Depression, healthcare utilization, and comorbid psychiatric disorders after spinal cord injury

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Background: Depression is often comorbid with other psychiatric conditions in the general population, with resultant impact on severity of conditions and healthcare utilization. It is unclear to what degree this is also true among persons with spinal cord injury (SCI).

Objective: This study examined rates at which psychiatric conditions were comorbid with depression after SCI, and the association between a depression diagnosis and healthcare and pharmaceutical drug use.

Methods: Retrospective analysis of data ($N=41\,213$) abstracted from Veterans Health Administration administrative databases between fiscal years (FYs) 1997 and 2007 to examine overall rates of depression. Administrative data from FY 2007 was used to examine rates of psychiatric disorders comorbid with depression, and to compare veterans with SCI and depression to veterans with SCI but no depression on healthcare and pharmaceutical use.

Results: Twenty-eight percent ($n=11\,506$) of 41 213 veterans who received SCI care between FY 1997 and FY 2007 were diagnosed with depressive disorders. Among the veterans with SCI and depression diagnoses in 2007 ($n=2615$), 70% were also diagnosed with another psychiatric illness, with posttraumatic stress disorder and other anxiety disorders being the most common. Veterans with SCI and depression had more healthcare visits and received more pharmaceutical prescriptions than their counterparts without depression.

Conclusions: Persons with SCI and depression are likely to experience comorbid psychiatric illnesses, with associated increased healthcare visits and medication use. Research and theory on depression after SCI should develop toward describing and addressing psychiatric and medical co-morbidities that are normative in this population.

Keywords: Depression, Comorbidity, Healthcare, Posttraumatic stress disorder, Spinal cord injury

Introduction

Depression is a common secondary condition after spinal cord injury (SCI)¹ that is implicated in poorer health,² lower functioning,^{3,4} and higher mortality rates.⁵ Depression has also been consistently correlated with additional psychological problems after SCI, such as lower quality of life and higher perceived stress.⁶

The extent to which depression is comorbid with other psychiatric diagnoses after SCI has received little attention in the empirical literature. One recent study demonstrated that mental illnesses occurring after SCI were often comorbid to substance abuse problems.⁷ Another study conducted at four SCI Model Systems sites found that persons with SCI and probable major depression were more likely to report a history of other psychiatric disorders than those without probable major depression.⁸ This emerging evidence suggests that

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psychiatric comorbidity may be common after SCI. This should be of concern to patients with SCI and their care providers based upon what we know from research in the general population. Specifically, in general populations, psychiatric comorbidities are quite common; in fact, diagnosis with two or more psychiatric conditions may be more common^{9,10} or almost as common¹¹ as diagnosis with one. Psychiatric conditions are more severe when co-occurring,^{9–11} which may account for findings that those individuals with comorbid conditions generally have a more chronic and complicated course, and poorer treatment response.⁷

The primary aims of this study were to examine rates of depression and psychiatric disorders comorbid to depression among United States military veterans with SCI. A secondary aim of the study was to examine healthcare and medication use among veterans with SCI and depression.

Methods

Study aims were addressed through retrospective analysis of administrative data gathered from the Veterans Health Administration (VA) National Registry for Depression (NARDEP).¹² NARDEP includes data for over two million patients diagnosed with depressive disorders in VA facilities from fiscal year (FY) 1997 forward. NARDEP draws patient-level data from the Austin Automation Center in Austin, Texas, which is the repository for multiple VA administrative databases, which in turn are populated with data from all VA facilities nationwide. Veterans with SCI diagnosed with depressive disorder, as determined by ICD-9 codes, in either inpatient or outpatient settings, were the focus of the study. Diagnoses considered to indicate depressive disorders in this study included major depressive disorder, dysthymic disorder, and depressive disorder not otherwise specified (NOS) (Table 1). NARDEP also contains a random sample of VA users without depression who made at least one inpatient or outpatient visit within the VA. From the NARDEP random

sample, ICD-9 codes were used to focus on veterans with SCI but no depression in 2007. This sample provided a comparison group for veterans with SCI and depression. The random sample included veterans with SCI and psychiatric illnesses other than depression.

