Correlates of Suicide Among Veterans Treated in Primary Care: Case–Control Study of a Nationally Representative Sample

Steven K. Dobscha, MD[1,2], Lauren M. Denneson, PhD[1,2], Anne E. Kovas, MPH[1], Alan Teo, MD[1,2], Christopher W. Forsberg, MS[1], Mark S. Kaplan, DrPH[3], Robert Bossarte, PhD[4], and Bentson H. McFarland, MD, PhD[2]

[1]Center to Improve Veteran Involvement in Care, Portland Veterans Affairs Medical Center, Portland, OR, USA; [2]Department of Psychiatry, Oregon Health & Science University, Portland, OR, USA; [3]Department of Social Welfare, UCLA Luskin School of Public Affairs, Los Angeles, CA, USA; [4]Veterans Integrated Service Network (VISN) 2 Center of Excellence for Suicide Prevention, Canandaigua, NY, USA.

BACKGROUND: Veterans receiving Veterans Affairs (VA) healthcare have increased suicide risk compared to the general population. Many patients see primary care clinicians prior to suicide. Yet little is known about the correlates of suicide among patients who receive primary care treatment prior to death.

OBJECTIVE: Our aim was to describe characteristics of veterans who received VA primary care in the 6 months prior to suicide; and to compare these to characteristics of control patients who also received VA primary care.

DESIGN: This was a retrospective case–control study.

SUBJECTS: The investigators partnered with VA operations leaders to obtain death certificate data from 11 states for veterans who died by suicide in 2009. Cases were matched 1:2 to controls based on age, sex, and clinician.

MAIN MEASURES: Demographic, diagnosis, and utilization data were obtained from VA's Corporate Data Warehouse. Additional clinical and psychosocial context data were collected using manual medical record review. Multivariate conditional logistic regression was used to examine associations between potential predictor variables and suicide.

KEY RESULTS: Two hundred and sixty-nine veteran cases were matched to 538 controls. Average subject age was 63 years; 97 % were male. Rates of mental health conditions, functional decline, sleep disturbance, suicidal ideation, and psychosocial stressors were all significantly greater in cases compared to controls. In the final model describing men in the sample, non-white race (OR=0.51; 95 % CI=0.27–0.98) and VA service-connected disability (OR=0.54; 95 % CI=0.36–0.80) were associated with decreased odds of suicide, while anxiety disorder (OR=3.52; 95 % CI=1.79–6.92), functional decline (OR=2.52; 95 % CI=1.55–4.10), depression (OR=1.82; 95 % CI=1.07–3.10), and endorsement of suicidal ideation (OR=2.27; 95 % CI=1.07–4.83) were associated with greater odds of suicide.

CONCLUSIONS: Assessment for anxiety disorders and functional decline in addition to suicidal ideation and depression may be especially important for determining suicide risk in this population. Continued development of interventions that support identifying and addressing these conditions in primary care is indicated.

Published online October 30, 2014

KEY WORDS: mental health; veterans; primary care; health services research.

J Gen Intern Med 29(Suppl 4):S853–60

DOI: 10.1007/s11606-014-3028-1

BACKGROUND

Suicide prevention has been designated a "national imperative" in the United States[1] and addressing suicide among veterans is a high priority. Many veterans receiving treatment in the Veterans Health Administration (VA) system have risk factors for suicide, including older age, male gender, and multiple medical and psychiatric comorbidities; veterans treated in the VA have approximately 50 % greater risk than the general population for suicide.[2]

Primary care has been highlighted by experts as a key setting for suicide prevention[3] for several reasons. A systematic review of published studies up to the year 2000 indicated that, on average, 45 % of suicide victims have contact with primary care clinicians within 1 month of suicide.[4] Several studies have shown that a minority of these patients have contacts with mental health clinicians.[4,5] Primary care clinicians, often working upstream from specialty mental health, may therefore be in a uniquely advantageous position to intervene with patients at risk for suicide.

There are a number of challenges to enhancing suicide prevention in primary care. Little information is available in the literature describing the characteristics of veterans who see primary care clinicians and subsequently die by suicide. Prior studies have been limited to one state,[5] examined suicidal ideation rather than suicide,[6,7] synthesized data pre-dating recent VA suicide prevention initiatives,[8] or focused on particular mental health populations[9,10] or on patients referred *from* primary care.[11]

The objective of this study was to describe demographic, clinical, and psychosocial characteristics of a multi-state sample of veterans who received VA primary care in the 6 months prior to death, and compare these characteristics to those of a

group of control patients who received care over the same time period from the same clinicians. Our goal was to highlight salient patient characteristics for primary care clinicians to identify and address among their patients.

