged from an emergency department can have significantly lower QoL in the year after that injury that may be attributed to postinjury depression. Nurses should provide anticipatory guidance to patients that they may experience feelings of sadness or being “blue,” and that if they do, they should seek care.

Keywords

Cohort study; depression; injuries; quality of life; trauma

Traumatic injury accounts for 1 of every 10 deaths globally and poses a growing health burden in low- and middle-income countries (Hofman, Primack, Keusch, & Hrynkow, 2005; Norton & Kobusingye, 2013). Mortality alone, however, underestimates the tremendous burden of injury since the vast majority of injuries are not life threatening. In the United States in 2010 there were 180,911 deaths from injury, and in the same year there were 31,575,978 nonfatal injuries (Centers for Disease Control, National Center for Injury Prevention and Control, 2013).

Three strategies can reduce the global burden of injury: (a) prevent injury, (b) improve survival, and (c) optimize recovery. Inroads have been made in preventing injury; for example, reduction of deaths from motor vehicle crashes in the United States is considered one of the top 10 public health prevention successes of the 20th century (Centers for Disease Control, 1999). Advances have also been achieved in improving injury survival. A robust body of research has demonstrated that trauma centers and regional trauma systems improve survival of the most seriously injured (MacKenzie et al., 2006). While these successes are admirable, less progress has been made in optimizing recovery.

The goal of injury recovery is to help patients return to their preinjury state of health and quality of life (QoL). This does not occur. Health status, functional status, and QoL have been shown to fall below population norms following moderate to severe injuries (Aitken, Chaboyer, Kendall, & Burmeister, 2012; Ringburg et al., 2011; Ringdal, Plos, Ortenwall, & Bergbom, 2010). Yet the vast majority of injuries are minor (Polinder, Haagsma, Toet, & van Beeck, 2011). Labeling an injury as “minor” may very well be a misnomer if we consider the impact of injury. Lyons et al. (2011) found that nonadmitted emergency department (ED) injuries (e.g., minor injuries) account for more than two thirds (67%) of years lived with disability after injury. Given this public health burden, it is important to examine why there are suboptimal outcomes.

Nurses and the entire healthcare team are well positioned to optimize recovery but are hampered by the fact that trauma care is primarily acute care oriented and focuses predominately on the physical injury. Indeed, patients seen in the ED are typically “treated and stretted,” with limited follow-up and poor understanding of how these patients recover after these injuries. Recognizing the limitations of these foci, Richmond and Aitken (2011) developed the Trauma Outcomes Model as a theoretical foundation to guide research and practice. This model purports that important long-term outcomes are physical, functional, psychological, and QoL and emphasizes the need to examine outcomes across settings. These outcomes are important to patients and families and resonate with the increasing focus on patient-reported outcomes.

In this study, we focus on QoL as a salient outcome in the year after minor injury. Minor injuries are defined as injuries that have no central nervous system involvement and do not threaten loss of life or limb, but are of sufficient import that individuals seek urgent medical care in an ED. A recent systematic review demonstrates that postinjury health-related QoL

improved over the postinjury year but remained lower than before injury (Polinder et al., 2010). What is less clear is why QoL is reduced even after minor injury, where the physical nature of the injury is unlikely to account for this reduction beyond the immediate acute recovery phase. Therefore, it is important to examine possible factors that could account for reduced postinjury QoL.

Between 20% and 35% of patients develop a new psychiatric disorder in the year after moderate to severe injury (Bryant et al., 2010), and these disorders negatively affect return to preinjury function (Sutherland, Suttie, Alexander, & Hutchison, 2011) and reduce health-related QoL (Tolen, Bredal, Skogstad, Myhren, & Ekeberg, 2011). The preponderance of research shows little association between the severity of physical injury and the severity of psychological distress (Brasel, deRoos-Cassini, & Bradley, 2010; Richmond, Kauder, Hinkle, & Shults, 2003). Previous work from our team showed that 18% of patients with minor injury developed significant depression in the postinjury year (Richmond et al., 2009). The purpose of this study was to determine the contribution of postinjury depression on QoL in the year following minor traumatic injury.

