The Course of Suicide Risk Following Traumatic Injury

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ABSTRACT

Objective: Although traumatic injuries affect millions of patients each year and increase risk for psychiatric disorder, no evidence currently exists regarding associated suicidal risk. This study reports a longitudinal investigation of suicidal risk in the 2 years after traumatic injury.

Methods: A prospective design cohort study was conducted in 4 major trauma hospitals across Australia. A total of 1,129 traumatically injured patients were assessed during hospital admission between April 2004 and February 2006 and were followed up at 3 months (88%), 12 months (77%), and 24 months (72%). Lifetime psychiatric disorder was assessed in hospital using the Mini-International Neuropsychiatric Interview, version 5.5, which was also used to assess the prevalence of suicidality, psychiatric disorder, and exposure to adverse life events at 3, 12, and 24 months after traumatic injury.

Results: Approximately 6% of patients reported moderate/high suicidal risk at each assessment. At each assessment, half of suicidal patients reported no suicidal risk at the previous assessment. Suicidality at 24 months was predicted by current pain levels (odds ratio [OR] = 1.16; 95% CI, 1.09–1.23), recent life events (OR = 1.30; 95% CI,1.17–1.44), and current psychiatric disorder (OR = 17.07; 95% CI, 7.03–41.42), whereas only 36.6% of suicidal patients had consulted a mental health professional in the previous month, and 66.2% had consulted a primary care physician.

Conclusions: Suicidal risk affects a significant proportion of patients who experience a traumatic injury, and the risk for suicide fluctuates markedly in the initial years following the injury. Primary care physicians need to be trained to assess for suicidal risk in the initial years after a traumatic injury.

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Traumatic injuries are a major public health issue, affecting millions of people worldwide each year.[1] Although traumatic injury can result in a range of psychiatric disorders,[2] little attention has focused on the capacity of traumatic injury to lead to suicidal risk. Considering that suicidal ideation is a key risk factor for successful suicide attempts,[3] it is important to understand the risk factors that contribute to suicidal risk following traumatic injury. Up to 83% of people who eventually commit suicide have contact with health providers in the year prior to their suicide,[4] which highlights the importance that health workers be able to identify risk factors in this population. The literature has produced evidence of increased risk of psychiatric disorders following traumatic injury[5] and evidence that suicidal risk is associated with depression and substance abuse,[6] and also with anxiety disorders.[7]

To our knowledge, however, no studies have specifically longitudinally addressed the incidence of suicidal risk after traumatic injury or the factors that may be predictive of suicidal risk. Accordingly, this article reports a longitudinal study of suicidality in traumatic injury survivors. To additionally determine the onset of new cases of suicidality, we assessed lifetime suicidality immediately after injury and again at 3, 12, and 24 months after injury. To identify potential predictors of suicidal risk, we assessed the extent to which injury-related factors and current psychiatric disorder inferred suicidal risk. On the basis that patients who sustain traumatic injuries often suffer multiple stressors following the injury[8] and that suicidality has been linked to adverse life events,[9] we also assessed for stressful life events following the traumatic injury and hypothesized this would also predict suicidality.

METHODS

Participants

Weekday admissions to four level 1 trauma centers across 3 states in Australia were recruited into the study between April 2004 and February 2006. The study was approved by the research and ethics committee at each hospital. Inclusion criteria were hospital admission of greater than 24 hours following traumatic injury, persons aged between 16 and 70 years, and persons who could understand and speak English proficiently. Individuals were excluded if they had moderate or severe brain injury, were currently psychotic, were non-Australian visitors, were under police guard, or were admitted following a suicidal or self-harm attempt. Four hundred seventy-eight (42%) experienced a mild traumatic brain injury (MTBI), which was defined as a documented injury to the head, impaired consciousness for less than 30 minutes, posttraumatic amnesia of less than 24 hours, and a Glasgow Coma Scale score of least 13.[10]

Of the 1,593 trauma patients who met inclusion criteria, 1,129 completed the initial assessment, 990 (88%) completed the 3-month assessment, 868 participants (77%) completed the 12-month assessment, and 722 participants (64%) completed the 24-month assessment. Those who were lost to follow-up were younger (mean ± SD: 35.65 ± 13.58 vs 39.17 ± 13.37 years; $t_{1,088} = 4.30$, $P = .001$) than those who did participate. Table 1 presents the sample characteristics. The mean Injury Severity

Clinical Points

- After people experience a traumatic injury, their risk for suicide fluctuates and they require consistent monitoring.
- Identification of patients most at risk for suicidality after traumatic injury may be achieved by assessing for prior suicidal history, recent stressful events, pain, mild traumatic brain injury, and other psychiatric disorders.
- Most suicidal patients do not consult mental health services but do access primary care physicians, who may be optimally situated to screen for suicidal risk.