METHODS

This study was approved by the Institutional Review Board of the VA medical center where the study was conducted. Data sharing agreements were completed and appropriate permissions obtained in order to access and analyze all sources of data.

Collaboration Between Investigators and VA Operations Partners. In 2010, Secretary of Veterans Affairs Shinseki engaged the governors of all U.S. states, requesting support and collaboration to improve the timeliness and utility of suicide mortality reporting for veterans. This request led to the development of state-level data use agreements for the purpose of sharing identified mortality data with the VA for known suicides (as of 2012, data use agreements had been approved by 34 states, and data had been received from 21 states). At approximately the same time, the investigators began a dialogue with the VA Mental Health Services–Suicide Prevention Office regarding suicide prevention in primary care. The Office encouraged us to pursue collaboration with them in order to help VA identify opportunities to intervene with veterans seen in primary care who may be at risk. As a result of this dialogue, a data-sharing agreement was established between the Veterans Integrated Service Network (VISN)-2 Center of Excellence for Suicide Prevention and our investigator group, to provide extracts of state death certificate data spanning 1999 to 2009.

Sources of Data. For the current project, we used data from 11 states (first set of states to complete data use agreements with the VA). This data set contained information on all individuals determined on death certificates to have died by suicide, and whose Social Security number matched exactly to an individual listed in the VA's National Patient Care Database. We then obtained data on veteran status and prior healthcare from the national VA Corporate Data Warehouse (CDW),[12] a collection of demographic, clinical, utilization, and cost data from many databases accessed securely via the VA Informatics and Computing Infrastructure (VINCI) Workspace.[12] Additional data describing psychosocial context variables were obtained through manual medical record review using the VA Compensation and Pension Records Interchange.

Settings. The 11 states were diverse in terms of geographic distribution across the U.S. and population (Fig. 1). Within these states, 41 unique VA facilities were represented. Our sample represented approximately one-third of national VA facilities and, as compared to the national VA patient population, was very similar across multiple patient and facility characteristics (Table 1).

SUBJECTS

Cases. We included all veterans from 11 states who died by suicide in 2009 and who had contact (telephone or in person) with a VA primary care clinician (physician, nurse practitioner, physician assistant) in the 6 months prior to suicide. There were no exclusion criteria.

Controls. Using CDW, controls were identified and matched 2:1 to cases based on a predefined set of characteristics. Typically, cases are matched to controls on a limited number of variables to control for effects of variables that prior work has demonstrated affect the outcome variable.[13] Our approach also allowed for estimation of the association of the non-matched variables on the outcome using multivariable analysis.[13] For each case, we first identified the primary care clinician seen most often in the 6 months prior to death. Then, we identified potential controls as all patients who had received care from the same clinician in the same 3-month time period (quarter). We then matched cases to controls on sex, then age—rates and methods of suicide have been shown to vary by sex and by age.[14,15] When multiple suitable controls were available, we selected the control patient who saw the matched primary care clinician most proximally to the case's primary care visit. Exact age matches were obtained for 93 % of controls, and 86 % of controls had been seen within 2 weeks of case primary care visits. An index date for each case–control triad was defined as the case patient's date of death.

MEASURES

Demographic Characteristics. Date of death and education level were obtained from state death certificates. Veteran age, sex, race, ethnicity, marital status, ZIP code, and VA service connected disability rating (categorized as greater or equal to vs. less than 50 % disabled) were extracted from CDW. Rural versus urban residence was determined by matching patient residence ZIP codes with Rural–urban Commuting Area Codes.[16,17] We also used CDW to determine the facility in which primary care clinician visits occurred.