Depression registry data between FY 1997 and FY 2007 were accessed to examine overall rate of depressive disorders among veterans with SCI. The cohort of veterans with SCI was obtained from a list created by the VA Allocation Resource Center, which maintains an ongoing registry of veterans with SCI that is used to allocate resources to VA medical centers. The list is based on VA utilization and diagnosis data; veterans are included in the cohort if they have one of the following SCI-related diagnostic codes: quadriplegia (344.0–344.09), paraplegia NOS (344.1), fracture of vertebral column with SCI (806.00–806.9), late effect of SCI (907.2), and SCI without evidence of spinal bone injury (952.0–952.9). This list was cross-referenced with NARDEP registry data to determine the number of veterans with SCI who had received depressive disorder diagnoses during this time frame.

Depression registry data from FY 2007 was accessed to address comorbidity and healthcare utilization questions. Comorbidity and healthcare utilization analyses were focused on a single year in order to provide a specific time period for analyzing healthcare utilization and for defining comorbidity. Data available in NARDEP included demographic and SCI characteristics, number and type of inpatient stays, number and type of outpatient visits, and receipt of medication prescriptions in the following classes: anxiolytics, anticholinesterases, anticonvulsants, antidepressants, benzodiazepines, antipsychotics, and opioids. ICD-9 codes were used to determine the present of the following psychiatric comorbidities: post-traumatic stress disorder (PTSD), other anxiety disorders, substance abuse, alcohol abuse, bipolar disorder, personality disorder, and schizophrenia (Table 1).

Descriptive statistics were used to examine prevalence and sample characteristics questions. Chi-square

Table 1 Diagnostic classifications and corresponding ICD-9 codes

Diagnostic classifications	ICD-9 codes
Major depressive disorder	296.2x, 296.3x
Dysthymic disorder	300.4
Depressive disorder NOS	311
PTSD	309.81
Other anxiety disorder	300.00, 300.02, 300.09, 300.10, 300.20, 300.23, 300.29
Substance abuse	292.x, 304.0x–9x
Alcohol abuse	291.x, 303.0x, 303.9x
Bipolar disorder	296.8x
Personality disorder	301.0, 301.2, 301.22, 301.7, 301.83, 301.5, 301.81, 301.82, 301.6, 301.4, 301.9
Schizophrenia	295.0–0.9

analyses and *t*-tests were used to compare Veterans with SCI who were diagnosed with depressive disorders in FY 2007 to veterans with SCI and no depression diagnoses which were drawn from the NARDEP random sample.

Results

Overall prevalence and sample characteristics

Of the 41 213 veterans with SCI identified between FYs 1997 and 2007, 11 506 (28%) were diagnosed with depression during that time period. Additional analyses focused on the 2615 veterans with SCI who were diagnosed with depression during FY 2007 and how they compared to the 181 veterans with SCI without depression from the NARDEP random sample. Those with depression were not significantly different from those without depression on demographic or medical characteristics. On average, veterans with SCI and depression in 2007 were male, white, older than 45 years of age, and had been living with SCI for over 20 years (Table 2). Most (81%) veterans had traumatic SCI; 19% had non-traumatic spinal cord disorder.

Comorbidity

Rates of psychiatric disorders comorbid to depression were examined among veterans with SCI who were diagnosed with depression in 2007. Less than one-third had depression alone. PTSD was the most common comorbid condition at about 21%, followed by other anxiety disorders (about 13%), substance abuse (about 10%), and alcohol abuse (about 8%) (Table 3).

Table 2 SCI characteristics and demographics

	SCI and depression (<i>n</i> = 2615)	SCI, no depression (<i>n</i> = 181)
Years since injury (mean, SD)	20.1 (15.0)	21.1 (14.5)
Neurological impairment (%)		
Paraplegia	57.1	55.9
Tetraplegia	42.9	44.1
Age group (%)		
18 to 44	14.7	15.4
45 to 64	62.9	52.8
65 +	22.5	31.8
Married (%)	41.9	42.0
Male (%)	94.9	98.9
Race (%)		
White	68.7	66.3
Black	15.0	20.4
Other	12.8	7.8
Hispanic	3.5	5.5

Differences between groups were not statistically significant.
SCI, spinal cord injury.

Healthcare and pharmaceuticals use

Healthcare and pharmaceuticals use was examined among veterans with SCI who were diagnosed with depression in 2007. As compared to veterans with SCI and no depression, those with depression generally received more inpatient and outpatient services. The majority of veterans with SCI and depression had at least one psychiatric outpatient visit; five such visits were made, on average. Veterans with SCI and depression had, on average, about one outpatient visit for substance abuse care and about one inpatient stay for medical care during that year (Table 4).