Methods

This was a prospective, longitudinal cohort study of 275 adults with minor injury who sought care for the injury in an ED. The study was approved by the university's institutional review board. A brief summary of methods is presented, and a detailed description of the study methodology has been previously published (Richmond et al., 2009).

Eligibility Criteria and Setting

The primary inclusion criteria were adults (age 18 years and older) who sustained an acute traumatic injury and who sought care in an ED. An injury was defined as minor by an injury severity score (ISS) of 2 to 8 (possible range 1–75, where 75 is incompatible with life) and normal physiology following injury, defined by a triage-Revised Trauma Score (t-RTS) of 12 (Baker & O'Neill, 1976; Champion et al., 1989). The internationally accepted TRISS methodology, which calculates the probability of survival (Ps) based on a mathematical equation of the t-RTS, ISS, and age indicate that the Ps of a 35-year-old with a t-RTS of 12 and an ISS of 8 would be 99.5%. Exclusion criteria included injury due to suicide attempt, intimate partner violence or a medical condition (e.g., pathological fracture), current psychosis or major depression, traumatic brain injury, or cognitive deficit that precluded informed consent. The setting was an urban ED in an academic medical center with a level 1 trauma center in the northeastern United States.

Instruments

Primary outcome—The primary outcome of QoL was measured using the Quality of Life Index-Generic Version III (QLI), a self-report measure of a person's satisfaction with key domains of his or her life and the self-reported relative importance of each of these domains (Ferrans & Powers, 1985; Ferrans & Powers, 1992). The total score can range from 0 to 30, with higher scores indicating higher QoL. Four subscale scores can be calculated, and these are health/functioning, social/economic, psychological/spiritual, and family. Internal consistency for the total QLI score ranges from 0.73 to 0.99 (www.uic.edu/orgs/gli). Content and construct validity have been established (Ferrans & Powers, 1985; Ferrans & Powers, 1992). The QLI was completed at 3, 6, and 12 months after injury.

Psychiatric diagnostic assessment—Depression is the primary predictor variable of interest. Depression was diagnosed using a comprehensive research diagnostic interview, the Structured Clinical Interview for Axis I DSM-IV Disorders—Patient Edition (SCID-I/P;

American Psychiatric Association, 1994; First, Spitzer, Gibbon, & Williams, 1994). This semi-structured interview provided a detailed psychiatric history and diagnoses at the 3-month interview. It was supplemented by the Longitudinal Interval Follow-up Evaluation (LIFE; Keller et al., 1987) at the 6- and 12-month interviews. When participants screened positive in the LIFE semi-structured interview, the full depression module of the SCID was used for diagnostic verification.

Covariates—Demographics, injury mechanism, body system injured, ISS, and other salient variables were adjusted in the multivariate analysis. Preinjury functional status was measured using the Functional Status Questionnaire (FSQ), which assessed activities of daily living, instrumental activities of daily living, mental well-being, social activity, and quality of interaction prior to injury (Jette et al., 1986). Internal consistency ranges from 0.77 to 0.92, and criterion and construct validity have been established (Cleary & Jette, 2000). Each subscale score is transformed to 0 to 100. All subscales with the exception of mental well-being (because of overlap with depression) were included as covariates. Social support was measured at intake by the brief version of the Social Support Questionnaire, a short, reliable, and psychometrically sound instrument to measure social network and satisfaction with the support received (Sarason, Sarason, Shearin, & Pierce, 1987). Social network scores can range from 0 to 54 and support scores from 1 to 6, with higher scores indicating a larger network and higher satisfaction.

We collected self-report of the days affected by health in the month before injury (Jette et al., 1986). Specifically, participants were asked the number of days lost from work (including school and home management), number of days spent in bed more than one-half day, and number of days where activities were cut down more than one-half day because of health in the month before the injury. Participants were asked to rate satisfaction with their health prior to the injury and were asked if they anticipated problems after discharge due to their injury (yes-no response).

Procedure

When patients were medically stable in the ED, they were asked to provide verbal consent to release their names to the research team and to complete the FSQ. Patients were asked to respond to the FSQ based on the week prior to injury, providing a preinjury measure of functional status, and took 10 to 15 min to complete the questionnaire. Individuals were drawn from this pool of eligible patients using a list of random numbers that were weighted to reflect the flow of patients in the ED and were based on treatment room admission time. Randomly selected patients were contacted, provided study information, and had all questions answered. If interested, an appointment for an in-person intake interview was made, at which time written informed consent was obtained.