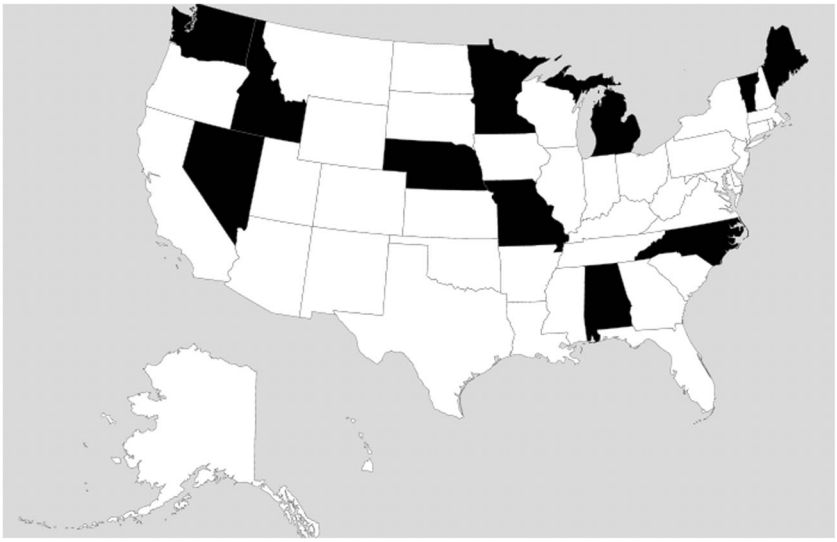

Figure 1. Death certificate data were obtained from Alabama, Idaho, Maine, Michigan, Minnesota, Missouri, North Carolina, Nebraska, Nevada, Vermont, and Washington.

Clinical Characteristics. We used ICD-9-Clinical Modification (ICD-9-CM) diagnoses from CDW that had been recorded by clinicians to document clinical encounters in the 6 months prior to index date. We specifically identified any diagnosis of mood disorders, psychotic disorders, substance including alcohol use disorders, post-traumatic stress disorder (PTSD), other anxiety disorders, traumatic brain injury (TBI), and pain diagnoses (ICD-9-CM codes available from authors on request). The Selim comorbidity index[18,19] was used to measure overall medical morbidity; it counts across 30 medical conditions and six mental conditions from ICD-9-CM diagnoses made in the prior year.

Table 1. Patient Characteristics and Complexity of Veterans Affairs Facilities in Study Year (2009)

	11-State sample	Nationally
Patient characteristics*		
Age %		
25–39	11.79	12.49
40–49	14.89	14.56
50–59	17.88	17.30
60–69	26.19	25.31
70–79	16.41	16.50
80+	11.79	12.72
Female %	9.22	9.57
White (vs. Other) %	84.28	79.48
Facility Characteristics		
Unique patients per VA facility†		
Mean	43,333	44,394
Median	40,785	40,785
Range	15,498–92,325	11,807–128,857
Distribution of VA facilities by complexity‡		
1a	24.39	23.19
1b	7.32	12.32
1c	17.07	18.12
2	29.27	23.91
3	21.95	23.19

*Source: Vet Pop 2011 data for 30 September2010[37]
†Source: Veterans Health Administration FY09 Allocation Resource Center: Unique veterans by VERA category – Facility[47]
‡Source: Veterans Health Administration 2009 VHA Facility Quality and Safety Report.[48] The Veterans Health Administration classifies its facilities as Level 1 (most complex) to Level 3 (least complex) using a system based on patient population characteristics, clinical services offered, educational and research missions, and administrative complexity. Level 1 is further subdivided into categories 1a–1c, with 1a facilities representing the highest complexity

We used a systematic, iterative process to develop a medical record data collection tool to record documentation of previously identified suicide risk factor variables in the 6 months prior to the index date; we have used similar approaches in prior studies.[9,20–24] Clinical variables determined using this method included sleep problems, functional decline, anger, and suicidal ideation endorsement; psychosocial context variables included housing instability, isolation, grief/loss of a loved one, recent move, and financial, legal, job/school, or relationship problems (Table 2). These items were selected based on prior research suggesting possible relationships among these variables and suicide risk, and recommended data elements from the Centers for Disease Control and Prevention.[9,15,20,22,24–27] The majority of these variables were recorded dichotomously— counted as "yes" if the construct was documented in any progress note by clinicians or other medical staff (e.g., medical assistants or nurses) during the 6 months prior to the index date. For suicidal ideation and attempts, there were three levels: not asked (suicidal ideation not mentioned in notes); not endorsed (veteran asked, but did not endorse); and endorsed (veteran asked and endorsed). The investigators and experienced medical record reviewers developed the data collection tool over several iterations until they agreed on content and coding, and inter-rater reliability was excellent (individual item and overall Kappa≥0.75).[28] Each patient's record was reviewed independently with monthly re-testing of inter-rater reliability (which remained excellent).