Almost all (98%) veterans with SCI who had been diagnosed with depression were prescribed some drug in the year of the study, as compared to about one half (56%) of their counterparts without depression who received a prescription. With only one exception (anticholinesterases), in every drug class veterans with SCI and depression were much more likely to have received a prescription. Nearly all (96%) veterans with SCI and depression had been on an antidepressant at some time during 2007. Almost half of those with depression used anxiolytics, anticonvulsants, and opioid medications during the year of the study. Of note is the finding that use of these medication classes, even antidepressants, was also common among those without depression diagnoses (Table 5).

Discussion

Evidence is emerging that psychiatric disorders are often comorbid to depression among persons with SCI. This study built upon past research by examining rates of comorbidity for depression and psychiatric disorders in a large sample of veterans with SCI and how this comorbidity was associated with use of healthcare and pharmaceuticals. We first examined overall rates of depression among the 41 213 veterans with SCI who received care in the VA between 1997 and 2007; 28% were diagnosed with a depressive disorder in this time period. This rate compares closely to rates of depression

Table 3 Rates of comorbid psychiatric disorders among veterans diagnosed with depression

Depression alone	29.6%
PTSD	20.8%
Other anxiety disorder	12.6%
Substance abuse	10.2%
Alcohol abuse	7.5%
Bipolar disorder	4.5%
Personality disorder	3.7%
Schizophrenia	3.1%
Two or more comorbidities	8.0%

PTSD, posttraumatic stress disorder.

Table 4 Healthcare use during the year of study

	SCI and depression <i>n</i> = 2615	SCI, no depression <i>n</i> = 181	<i>P</i> value
Outpatient utilization			
At least one psychiatric visit (%)	59.9	11.1	<0.0001
At least one substance abuse visit (%)	6.7	0.6	<0.0001
Total psychiatric visits (mean, SD)	5.1 (14.1)	0.3 (1.2)	NS
Total non-psychiatric visits (mean, SD)	43.0 (40.0)	31.0 (25.6)	<0.01
Total Substance Abuse visits (mean, SD)	0.96 (7.2)	0.01 (0.1)	NS
Inpatient utilization			
At least one psychiatric stay (%)	8.5	1.1	<0.01
At least one medical stay (%)	44.2	27.6	<0.0001
Total psychiatric stays (mean, SD)	0.12 (0.55)	0.01 (0.14)	<0.001
Total medical stays (mean, SD)	0.98 (1.5)	0.67 (1.3)	<0.001

SCI, spinal cord injury; SD, standard deviation.

reported among persons with SCI in another recent examination of VA databases (27%)⁷ and by four SCI Model System sites (23%).⁸ An important strength of this study was the veteran sample with several notable features not typically found in studies of persons with SCI: there were many participants who were older in age, many years post-SCI, of non-white ethnicity, and with non-traumatic spinal cord disorders.

Comorbidity

Depression was accompanied by other psychiatric diagnoses, anxiety disorders predominantly, in a large majority (70%) of veterans with SCI in this sample. This finding is consistent with past recent research on psychiatric comorbidities after SCI. Banerjee *et al.*⁷ found that almost one-third of persons with SCI and a psychiatric disorder also had a substance use disorder. Fann *et al.*⁸ also found high rates of current and historical psychiatric comorbidities to depression after SCI. Rates of comorbidity in this study far exceed rates of comorbid psychiatric disorders reported in the National Comorbidity Survey Replication (70% versus 45%, respectively).¹¹ This difference in comorbidity rates is especially striking because the comorbidity

rates reported in the National Comorbidity Survey Replication¹¹ included all possible psychiatric comorbidities, not just disorders comorbid to depression.

The very high rates of comorbidity in this study are concerning because depression accompanied by other mental health disorders is likely to be more severe and difficult to treat effectively.^{9–11} The collective evidence suggests that efforts to assess and treat depression after SCI as an isolated disorder may be limited in effectiveness and applicable to few patients. This research aligns with the long-recognized position that patterns of comorbidity are a manifestation of the true structure of psychopathology, with important ramifications for the classification of mental illness.⁹ For example, factor analytic studies¹³ consistently find strong inter-correlations between depressive and anxiety disorders (i.e. comorbidity), leading to suggestions that these disorder classes should be collapsed together in a “distress disorder” class within diagnostic classification systems.¹⁴

Healthcare and pharmaceuticals use

Veterans with SCI and depression received more services than their counterparts without depression, findings that