Interviews were conducted in the participant's home, study offices, or a mutually agreeable public place with a private space. The intake interview was conducted within days to approximately a week after the ED visit and included demographic, injury, and covariate data, the psychiatric interview (via SCID), and the QLI to assess the immediate postinjury QoL. The psychiatric diagnostic interview took 1 to 2 hr to complete and was conducted by a master's-prepared social worker who had been trained in diagnostic interviews under the direction of the study psychiatrist (J.A.). At follow-up, the QoL was measured asking participants to consider their QoL during the month immediately prior to the study visit and took 5 to 10 min to complete. Patients were provided thank you incentives of \$30, \$30, \$30, and \$60 for the intake, 3-, 6-, and 12-month visits, respectively.

Statistical Methods

Study power was based on the assumption that 15% of participants would have postinjury depression. This was a conservative assumption based on a study of survivors treated for injury in EDs in Israel (Shalev et al., 1998). For the General Estimating Equation (GEE) analyses there was 80% power, with $\alpha = 0.05$ to detect an effect size of 0.49 standard deviation (*SD*) in QoL by 12 months between participants with and without depression (Diggle, Liang, & Zeger, 1994). *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. Frequencies with 95% confidence intervals (95% CIs) described the proportion of participants diagnosed with a depression. Means and SDs for QLI were calculated for the depressed and nondepressed groups and were compared using *t* tests. The QLI scores were sufficiently normally distributed to use the raw score as the dependent variable.

We tested the hypothesis that individuals with depression in the postinjury year would have lower QoL than those without depression. Individuals were coded in the depressed group if the diagnosis was made postinjury. Regardless of whether the depression resolved, the individual remained coded as depressed for the remainder of the analyses. Injury is an unexpected event; hence, we did not have a preinjury measure of QoL and used the raw QLI total score as the dependent variable. Because the QLI subscale scores reflect the same patterns and magnitudes of difference between depressed and nondepressed individuals, we report only the QLI total score. The GEE was used to compare changes in QLI total scores between participants with and without depression across time (3, 6, and 12 months), while adjusting for covariates (demographics, injury intent, injury mechanism, satisfaction with social network, preinjury functional status, and preinjury work status).

Results

Sample Description

The sample has been previously described (Richmond et al., 2009), and we provide a brief summary of the 275 individuals who consented to participate. Fifty-two percent of the sample were men. The mean age was 40.4 years (*SD* 16.8) and 25.8% were married. Blacks comprised 57% of the sample, with the remainder Whites (40%) and Asians (3%). The majority graduated high school (average of 13.7 years of education). Seventy-one percent were employed. The majority (45.1%) reported an annual income between \$20,000 and \$59,999, with 32.1% reporting less than \$20,000 and the remainder reporting an income exceeding \$60,000.

Injuries were predominately unintentional (91%) and due to slips or falls (48%), motor vehicle-pedestrian-bike crashes (28.7%), sports (8.4%), and assaults (8%). The majority of participants had an extremity fracture (63%). The mean ISS for the entire sample was 4.1 (*SD* 1.12), reflecting minor injury. Preinjury function as measured by the FSQ ranged from a low score of 79.4 (*SD* 17.1) for mental well-being to a high score of 96.8 (*SD* 10.5) for activities of daily living. The mean social network score was 22.1 (*SD* 12.4), with the score for high levels of satisfaction 5.73 (*SD* 0.56). Preinjury satisfaction with health ranged from *very dissatisfied* (2.9%) to *very satisfied* (33.2%). Participants reported an average of 1.13 days (*SD* 3.2) of reduced activities due to health in the month before the injury. Immediately after injury, 44% of participants reported they anticipated problems returning to their normal activities.

Two hundred and forty-eight participants (90%) were retained, although some missed one of the three follow-up visits (240 at 3 months, 235 at 6 months, and 238 at 12 months). Participants lost to follow-up were more likely to be men, to be injured via motor vehicle

crashes, to have a less severe injury, and to have a mean of 1.5 years less education than those who completed the study ($p < .05$). Forty-five participants (18%; 95% CI 13.3, 22.9%) were diagnosed with a mood disorder in the postinjury year (Richmond et al., 2009).