ANALYSIS

First, using t-tests for linear variables and chi-square tests for categorical variables, we assessed bivariate relationships

Table 2. Coding Definitions for Data Extracted Via Manual Medical Record Review

Clinical actions and conditions	
Discussed suicidal ideation	Notes document discussion of whether patient is experiencing suicidal ideation. Includes response to templated suicide risk assessments routinely administered in VA following positive depression and post-traumatic stress disorder screens.[49]
Endorsed suicidal ideation	Endorsement of thoughts about engaging in suicide-related behavior, including passive ideation.
Discussion of attempt	Notes document discussion of whether patient had any previous suicide attempts.
Attempt endorsed	Endorsement of suicide attempt(s).
Anger	Notes indicate angered emotional state ranging from irritation to intense fury or rage.
Functional decline	New or worsening health problem that limits normal activities or requires dependence on others.
Sleep disturbances	Any difficulty with sleep, nightmares, or sleep apnea, excluding oversleeping or sleepiness.
Psychosocial context	
Housing instability	Evidence of homelessness, evictions, or temporary housing occurring within 6 months prior to index date.
Relationship problem	Evidence of divorce, break-up, arguments or estrangement with either intimate or non-intimate relationships.
Isolation	Evidence of loneliness, social withdrawal, living alone without supports, non-intact or estranged families.
Moving/recently moved	A recent move of residence or plans to move in near future (unrelated to housing instability or loss of independence).
Legal problems	Evidence of involvement in legal process, such as impending court appearance, custody dispute, or probation/parole.
Financial problems	Evidence of concern about finances, bankruptcy, debts, and/or foreclosure.
Job or school problems (other than financial)	Difficulty stemming from work/school or lack of work such as job layoff/firing, pressure/stress, or active search for employment.
Grief/loss of loved one	Recent death of loved one or a pet, or current grief for a death of loved one that occurred at any time.

between demographic, clinical and psychosocial context variables and case/control status. PTSD was examined separately from other anxiety disorders. Next, we used multivariate conditional logistic regression to examine associations between candidate predictor variables and suicide. Women were excluded from the analyses, as our sample contained few women, and suicide behaviors and risks for men and women have been shown to differ in important ways.[29,30] In order to account for possible within-facility correlation, regression models were clustered on facility. To limit the number of variables in regression models, we used all variables (except the composite variable, "any" psychiatric diagnosis) that were associated with suicide in bivariate tests at $p<0.10$. Alcohol use disorder was collapsed with other substance use disorders. All analyses were conducted using Stata 13.1 with two-sided alpha=0.05, unless otherwise stated.

RESULTS

Across the 11 state sample, the 269 cases and 538 controls had similar age and sex characteristics compared to the national veteran population (Table 1). During their study periods, cases and controls in our sample had visits with 236 clinicians in total, 65 (28 %) nurse practitioners or physician assistants, and 171 physicians (73 %).

Because males comprised 97 % of the veteran sample, females ($n=24$) were excluded from the analyses; the final sample included 261 cases and 522 controls. Table 3 shows demographic and clinical characteristics of male cases and controls, as well as unadjusted bivariate comparisons between the two groups. Across the sample, mean age was 63 years, 84 % were white, and 66 % lived in urban areas. Cases were significantly more likely than controls to be unmarried, white, and to have major depression, bipolar disorder, anxiety disorder other than PTSD, alcohol or other substance use disorder diagnoses. Cases were also more likely than controls to have documented functional decline, sleep disturbance, or expressions of anger. Within the subgroup of cases and controls specifically asked about suicidal ideation or attempts by clinicians or staff (44 %), 59 % vs. 16 % endorsed ideation or attempts, respectively ($p<0.001$). Finally, stressful or negative psychosocial context variables were significantly more prevalent among cases compared to controls, except for housing instability. PTSD diagnosis was not significantly associated with suicide, nor were pain diagnoses or general medical comorbidity.