Score (ISS)[11] was 10.87 ± 7.94 (maximum possible score is 75). Participants spent a mean of 12.38 (SD = 12.93) days in hospital.

Measures

The Mini-International Neuropsychiatric Interview, version 5.5 (MINI),[12] was used to assess suicidality and 3-, 12-, and 24-month psychiatric disorder. The MINI is a structured diagnostic interview based on the *DSM-IV* and the *ICD-10* classification of mental illness. We used the MINI to identify major depressive episode (MDE), panic disorder, agoraphobia, social phobia, obsessive-compulsive disorder, generalized anxiety disorder, alcohol abuse and dependence, and marijuana abuse and dependence. At 3, 12, and 24 months, posttraumatic stress disorder (PTSD) was assessed using the Clinician-Administered PTSD Scale (CAPS-1).[13] The CAPS-1 is a structured clinical interview that possesses good sensitivity (0.84) and specificity (0.95) relative to the Structured Clinical Interview for *DSM-III-R* Disorders PTSD diagnosis and also possesses sound test-retest reliability (0.90). The MINI suicidality module was employed at each assessment to assess current suicide risk; this includes 6 items that have different weighted scores that provide a total suicidality risk estimate. The items are asked in reference to the previous month and include desire to be dead (1 point), desire to harm self (2 points), thoughts of suicide (6 points), suicide plan (10 points), suicide attempt (10 points), and lifetime suicide attempt (4 points). At baseline assessment, lifetime suicidality was indexed by anchoring responses to any time prior to the injury. Lifetime suicide attempts were assessed at baseline by asking if the patient had ever attempted suicide, and at each subsequent assessment, the patient was asked if an attempt was made since the last assessment. Suicidality risk is calculated as no risk (0 point), low (1–5 points), moderate (6–9 points), and high (> 10 points). The List of Threatening Experiences[14] was employed to index adverse life events occurring prior to the previous assessment; this measure assesses life events that may be deemed threatening and can be summed to form a total score. The List of Threatening Experiences indexes the occurrence of 20 common stressful life events that encompass both traumatic (eg, assaults) and aversive (eg, losing one's job) events. Each item was dichotomously scored if each event occurred in the interval since the previous assessment.

Table 1. Characteristics of Participants Completing 24-Month Assessment According to Suicidal Risk Since Traumatic Injury

Characteristic	No Suicidal Risk (n = 636), % (n)	Suicidal Risk (n = 86), % (n)
Gender		
Male	73.3 (466)	68.6 (59)
Female	26.7 (170)	31.4 (27)
Age, y		
18–24	17.6 (112)	10.9 (9)
25–34	21.8 (139)	19.3 (17)
35–44	23.7 (151)	27.7 (24)
45–54	21.2 (135)	31.3 (27)
55–64	12.9 (82)	9.6 (8)
≥ 65	2.8 (17)	1.2 (1)
Previous disorder		
Prior disorder	54.3 (345)	74.4 (64)
No prior disorder	45.7 (291)	25.6 (22)
Type of injury		
Transport	66.4 (422)	60.5 (52)
Assault	5.7 (36)	19.8 (17)
Fall	15.9 (96)	10.5 (9)
Work injury	5.6 (36)	1.2 (1)
Other injury	6.4 (41)	8.0 (7)
Length of hospital stay, d		
2–4	17.5 (111)	14.0 (12)
5–10	45.5 (290)	36.0 (31)
11–15	15.1 (96)	20.9 (18)
16–20	8.5 (54)	11.6 (10)
≥ 21	13.4 (85)	17.4 (15)
Injury Severity Score		
Minimum	32.3 (205)	31.4 (27)
Moderate	46.5 (296)	43.0 (37)
Severe	15.1 (96)	18.6 (16)
Serious/critical	6.1 (39)	7.0 (6)
MTBI	40.4 (257)	51.2 (44)
No MTBI	59.6 (379)	48.8 (42)
Ethnic status		
White	87.0 (553)	86.5 (74)
Other	13.0 (83)	14.0 (12)
Marital status		
Married/de facto	52.5 (334)	44.2 (38)
Single	47.5 (302)	55.8 (48)
Employment status		
Employed	91.8 (584)	90.3 (78)
Unemployed	8.2 (52)	9.7 (8)
Education		
Trade/higher degree	62.0 (394)	61.5 (53)
High school	38.0 (242)	38.5 (33)