Major Findings

The depressed and nondepressed groups were compared at each time point (3, 6, and 12 months) without controlling for any covariates. At all time points, the QLI score was 3.4 to 5.5 points lower in the depressed group than in the nondepressed group (Table 1). Depression affected all subscales of the QLI similarly (Figure 1). Thus, our multivariate analysis used the total QLI score as the primary outcome.

In the multivariate model (Table 2), controlling for all other covariates, the QLI was 4.2 points lower in participants with postinjury depression (95% CI 2.79–5.62) as compared to those without depression. Other covariates significantly contributing to lower QoL were dissatisfaction with preinjury health, fewer people in the social network, anticipating problems after hospital discharge, and having more days of activities reduced due to health in the month before injury. The overall time trend is positive, at the rate of 0.16 per month, indicating that the QoL improved over time, but QoL for the depressed group and nondepressed group never equalized, even a full year post-injury. We tested the interaction between depression and time, and this interaction was not significant.

Discussion

Our findings indicate that depression is the major contributor to reduced QoL in the year following minor injury. QoL scores of the depressed group slowly increased in the postinjury year; however, at all time points, the mean QoL score was significantly lower in participants with depression than in those without depression. Importantly, type, mechanism, and severity of physical injury were not significantly associated with QoL in the postinjury year. This finding is consistent with a recent report of more seriously injured patients, which showed posttraumatic stress and depression negatively affects QoL but severity of physical injury does not (Moergeli, Wittmann, & Schnyder, 2012). Given that 1 in 10 adults in the United States seeks care in an ED for injury and that 18% of our sample were diagnosed with depression after injury, this finding has significant implications for the public's health.

In this study, our primary outcome was patient-reported QoL. There are varying ways of measuring QoL, and many studies have used measures that focus on physical and mental dimensions of health (e.g., Wang, Tsay, & Bond, 2005). In particular, some studies measure QoL using the Short Form-36 Health Survey (SF-36), which is valid, reliable, and widely used. However, the SF-36 could arguably be said to more directly measure health status or functional status rather than QoL. In this study, we approach QoL as a multidimensional concept. Several researchers recommend taking into account not only the degree to which each dimension of QoL is met, but also how important each dimension is to the individual (e.g., weighting of the contribution to well-being; Costanza et al., 2007). Our approach to assessing QoL in a way that measures satisfaction with key dimensions of one's life and takes into account the importance of each to the individual contributes to our understanding of QoL after minor injury (Ferrans & Powers, 1985, 1992).

QoL is reduced after moderate to severe injury (Gross, Attenberger, Huegli, & Amsler, 2010; Overgaard, Hoyer, & Christensen, 2011) and after specific injury types such as brain injury (Gross, Schuepp, Attenberger, Pargger, & Amsler, 2012; Steel et al., 2010), pelvic ring injuries (Borg, Berg, Fugli-Meyer, & Larsson, 2010), or injuries requiring a delayed abdominal closure (Zarza et al., 2011). However, our findings suggest that individuals experience problems even after minor injury (Langley, Derrett, Davie, Ameratunga, &

Wyeth, 2011; Richmond et al., 2009). The question is why. The findings of this study add to the understanding of the interaction of physical injury and psychological consequences on an important patient-centered outcome such as QoL.

There has been significant growth in research documenting the psychological consequences of injury, and studies have predominately focused on posttraumatic stress disorder (Aitken, Chaboyer, Shuetz, Joyce, & Macfarlane, 2012) although increasingly on depression (Orwelius et al., 2012). Linking these psychological consequences to long-term changes in QoL has been less forthcoming. Several studies report inverse associations between posttraumatic stress symptoms and QoL across all severities of physical injury (Haagsma et al., 2012) and after minor traumatic brain injury (van Veldhoven et al., 2011). These studies, however, do not examine the contribution of postinjury depression to QoL after minor injury. Our study illuminates both the prevalence of depression after even minor physical injury and its impact on postinjury QoL controlling for many other variables that could potentially affect QoL.