Table 5 Rates of medications received

	SCI and depression <i>n</i> = 2615	SCI, no depression <i>n</i> = 181	<i>P</i> value
Any drug	97.9	56.2	<0.0001
Antidepressants	95.7	24.4	<0.0001
Anxiolytics	46.1	27.4	<0.0001
Anticonvulsants	45.1	25.1	<0.0001
Opioids	44.5	25.1	<0.0001
Benzodiazepines	43.1	25.8	<0.0001
Antipsychotics	13.6	5.0	<0.0001
Atypical antipsychotics	13.3	4.3	<0.0001
Anticholinesterases	1.9	1.7	NS

Values represent the percentage of the sample who received a prescription for a drug in the medication class during the year of study. SCI, spinal cord injury.

align with past research.¹⁵ The rate of hospitalization for veterans with SCI and depression was about double that found during past research among non-veterans with SCI.¹⁶ Past research has found that healthcare utilization by persons with SCI may be associated with socio-demographic factors^{17,18} which were not associated with depression status in this study. It is possible that greater use of healthcare resources by veterans with SCI and depression in this study was related to unmeasured variables such as medical illnesses^{17,18} and/or health behavior factors such as smoking, skin care, or diet.¹⁷

Use of pharmaceutical drugs of most classes was high among veterans with SCI and depression as compared to their counterparts without depression. Almost half of those with depression were prescribed anxiolytics, anticonvulsants, and opioid medication classes during the year of study. Use of anxiolytics is likely a reflection of the prominent anxiety disorders in this sample. High use of anticonvulsants and opioids may be attributable to pain treatments. VA¹⁹ and non-VA²⁰ studies have also found high rates of opioid use among patients with mental health concerns, raising concerns about high-risk use and adverse clinical outcomes.²¹ Use of these medication classes, including antidepressants, was also common (about 25%) among those without depression, suggesting the possibility of sub-diagnostic distress concerns, pain problems, and other ailments typical after SCI. Data available for this study did not allow for examination of the adequacy of treatment received. Two studies found that rates and duration of antidepressant medication prescriptions were inadequate among persons with SCI.^{8,22}

Limitations

This study had strengths and limitations related to use of VA healthcare databases.²³ These databases allowed access to a very large, nationwide cohort. However, these databases were created for clinical and administrative purposes and thus were limited for exploring all research questions such as explanations for comorbidities or healthcare utilization. In addition, focus on depression as defined by diagnostic codes limits what meaning these results may have for diagnostic or sub-diagnostic conditions experienced by persons with SCI. Generalizability of results can be questioned because this study focused on veterans with SCI, who tend to be older and to experience more medical problems than non-veterans. Additionally, the sample in this study was overwhelmingly male, which is characteristic of veterans in general, but raises concerns about how well findings generalize to women with SCI.

Conclusions

Persons with SCI and depression are likely to experience comorbid psychiatric illnesses, along with increased healthcare visits and medication use. This common scenario for persons with SCI and depression may center on the complicated bidirectional interplay of psychological distress and medical illness²⁴ wherein clinical conditions are worsened and treatments are rendered less effective. Interdisciplinary care represents the best chance for successful treatment of these troublesome conditions, with both psychological and pharmacological treatments being administered conjointly. Research and theory on depression after SCI should develop in the direction of describing and addressing psychiatric and medical comorbidities that are normative in this population.