Abbreviation: MTBI = mild traumatic brain injury.

At each assessment, pain levels were indexed by asking patients to indicate on a visual analog scale their mean level of physical pain in the past 2 weeks (1 = no pain at all, 20 = worst pain possible). Mental health service use was assessed by asking participants whether they had consulted a psychiatrist, psychologist, social worker, or counselor in the month prior to the month of assessment. At each assessment, patients were also asked whether they had consulted a primary care physician in the past month. This timeframe was adopted to index treatment-seeking patterns for conditions that patients currently experienced.

Procedure

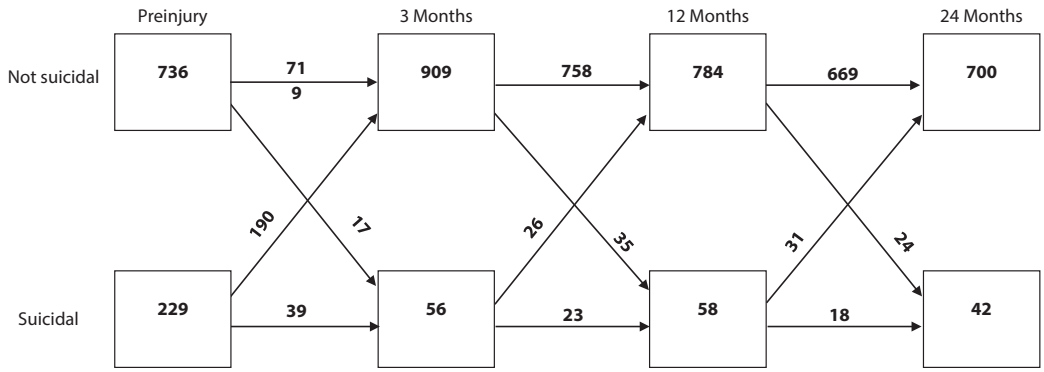
Following written informed consent, participants were assessed prior to discharge from each trauma center a mean of 7.2 days (SD = 9.6) after injury. During hospitalization, participants completed the MINI to assess lifetime suicidality.

Table 2. Incidence of Suicidal Risk

	3 Months		12 Months		24 Months	
Variable	All Cases, n (%)	New Cases, n (%)[a]	All Cases, n (%)	New Cases, n (%)[a]	All Cases, n (%)	New Cases, n (%)[a]
No/low suicidal risk	930 (93.9)	719 (97.7)	808 (93.1)	636 (97.1)	787 (94.6)	604 (97.3)
Moderate/high risk	60 (6.1)	17 (2.3)	60 (6.9)	19 (2.9)	45 (5.4)	17 (2.7)

[a]New cases of suicidality refer to cases of suicidality not reported prior to the traumatic injury.

Figure 1. Lifetime Suicidality and Suicidality During the First 2 Years After Trauma Exposure[a]



[a]More than 50% of patients who were suicidal at 12 and 24 months were not suicidal at the previous assessment. Similarly, more than 50% of patients who were suicidal at 3 and 12 months were not suicidal at the following assessment.

Information regarding demographics, hospital admission, and injury-related factors were obtained from medical records. At 3, 12, and 24 months after injury, participants were contacted by telephone and were administered the CAPS-1 and the MINI to assess current prevalence of PTSD, suicidality, and other psychiatric disorders. Self-report questionnaire booklets containing the List of Threatening Experiences, as well as a question regarding whether participants had accessed a mental health service use in the past month, were sent to participants to complete. All assessments were recorded to ensure ongoing adherence to the protocol. Five percent of all CAPS-1 and MINI interviews were rescored blind to the original scoring to test interrater reliability. Overall, the interrater reliability was strong for both PTSD diagnostic consistency and symptom severity at 3 months (1.00 and 0.84, respectively), 12 months (0.98 and 0.85, respectively), and 24 months (0.96 and 0.82, respectively).