In our primary set of multivariate models of men in the sample (Table 4), non-white race (OR=0.51; 95% CI=0.27–0.98, $p=0.04$) and VA service-connected disability rating (OR=0.54; 95% CI=0.36–0.80, $p<0.01$) were associated with decreased odds of suicide. Diagnosed anxiety disorder other than PTSD (OR=3.52; 95% CI=1.79–6.92, $p<0.001$), recent functional decline (OR=2.52; 95% CI=1.55–4.10, $p<0.001$), depression diagnosis (OR=1.82; 95 % CI=1.07–3.10, $p=0.03$), and endorsement of suicidal ideation (OR=2.27; 95% CI=1.07–4.83, $p=0.03$), were associated with greater odds of suicide. We did not detect significant relationships between marital status, substance (including alcohol) use disorder diagnoses, the psychosocial context variables, and suicide.

DISCUSSION

Many studies have examined risk factors for suicide. But to our knowledge, this is one of only a few case–control studies to examine correlates of suicide across multiple domains (demographic, clinical, psychosocial context) using a multi-state sample of veterans treated in VA primary care. We found that veterans seen in VA primary care who die by suicide frequently have diagnosed psychiatric disorders, as well as sleep problems, functional decline, expressed anger and endorsed suicidal ideation. These veterans also have high rates of

Table 3. Characteristics of Male Cases and Controls over 6 months Prior to Index Date

	Cases (n=261) n (%)	Controls (n=522) n (%)	p-value
Demographics			
Age at primary care clinician visit			
25–39	16 (6.1)	29 (5.6)	1.00
40–49	28 (10.7)	58 (11.1)	
50–59	66 (25.3)	133 (25.5)	
60–69	62 (23.8)	126 (24.1)	
70–79	41 (15.7)	79 (15.1)	
80+	48 (18.4)	97 (18.6)	
Married	120 (46.0)	310 (59.8)	< 0.001
Race*			0.01
White	183 (89.7)	353 (81.9)	
Black	17 (8.3)	73 (16.9)	
Other race	4 (2.0)	5 (1.2)	
Non-Hispanic ethnicity**	204 (99.0)	460 (98.3)	0.47
Urban residence	167 (64.2)	345 (66.2)	0.58
VA Service Connected Disability (y/n)	102 (39.1)	280 (53.6)	< 0.001
50 % service connected or greater	54 (52.9)	174 (62.1)	0.11
Seen at multiple VAs	30 (11.5)	50 (9.6)	0.40
Clinical characteristics			
Any psychiatric diagnosis (y/n)	165 (63.2)	194 (37.2)	< 0.001
Major depressive disorder	86 (33.0)	76 (14.6)	< 0.001
Dysthymia	7 (2.7)	15 (2.9)	0.88
Bipolar disorder	19 (7.3)	16 (3.1)	0.01
PTSD	34 (13.0)	63 (12.1)	0.70
Anxiety/panic disorder (other than PTSD)	57 (21.8)	34 (6.5)	< 0.001
Schizophrenia	12 (4.6)	15 (2.9)	0.21
Substance use disorder†	26 (10.0)	25 (4.8)	0.01
Alcohol use disorder	51 (19.5)	40 (7.7)	< 0.001
Traumatic Brain Injury	2 (0.8)	3 (0.6)	–
Any pain diagnosis (y/n)	126 (48.3)	255 (48.9)	0.88
Selim comorbidity score, mean (SD)‡	3.4 (2.3)	3.3 (2.2)	0.41
Functional decline	73 (28.0)	63 (12.1)	< 0.001
Sleep disturbances	119 (45.6)	165 (31.6)	< 0.001
Anger	66 (25.3)	83 (15.9)	< 0.01
Endorsed suicidal ideation or attempt			<.001
Yes to ideation or attempt	80 (30.7)	34 (6.5)	
No to all asked	56 (21.5)	175 (33.5)	
Asked neither	125 (47.9)	313 (60.0)	
Psychosocial Context			
Housing instability	13 (5.0)	19 (3.6)	0.37
Relationship problem	57 (21.8)	42 (8.0)	< 0.001
Isolation	57 (21.8)	39 (7.5)	< 0.001
Moving/recently moved	29 (11.1)	19 (3.6)	< 0.001
Legal problems	21 (8.0)	12 (2.3)	< 0.001
Financial problems	50 (19.2)	49 (9.4)	< 0.001
Job/school problems	31 (11.9)	35 (6.7)	0.01
Grief/loss of loved one	42 (16.1)	33 (6.3)	< 0.001