Depression usually does not emerge until patients are discharged from the hospital, at which point symptoms can be ignored, not recognized or diagnosed, and not treated (Richmond, et al., 2000). Individuals with minor injury who are seen and discharged from the ED with the expectation of rapid resumption of preinjury roles and responsibilities may be at particular risk for having depression go unrecognized. Several screeners designed to predict the future development of depression or posttraumatic stress disorder based on a short assessment prior to discharge have been developed with good sensitivity and specificity (Mason et al., 2009; O'Donnell et al., 2008; Richmond et al., 2011). Coupling the use of predictive screening to narrow the group at risk for psychological consequences with the use of early treatment (Zatzick et al., 2013) has the potential to significantly improve quality of life after injury.

The major strength of this study is the prospective, cohort, longitudinal design, which allowed us to examine the emergence of depression in the postinjury year. The use of a random selection process to identify potential participants for the population of minor injury patients seen in the ED and the excellent retention rate over the 12 months adds to the credibility of the study.

Several caveats should also be considered when interpreting the findings. The unexpected nature of traumatic injury precluded our ability to obtain preinjury QoL measures. Nonetheless, the consistent reduction in QoL in the depressed group over time supports the importance of addressing the psychological as well as physical aspects of injury. It is possible there could be alternative explanations for the reduced QoL. We did not assess pain in our study. Pain has been shown to be present in a subset of trauma patients postinjury (Black, Herbison, Lyons, Polinder, & Derrett, 2011; Gross & Amsler, 2011; Treviono, Essig, deRoos-Cassini, & Brasel, 2012) and could contribute to reduced QoL and warrants examination in future studies.

Conclusions and Clinical Implications

Depression after minor injury negatively affects QoL even a full year postinjury. Depression has been shown to emerge after moderate to severe injuries and after central nervous system injuries and has been shown to reduce postinjury QoL. The findings from this study show that even after minor injury, depression emerges to the detriment of QoL. It is therefore prudent for clinicians to provide anticipatory guidance to patients that they may experience feelings of sadness or being "blue," and that if they do, they should seek care. As predictive screeners become more refined, systems of care could be developed that allow simple follow-up phone calls to patients in high-risk categories to perform a screen within the first

month or two after injury to determine if depression has emerged and to refer patients for follow-up care.

Acknowledgments

This study was funded by the National Institutes of Mental Health R01 MH63818 to Dr. Richmond.