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References

- 1 Craig A, Tran Y, Middleton J. Psychological morbidity and spinal cord injury: a systematic review. *Spinal Cord* 2009;47(2):108–14.
- 2 Herrick S, Elliott TR, Crow F. Social support and the prediction of health complications among persons with spinal cord injuries. *Rehabil Psychol* 1994;39(4):231–50.
- 3 Fuhrer MJ, Rintala DH, Hart KA, Clearman R, Young ME. Depressive symptomatology in persons with spinal cord injury who reside in the community. *Arch Phys Med Rehabil* 1993; 74(3):255–60.
- 4 Umlauf R, Frank RG. A cluster-analytic description of patient subgroups in the rehabilitation setting. *Rehabil Psychol* 1983; 28(3):157–67.
- 5 Krause JS, Carter R, Pickelsimer E, Wilson D. A prospective study of health and risk of mortality after spinal cord injury. *Arch Phys Med Rehabil* 2008;89(8):1482–91.
- 6 Martz E, Livneh H, Priebe M, Wuermser LA, Ottomanelli L. Predictors of psychosocial adaptation among people with spinal cord injury or disorder. *Arch Phys Med Rehabil* 2005;86(6): 1182–92.
- 7 Banerjee R, Findley PA, Smith B, Findly T, Sambamoorthi U. Co-occurring medical and mental illness and substance use disorders among veteran clinic users with spinal cord injury patients with complexities. *Spinal Cord* 2009;47(11):789–95.
- 8 Fann JR, Bombardier CH, Richards JS, Tate DG, Wilson CS, Temkin N. Depression after spinal cord injury: comorbidities, mental health service use, and adequacy of treatment. *Arch Phys Med Rehabil* 2011;92(3):352–60.
- 9 Clark LA, Watson D, Reynolds S. Diagnosis and classification of psychopathology: challenges to the current system and future directions. *Ann Rev Psychol* 1995;46:121–53.
- 10 Kessler RC, McGonagle KA, Zhao S, Nelson CB, Hughes M, Eshleman S, Wittchen HU, Kendler KS. Lifetime and 12-month prevalence of DSM-III-R psychiatric disorders in the United States: results from the National Comorbidity Study. *Arch Gen Psychiatry* 1994;51(1):8–19.

- 11 Kessler RC, Chiu WT, Demler O, Merikangas KR, Walters EE. Prevalence, severity, and comorbidity of 12-month DSM-IV disorders in the National Comorbidity Survey Replication. *Arch Gen Psychiatry* 2005;62(6):617–27.
- 12 Blow FC, Owen RE, Valenstein M, Austin K, Khanuja K, McCarthy JF. Specialty care for veterans with depression in the VHA 2002 National Registry for Depression (NARDEP) Report. Ann Arbor, MI: Department of Veterans Affairs National Serious Mental Illness Treatment Research & Evaluation Center; 2003.
- 13 Kotov R, Ruggero CJ, Krueger RF, Watson D, Yuan Q, Zimmerman M. New dimensions in the quantitative classification of mental illness. *Arch Gen Psychiatry* 2011;68(10):1003–11.
- 14 Watson D. Rethinking the mood and anxiety disorders: a quantitative hierarchical model for DSM-V. *J Abnorm Psych* 2005; 114(4):522–36.
- 15 Ullrich PM, Lincoln RK, Tackett MJ, Miskevics S, Smith BM, Weaver FM. Pain, depression and health care utilization over time after spinal cord injury. *Rehabil Psychol* 2013;58(2):158–65.
- 16 Savic G, Short DJ, Weitzenkamp D, Charlifue SW, Gardner BP. Hospital readmissions in people with chronic spinal cord injury. *Spinal Cord* 2000;38(6):371–7.
- 17 Krause JS, Saunders LL. Risk of hospitalizations after spinal cord injury: relationship with biographical, injury, educational, and behavioral factors. *Spinal Cord* 2009;47(9):692–7.
- 18 LaVela SL, Smith B, Weaver FM, Miskevics SA. Geographical proximity and health care utilization in veterans with SCI&D in the USA. *Soc Sci Med* 2004;59(11):2387–99.
- 19 Edlund MJ, Steffick D, Hudson T, Harris KM, Sullivan M. Risk factors for clinically recognized opioid abuse and dependence among veterans using opioids for chronic non-cancer pain. *Pain* 2007;129(3):355–62.
- 20 Sullivan MD, Edlund MJ, Steffick D, Unützer J. Regular use of prescribed opioids: association with common psychiatric disorders. *Pain* 2005;119(1–3):95–103.
- 21 Seal KH, Shi Y, Cohen G, Cohen BE, Maguen S, Krebs EE, *et al.* Association of mental health disorders with prescription opioids and high-risk opioid use in US veterans of Iraq and Afghanistan. *JAMA* 2012;307(9):940–7.
- 22 Smith BM, Weaver FM, Ullrich PM. Prevalence of depression diagnoses and use of antidepressant medication by veterans with spinal cord injury. *Am J Phys Med Rehabil* 2007;86(8): 662–71.
- 23 Smith BM, Evans C, Ullrich PM, Burns S, Guihan M, Miskevics S, *et al.* Using VA data for research in persons with spinal cord injuries and disorders: lessons from SCI QUERI. *J Rehabil Res Dev* 2010;47(8):679–88.
- 24 Katon W, Ciechanowski P. Impact of major depression on chronic medical illness. *J Psychosom Res* 2002;53(4):859–63.