Data Analysis

We calculated the rates of incidence of suicidal risk for (*a*) all patients and (*b*) those with no history of suicidal risk prior to the injury. Logistic regressions were conducted that predicted moderate/high suicidal risk; that is, a dichotomous variable was calculated in terms of absent/low risk (0–5 points on the MINI) or moderate/high (≥6 points on the MINI). Regressions that initially controlled for age, gender, type of injury, and injury severity score were conducted that subsequently considered presence of MTBI, recent stressful life events, current pain level, PTSD, MDE, anxiety disorder, substance use disorder, any psychiatric disorder, and suicidal history.

RESULTS

Incidence of Suicidality

There were 277 patients (24.7%) who reported prior levels of moderate/high risk of suicidality at some time in their lives prior to their injury. There were 89 patients (7.9%) who reported attempting suicide prior to the traumatic injury. Table 2 presents the incidence of suicidality at 3, 12, and 24 months. The vast majority of patients (88.1%) reported no suicidality at any of the postinjury assessments. At each assessment following the injury, approximately 6% of patients reported suicidality. In terms of those who had never experienced suicidality prior to the injury, approximately 2%–3% of patients reported suicidality at each assessment. To determine the extent to which suicidal risk occurs after injury without major depressive disorder, we also calculated the incidence of suicidality with and without depression. Over one-quarter of patients with suicidal risk had no MDE at 3 (26.2%), 12 (31.7%), and 24 (28.9%) months. Low rates of suicide attempts since the traumatic injury were reported at 3 (n = 5; 0.5%), 12 (n = 13; 1.5%), and 24 (n = 13; 1.6%) months.

Figure 1 demonstrates considerable shift in suicidal risk at the 3-, 12-, and 24-month assessments. Approximately half of the patients with suicidal risk at the 12- and 24-month assessments reported no suicidal risk at the previous assessment. Similarly, nearly half of patients who were high suicidal risk at the 3- and 12-month assessments reported no suicidal risk at the subsequent assessment. The majority of patients who reported no suicidality maintained their minimal suicidal risk for each assessment.

Table 3. Adjusted Odds Ratios (AORs) of Suicidality Development[a]

	3 Months			12 Months			24 Months		
Variable	AOR	95% CI	*P*	AOR	95% CI	*P*	AOR	95% CI	*P*
Suicidal history	8.10	4.42–14.84	.000	7.79	4.31–14.08	.000	6.04	3.15–11.48	.000
Mild traumatic brain injury	2.59	1.41–4.75	.002	1.50	0.84–2.67	.17	1.27	0.67–2.41	.47
Recent stressful events	1.38	1.20–1.58	.000	1.36	1.22–1.53	.000	1.30	1.17–1.44	.000
Pain	1.57	1.09–1.23	.000	1.17	1.10–1.23	.000	1.16	1.09–1.23	.000
Depression	18.13	9.65–34.07	.000	14.75	8.15–26.71	.000	18.45	0.83–36.76	.000
Posttraumatic stress disorder	6.24	3.36–11.60	.000	9.19	5.00–16.91	.000	7.53	3.94–14.39	.000
Anxiety	2.47	1.99–3.07	.000	2.40	1.95–2.97	.000	2.33	1.85–2.93	.000
Substance abuse	3.78	2.06–6.94	.000	5.64	2.86–11.11	.000	2.71	1.28–5.71	.01
Any disorder	5.59	2.74–11.42	.000	7.69	3.92–15.10	.000	17.07	7.03–41.42	.000

[a]Adjusted odds ratios controlling for gender, age, Injury Severity Score, and type of traumatic injury.

Incidence of Posttraumatic Adverse Events

The majority of patients reported stressful life events in the period between the injury and 24 months following the injury, with a mean number of 4.49 ± 3.96 events. Participants reported being injured again (23%), family or close friends being seriously injured (50%), death of family or close friends (43%), being separated from partner (15%), serious problem with friend or relative (22%), being subject to attack or discrimination (14.6%), being unemployed (32%), financial difficulties (32%), legal difficulties (26%), participant or family member mugged (8%), giving birth (6%), miscarriage (4%), moving from house (30%), and housing difficulties (13%).