References

- Aitken LM, Chaboyer W, Kendall E, Burmeister E. Health status after traumatic injury. *Journal of Trauma & Acute Care Surgery*. 2012; 72:1702–1708. [PubMed: 22695444]
- Aitken LM, Chaboyer W, Schuetz M, Joyce C, Macfarlane B. Health status of critically ill trauma patients. *Journal of Clinical Nursing*. 2012;10.1111/jocn.12026
- American Psychiatric Association. *Diagnostic and statistical manual of mental disorders*. 4. Washington, DC: Author; 1994.
- Baker SP, O'Neill B. The Injury Severity Score: An update. *Journal of Trauma*. 1976; 16:882–885. [PubMed: 994270]
- Black JA, Herbison GP, Lyons RA, Polinder S, Derrett S. Recovery after injury: An individual patient data meta-analysis of general health status using the EQ-5D. *Journal of Trauma: Injury, Infection, and Critical Care*. 2011; 71:1003–1010.
- Borg T, Berg P, Fugl-Meyer K, Larsson S. Health-related quality of life and life satisfaction in patients following surgically treated pelvic ring fractures. A prospective observational study with two years follow-up. *Injury*. 2010; 41:400–404. [PubMed: 20005513]
- Brasel KJ, deRoos-Cassini T, Bradley CT. Injury severity and quality of life: Whose perspective is important? *Journal of Trauma: Injury, Infection & Critical Care*. 2010; 68:263–268.
- Bryant RA, O'Donnell ML, Creamer M, McFarlane AC, Clark CR, Silove D. The psychiatric sequelae of traumatic injury. *American Journal of Psychiatry*. 2010; 167:312–320. [PubMed: 20048022]
- Centers for Disease Control. Ten great public health achievements – United States, 1900–1999. *Morbidity & Mortality Weekly Report*. 1999; 48(12):241–243. [PubMed: 10220250]
- Centers for Disease Control, National Center for Injury Prevention and Control. Web-based injury statistic query and reporting system. 2013. Retrieved from <http://www.cdc.gov/injury/wisqars/index.html>
- Champion HR, Sacco WJ, Copes WS, Glann DS, Gennarelli TA, Flanagan ME. A revision of the trauma score. *Journal of Trauma*. 1989; 29:623–629. [PubMed: 2657085]
- Cleary PD, Jette AM. Reliability and validity of the Functional Status Questionnaire. *Quality of Life Research*. 2000; 9:747–753.
- Costanza R, Fisher B, Ali S, Beer C, Bond L, Snapp R. Quality of life: An approach integrating opportunities, human needs, and subjective well-being. *Ecological Economics*. 2007; 61:267–276.
- Diggle, PJ.; Liang, KY.; Zeger, SL. *Analysis of longitudinal data*. Oxford, UK: Clarendon Press; 1994.
- Ferrans C, Powers M. Quality of Life Index: Development and psychometric properties. *Advances in Nursing Science*. 1985; 8:15–24. [PubMed: 3933411]
- Ferrans C, Powers M. Psychometric assessment of the Quality of Life Index. *Research in Nursing & Health*. 1992; 15:29–38. [PubMed: 1579648]
- First, MB.; Spitzer, RL.; Gibbon, M.; Williams, JBW. *Structured clinical interview for axis I DSM-IV disorders—Patient edition*. New York: Biometrics Research Department, New York State Psychiatric Institute; 1994.
- Gross T, Amsler F. Prevalence and incidence of longer term pain in survivors of polytrauma. *Surgery*. 2011; 150:985–995. [PubMed: 21676423]
- Gross T, Attenberger C, Huegli RW, Amsler F. Factors associated with reduced longer-term capacity to work in patients after polytrauma: A Swiss trauma center experience. *Journal of the American College of Surgeons*. 2010; 211:81–91. [PubMed: 20610253]
- Gross T, Schuepp M, Attenberger C, Pargger H, Amsler F. Outcome of polytraumatized patients with and without brain injury. *Acta Anaesthesiologica Scandinavica*. 2012; 56:1163–1174.

- Haagsma JA, Polinder S, Olff M, Toet H, Bonsel GK, van Beeck EF. Posttraumatic stress symptoms and health-related quality of life: A two year follow up study of injury treated at the emergency department. *BMC Psychiatry*. 2012; 12:1. [PubMed: 22230388]
- Hofman K, Primack A, Keusch G, Hrynkow S. Addressing the growing burden in trauma and injury in low- and middle-income countries. *American Journal of Public Health*. 2005; 95:13–17. [PubMed: 15623852]
- Jette AM, Davies AR, Cleary PD, Calteins DR, Rubenstein LV, Fink A, Delbonco TL. The Functional Status Questionnaire: Reliability and validity when used in primary care. *Journal of General Internal Medicine*. 1986; 1:143–149. [PubMed: 3772582]
- Keller MB, Lavori PW, Friedman B, Nielsen E, Endicott J, McDonald-Scott P, Andreasen NC. The longitudinal interval follow-up evaluation. *Archives of General Psychiatry*. 1987; 44:540–548. [PubMed: 3579500]
- Langley J, Derrett S, Davie G, Ameratunga S, Wyeth E. A cohort study of short-term functional outcomes following injury: The role of pre-injury socio-demographic and health characteristics, injury and injury-related healthcare. *Health & Quality of Life Outcomes*. 2011; 9:68. [PubMed: 21849082]
- Lyons RA, Kendrick D, Towner EM, Christie N, Macey S, Coupland C, Gabbe BJ. Measuring the population burden of injuries—Implications for global and national estimates: A multi-centre prospective UK longitudinal study. *PLOS Medicine*. 2011; 8(12):e1001140.10.1371/journal.pmed.1001140 [PubMed: 22162954]
- MacKenzie EJ, Rivara FP, Jurkovich GJ, Nathens AB, Frey KP, Egleston BL, Scharfstein DO. A national evaluation of the effect of trauma-center care on mortality. *New England Journal of Medicine*. 2006; 354:366–378. [PubMed: 16436768]
- Mason S, Farrow TFD, Fawbert D, Smith S, Bath PA, Hunter M, Turpin G. The development of a clinically useful tool for predicting the development of psychological disorder following injury. *British Journal of Clinical Psychology*. 2009; 48:31–45. [PubMed: 18799023]
- Moergeli H, Wittmann L, Schnyder U. Quality of life after traumatic injury: A latent trajectory modeling approach. *Psychotherapy and Psychosomatics*. 2012; 81:305–311. [PubMed: 22832585]
- Norton R, Kobusingye O. Injuries. *New England Journal of Medicine*. 2013; 368:1723–1730. [PubMed: 23635052]
- O'Donnell ML, Creamer MC, Parslow R, Elliott P, Holmes AC, Ellen S, Bryant RA. A predictive screener screening index for posttraumatic stress disorder and depression following traumatic injury. *Journal of Consulting and Clinical Psychology*. 2008; 76:923–932. [PubMed: 19045961]
- Orwelius L, Bergkvist M, Nordlund A, Simonsson E, Nordlund P, Backman C, Sjöberg F. Physical effects of trauma and the psychological consequences of preexisting diseases account for a significant portion of the health-related quality of life patterns of former trauma patients. *Journal of Trauma*. 2012; 72:504–512.
- Overgaard M, Hoyer CB, Christensen EF. Long-term survival and health-related quality of life 6 to 9 years after trauma. *Journal of Trauma: Injury, Infection & Critical Care*. 2011; 71:435–441.
- Polinder S, Haagsma JA, Belt E, Lyons RA, Erasmus V, Lund J, van Beeck EF. A systematic review of studies measuring health-related quality of life of general injury populations. *BMC Public Health*. 2010; 10:783. [PubMed: 21182775]
- Polinder S, Haagsma JA, Toet H, van Beeck EF. Epidemiologic burden of minor, major and fatal trauma in a national injury pyramid. *British Journal of Surgery*. 2011; 99:114–121. [PubMed: 22441864]
- Richmond TS, Aitken LM. A model to advance nursing science in trauma practice and injury outcomes research. *Journal of Advanced Nursing*. 2011; 67:2741–2753. [PubMed: 21707726]
- Richmond TS, Amsterdam JD, Guo W, Ackerson T, Gracias V, Robinson KM, Hollander JE. The effect of post-injury depression on return to pre-injury function: A prospective cohort study. *Psychological Medicine*. 2009; 39:1709–1720. [PubMed: 19250582]
- Richmond TS, Kauder D, Hinkle J, Shults J. Early predictors of long-term disability after injury. *American Journal of Critical Care*. 2003; 12:197–205. [PubMed: 12751393]