Risk for Suicidality

Table 3 presents the adjusted odds ratios for suicidality at 3, 12, and 24 months after injury. Notably, suicidality at each assessment was strongly predicted by depression, history of suicidality, recent stressful events, current level of pain, and current diagnoses of depression, PTSD, an anxiety disorder, or substance use disorder. Further, MTBI predicted suicidality at the 3-month assessment.

Health Service Use

In terms of patients with moderate/high suicidal risk, less than half of patients with suicidality had consulted a mental health professional in the previous month at 3 (33.7%), 12 (39.2%), and 24 (36.6%) months. In contrast, most of these patients had consulted a primary care physician in the previous month at 3 (79.8%), 12 (74.4%), and 24 (66.2%) months.

DISCUSSION

To our knowledge, this study is the first to longitudinally assess the suicidality of survivors of traumatic injury. Twenty-four months after injury, 5.4% were at moderate/high risk; approximately half of these patients had never experienced suicidality prior to the injury. This rate of suicidality is markedly higher than the 12-month prevalence rate of 2.3% reported in the Australian National Survey of Mental Health Wellbeing[15]; we note, however, that the measure used in this study (MINI) is not the same one used in the national survey (Composite International Diagnostic Interview). The findings underscore previous reports[6,7,16] that suicidal risk is not limited exclusively to patients with depression and support the contribution of PTSD, anxiety, and substance use to suicidality. Significantly, half of patients who reported suicidal risk after the injury reported that this was their first occurrence of suicidal ideation. Although we excluded patients who were admitted following a traumatic injury that resulted from suicidal or self-harm intent, many patients with suicidal ideation did have prior suicidal risk histories. However, the finding that half of patients with suicidal risk had no suicidal history underscores the deleterious effect of the traumatic injury on many patients' risk for self-harm.

Although the absolute rates of suicidality remained largely stable over the 2 years of the study, approximately half of patients who reported suicidal risk did not report risk at the previous assessment. This pattern suggests marked fluctuation in the suicidality of traumatic injury patients over the time course after injury. Given that recent life events predicted suicidality at each assessment, it is likely that changes in life stressors between assessments contributed to the fluctuating suicidal status of patients. This underscores the need for monitoring of the suicidal risk in patients who have had a traumatic injury because their risk level may change over time, depending on the adversity they are facing.

The finding that stressful life events predicted suicidality accords with theories of suicide risk that emphasize the role of life stressors[17] and with much evidence that life stressors often precipitate suicide.[18] This is consistent with the considerable evidence that chronic pain increases risk for suicide,[19,20] which indicates that the ongoing stress resulting from chronic pain increases the desire to end life. In addition to ongoing pain, many stressors can occur following traumatic injury, including medical procedures, occupational disruption, financial problems, and legal proceedings. The finding that these factors increase the risk for suicidal ideation suggests there is a need to monitor those patients who are particularly exposed to stressful events following traumatic injury.

The finding that MTBI increased risk for suicidality 3 months following injury accords with evidence that MTBI increases risk for posttraumatic psychiatric disorder.[5,21] It is possible that the neural networks required for emotion regulation are compromised as a result of the MTBI. Prevailing models of posttraumatic psychiatric disorders

posit that that impaired regulation of the amygdala by the ventral medial prefrontal cortex leads to excessive emotional difficulties.[22] As damage to the frontal neural networks are common in MTBI, it is possible that MTBI patients are more vulnerable to suicidal ideation because the neural networks required to regulate emotions may be impaired.[23] Additionally, MTBI can deplete cognitive resources,[24] which may impede the capacity to manage posttraumatic stressors. Optimal adjustment following trauma requires adequate use of cognitive strategies to appraise one's situation in functionally adaptive ways[25]; however, this may be compromised by the cognitive effects of MTBI, which, in turn, may increase the risk for suicidality.

Not surprisingly, at each time point the risk of suicidality was increased if the patient had any psychiatric disorder, which accords with much evidence that suicide is increased in the presence of depression, anxiety, and substance abuse.[6] Patients with any psychiatric disorder were 6.90 times more likely to be at risk at 3 months, 12.79 times more likely at 12 months, and 15.09 times more likely at 24 months. This pattern highlights that patients who are displaying psychiatric morbidity should be closely monitored because they are much more likely to engage in self-harm.

We recognize that diathesis-stress models posit that the interaction of vulnerabilities with environmental stress leads to elevated suicide risk.[26] It has been estimated that approximately 43% of the variance of suicidal attempts can be attributed to genetics and the remainder to environmental factors.[27] That is, the likelihood of being suicidal after traumatic injury is probably a function of a range of factors, including personality traits,[28] childhood trauma,[29] and genetic factors,[30] interacting with the effects of the traumatic injury. Relatedly, one-quarter of the sample reported suicidality prior to the traumatic injury, which is markedly higher than the Australian population rate.[31] This difference raises the interesting possibility that suicidal history is a risk factor for traumatic injury, possibly because of increased risk behaviors and increased substance abuse resulting in injury. Moreover, patients with a history of suicidality were 6–8 times more likely to be suicidal following the injury. At an applied level, this suggests that routine screening of suicidal history after traumatic injury may be useful in identifying patients who are markedly more at risk of suicidal tendencies in the years after traumatic injury.

In terms of study limitations, we note that we did not include a noninjured control group. Therefore, we were not able to draw conclusions about the roles of factors associated with traumatic injury, including the incidence of negative events and their impact on suicidal ideation. We also note that treatment-seeking behavior of suicidal patients in this study may be specific to the Australian urban context and should not necessarily be generalized to other health settings. More severe brain-injured patients were excluded from the study because they cannot be reliably assessed within days of hospital admission because of impaired consciousness, and this exclusion may have influenced suicidal rates. Finally, because patients who were admitted following suicidal attempts were excluded, the rates of suicidality may have been underestimated.

A key pattern in this cohort was that, whereas only one-third of patients with moderate/high suicide risk had consulted a mental health professional in the previous month, nearly all had consulted a primary care physician. This highlights that primary care physicians should regularly monitor the suicidal risk of patients with traumatic injury in the years following injury, especially those with any psychiatric disorder, ongoing pain, or recent stressful events. Our procedure did not allow us to index whether patients actually discussed suicidal tendencies with their primary care physician, so we cannot make inferences about disclosure to these health professionals. Nonetheless, given the elevated risk of suicide in patients who have had a traumatic injury, primary care physicians should be trained to screen these patients in the years following injury for these risk factors that render patients more vulnerable to self-harm.

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Author contributions: Dr Bryant has had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

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REFERENCES

1. Non-Fatal Injury Report: web-based injury statistics query reporting system. National Center for Injury Prevention and Control website: http://www.cdc.gov/injury/wisqars/nonfatal.html. Updated February 1, 2016. Accessed 2006.
2. Kessler RC, Sonnega A, Bromet E, et al. Posttraumatic stress disorder in the national comorbidity survey. *Arch Gen Psychiatry*. 1995;52(12):1048–1060.
3. Cavanagh JT, Carson AJ, Sharpe M, et al. Psychological autopsy studies of suicide: a systematic review. *Psychol Med*. 2003;33(3):395–405.
4. Pirkis J, Burgess P. Suicide and recency of health care contacts: a systematic review. *Br J Psychiatry*. 1998;173(6):462–474.
5. Bryant RA, O'Donnell ML, Creamer M, et al. The psychiatric sequelae of traumatic injury. *Am J Psychiatry*. 2010;167(3):312–320.
6. Kessler RC, Borges G, Walters EE. Prevalence of and risk factors for lifetime suicide attempts in the National Comorbidity Survey. *Arch Gen Psychiatry*. 1999;56(7):617–626.
7. Sareen J, Cox BJ, Afifi TO, et al. Anxiety disorders and risk for suicidal ideation and suicide attempts: a population-based longitudinal study of adults. *Arch Gen Psychiatry*. 2005;62(11):1249–1257.
8. Bryant RA, O'Donnell ML, Creamer M, et al. A multisite analysis of the fluctuating course of posttraumatic stress disorder. *JAMA Psychiatry*. 2013;70(8):839–846.
9. Johnson JG, Cohen P, Gould MS, et al. Childhood adversities, interpersonal difficulties, and risk for suicide attempts during late adolescence and early adulthood. *Arch Gen Psychiatry*. 2002;59(8):741–749.
10. American Congress of Rehabilitation Medicine. Definition of mild traumatic brain injury. *J Head Trauma Rehabil*. 1993;8:86–87.
11. *The Abbreviated Injury Scale 1990—Revision*. Des Plaines, IL: American Association for Automotive Medicine; 1990.
12. Sheehan DV, Lecrubier Y, Sheehan KH, et al. The Mini-International Neuropsychiatric