- Richmond TS, Ruzek J, Ackerson T, Wiebe DJ, Winston F, Kassam-Adams N. Predicting the future development of depression or PTSD after injury. *General Hospital Psychiatry*. 2011; 33:327–335. [PubMed: 21762828]
- Richmond TS, Thompson HJ, Deatrick JA, Kauder DR. Journal towards recovery following physical trauma. *Journal of Advanced Nursing*. 2000; 32:1341–1347. [PubMed: 11136401]
- Ringburg AN, Polinder S, van Ierland MC, Steyerberg EW, van Lieshout EM, Patka P, Schipper IB. Prevalence and prognostic factors of disability after major trauma. *Journal of Trauma: Injury, Infection & Critical Care*. 2011; 70:916–922.
- Ringdal M, Plos K, Ortenwall P, Bergbom I. Memories and health-related quality of life after intensive care: A follow-up study. *Critical Care Medicine*. 2010; 38:38–44. [PubMed: 19789455]
- Sarason IG, Sarason BR, Shearin EN, Pierce GR. A brief measure of social support: Practical and theoretical implications. *Journal of Social & Personal Relationships*. 1987; 4:497–510.
- Shalev AY, Freedman S, Peri T, Brandes D, Sahar T, Orr SP, Pitman RK. Prospective study of posttraumatic stress disorder and depression following trauma. *American Journal of Psychiatry*. 1998; 155:630–637. [PubMed: 9585714]
- Steel J, Youssef M, Pfeifer R, Ramirez JM, Probst C, Sellei R, Pape HC. Health-related quality of life in patients with multiple injuries and traumatic brain injury 10+ years postinjury. *Journal of Trauma: Injury, Infection, & Critical Care*. 2010; 69:523–531.
- Sutherland AG, Suttie S, Alexander DA, Hutchison JD. The mind continues to matter: Psychologic and physical recovery 5 years after musculoskeletal trauma. *Journal of Orthopedic Trauma*. 2011; 25:228–232.
- Tolen K, Bredal IS, Skogstad L, Myhren H, Ekeberg O. Health related quality of life in trauma patients: Data from a one-year follow up study compared with the general population. *Scandinavian Journal of Trauma, Resuscitation, & Emergency Medicine*. 2011; 19:22.
- Treviono CM, Essig B, deRoos-Cassini T, Brasel K. Chronic pain at 4 months in hospitalized trauma patients. *Journal of Trauma Nursing*. 2012; 19:154–159. [PubMed: 22955711]
- University of Illinois. Quality of Life Index. XXXXRetrieved from <http://www.uic.edu/orgs/qli/reliability/reliabilityhome.htm>
- Van Veldhoven LM, Sander AM, Struchen MA, Sherer M, Clark AN, Hudnall GE, Hannay HJ. Predictive ability of preinjury stressful life events and post-traumatic stress symptoms for outcomes following mild traumatic brain injury: Analysis in a prospective emergency department sample. *Journal of Neurology, Neurosurgery, & Psychiatry*. 2011; 82:782–787.
- Wang C, Tsay S, Bond AE. Post-traumatic stress disorder, depression, anxiety and quality of life in patients with traffic related injuries. *Journal of Advanced Nursing*. 2005; 52:22–30. [PubMed: 16149977]
- Zarza BL, DiCocco JM, Shahan CP, Emmett K, Magnotti LJ, Crose MA, Fabian TC. Quality of life after abdominal wall reconstruction following open abdomen. *Journal of Trauma: Injury, Infection, and Critical Care*. 2011; 70:285–291.
- Zatzick D, Jurkovich G, Rivara F, Russo J, Wagner A, Katon W. A randomized stepped care intervention trial targeting posttraumatic stress disorder for surgically hospitalized injury survivors. *Annals of Surgery*. 2013; 257:390–399. [PubMed: 23222034]

Figure 1. Mean Quality of Life Index (QLI) scores in the postinjury year. The depressed group is represented by the solid line and nondepressed group is represented by the dashed line. (Error bars show two times the standard error.)

Table 1

Comparison of Depressed and Nondepressed Patients on Quality of Life Index (QLI) Scores at 3, 6, and 12 Months Postinjury

Variable	Depressed mean (SD)	Nondepressed mean (SD)
	3 mo, <i>n</i> = 30	3 mo, <i>n</i> = 210
	6 mo, <i>n</i> = 42	6 mo, <i>n</i> = 189
	12 mo, <i>n</i> = 45	12 mo, <i>n</i> = 190
Total QLI score		
3 mo	17.2 (5.44)*	23.4 (4.41)
6 mo	16.8 (5.97)*	24.7 (6.31)
12 mo	18.1 (5.35)*	24.1 (4.13)

Higher QLI scores reflect higher levels of quality of life. Significance:

* $p < .001$.

Table 2

Multivariate General Estimating Equation Model of Quality of Life Index Scores in the Year Following Injury

Variable	Beta estimate	Standard error	95% Confidence interval
Depression			
Yes	-4.2072	0.7225	-2.7910, -5.6234****
No (ref)			
Time	0.0161	0.0061	0.0041, 0.0280**
Anticipate problems after discharge			
No	1.7377	0.4459	0.8638, 2.6117****
Yes (ref)			
Satisfaction with pre-injury health			
Very dissatisfied	-4.4553	1.4493	-7.2960, -1.6147**
Dissatisfied	-6.1067	1.1183	-8.2986, -3.9148****
Not sure	-4.125	0.8662	-5.8262, -2.4308****
Very satisfied (ref)			
No. of days where activities were cut down because of health in the month before injury	0.2650	0.0839	0.1005, 0.4295***
Social network	1.6739	0.4684	0.7559, 2.5919***

Note: ref = .

*
 $p < .05$,**
 $p < .01$,***
 $p < .001$,****
 $p < .0001$.