Interview (M.I.N.I.): the development and validation of a structured diagnostic psychiatric interview for *DSM-IV* and *ICD-10*. *J Clin Psychiatry*. 1998;59(suppl 20):22–33, quiz 34–57.
13. Blake DD, Weathers FW, Nagy LM, et al. The development of a Clinician-Administered PTSD scale. *J Trauma Stress*. 1995;8(1):75–90.
14. Brugha T, Bebbington P, Tennant C, et al. The List of Threatening Experiences: a subset of 12 life event categories with considerable long-term contextual threat. *Psychol Med*. 1985;15(1):189–194.
15. Slade T, Johnston A, Teesson M, et al. *The Mental Health of Australians 2. Report on the 2007 National Survey of Mental Health and Wellbeing*. Canberra, Australia: Department of Health and Ageing; 2009.
16. Nock MK, Hwang I, Sampson NA, et al. Mental disorders, comorbidity and suicidal behavior: results from the National Comorbidity Survey Replication. *Mol Psychiatry*. 2010;15(8):868–876.
17. Hawton K, Saunders KE, O'Connor RC. Self-harm and suicide in adolescents. *Lancet*. 2012;379(9834):2373–2382.
18. Horesh N, Sever J, Apter A. A comparison of life events between suicidal adolescents with major depression and borderline personality disorder. *Compr Psychiatry*. 2003;44(4):277–283.
19. Hooley JM, Franklin JC, Nock MK. Chronic pain and suicide: understanding the association. *Curr Pain Headache Rep*. 2014;18(8):435.
20. Hassett AL, Aquino JK, Ilgen MA. The risk of suicide mortality in chronic pain patients. *Curr Pain Headache Rep*. 2014;18(8):436.
21. Hoge CW, McGurk D, Thomas JL, et al. Mild traumatic brain injury in US soldiers returning from Iraq. *N Engl J Med*. 2008;358(5):453–463.
22. Rauch SL, Shin LM, Phelps EA. Neurocircuitry models of posttraumatic stress disorder and extinction: human neuroimaging research—past, present, and future. *Biol Psychiatry*. 2006;60(4):376–382.
23. Bryant RA. Disentangling mild traumatic brain injury and stress reactions. *N Engl J Med*. 2008;358(5):525–527.
24. Landre N, Poppe CJ, Davis N, et al. Cognitive functioning and postconcussive symptoms in trauma patients with and without mild TBI. *Arch Clin Neuropsychol*. 2006;21(4):255–273.
25. Ehlers A, Clark DM. A cognitive model of posttraumatic stress disorder. *Behav Res Ther*. 2000;38(4):319–345.
26. Mann JJ, Waternaux C, Haas GL, et al. Toward a clinical model of suicidal behavior in psychiatric patients. *Am J Psychiatry*. 1999;156(2):181–189.
27. McGuffin P, Marusic A, Farmer A. What can psychiatric genetics offer suicidology? *Crisis*. 2001;22(2):61–65.
28. Fazaa N, Page S. Personality style and impulsivity as determinants of suicidal subgroups. *Arch Suicide Res*. 2009;13(1):31–45.
29. Molnar BE, Berkman LF, Buka SL. Psychopathology, childhood sexual abuse and other childhood adversities: relative links to subsequent suicidal behaviour in the US. *Psychol Med*. 2001;31(6):965–977.
30. Mann JJ. Neurobiology of suicidal behaviour. *Nat Rev Neurosci*. 2003;4(10):819–828.
31. Johnston AK, Pirkis JE, Burgess PM. Suicidal thoughts and behaviours among Australian adults: findings from the 2007 National Survey of Mental Health and Wellbeing. *Aust N Z J Psychiatry*. 2009;43(7):635–643.