Race data: 19 % missing (percent White above is % of valid sample)
**Ethnicity data: 14 % missing (percent non-Hispanic above is % of valid sample)*
†Excludes alcohol and nicotine use disorders*
‡Selim co-morbidity sum of past 6-month comorbidities*

psychosocial stressors; in particular, relationship problems, isolation, and financial problems. Based on our multivariate models, several characteristics may be especially relevant for veterans treated in primary care: anxiety disorder other than PTSD, recent functional decline, depression, and endorsement of suicidal ideation.

Our findings differ somewhat from those of prior research by suggesting that anxiety disorder may indicate greater risk for suicide among veterans compared to substance use disorder or depression; in our sample, the odds of suicide associated with anxiety diagnoses were approximately twice those of the odds associated with depression. Conner and colleagues, who recently studied suicide risk in a national sample of veterans receiving VA healthcare, also found anxiety to be uniquely associated with suicide.[31] Prior work examining anxiety and suicide risk has perhaps been confounded by studying patients already receiving depression treatment or who have depression diagnoses. Further, while anxiety and depression share similar features, anxiety may be differentiated from depression by the relative prominence of positive affect;[32,33] thus, individuals suffering from anxiety may have the ability and sufficient discomfort to plan and act, while those suffering from depression alone may have less ability to act. Given the relatively high comorbidity of anxiety and depression, it would be important for future work to prioritize elucidation of the effects of these conditions versus their combination on suicide risk.

We found that functional decline was also strongly associated with increased odds of suicide. Prior work has identified relationships between functional decline or functional status and suicide,[34,35] and it has been noted to be predictive of suicide independent of physical illness. However, it remains unclear how functional decline relates to depression among suicide decedents; some studies show an independent association between functional status and suicide, while others suggest that mood disorders mediate this relationship.[36] The issue of functional decline may be particularly relevant for older populations: while the average age of veterans in our sample was 63 years, this is only slightly older than those who die by suicide in VA nationwide[37] or among the general population.[38] Taken together, our findings suggest that clinicians may need to place greater emphasis on understanding and integrating information on functional decline and anxiety into risk assessment activities. The findings further suggest that we may wish to prioritize development of interventions that assist people in coping with functional decline and treating anxiety conditions.

It is considered standard of care for clinicians to inquire about suicidal ideation among patients who may be at risk. Our finding that endorsement of suicidal ideation is associated with suicide supports this standard, and is consistent with recent work done by Simon et al.,[39] which found that endorsement of the ninth item of the Patient Health Questionnaire-9 ("thoughts that you would be better off dead or of hurting yourself in some way") was also associated with increased risk of suicide behaviors. Our finding underscores that when a veteran endorses suicidal ideation, it must be taken seriously. Unfortunately, veterans often do not disclose suicidal ideation in healthcare settings prior to suicide, even when asked.[9,24] Indeed, trust is a critical factor in disclosing suicidal ideation,[40] and clinical discussions of suicidal ideation would be well-served by approaching the topic in the context of strong patient–clinician rapport.

Table 4. Multivariate Correlates of Suicide (n=783)

	Model 1	Model 2	Model 3
Race			
White	1.0 (ref)	1.0 (ref)	1.0 (ref)
Non-white§	0.47 (0.28–0.77)	0.47 (0.25–0.85)	0.51 (0.27–0.98)
Unknown	1.21 (0.88–1.68)	1.39 (0.96–2.00)	1.47 (0.99–2.17)
Married	0.58 (0.40–0.84)	0.64 (0.41–0.98)	0.66 (0.42–1.03)
Service Connected*‖	0.59 (0.44–0.79)	0.56 (0.38–0.82)	0.54 (0.36–0.80)
Clinical variables			
Major Depressive Disorder§	–	1.70 (1.10–2.63)	1.82 (1.07–3.10)
Bipolar Disorder†	–	1.43 (0.45–4.51)	1.42 (0.44–4.61)
Anxiety Disorder¶	–	3.87 (2.01–7.48)	3.52 (1.79–6.92)
Alc/Substance Use Disorder†	–	1.68 (0.94–3.00)	1.46 (0.80–2.67)
Functional Decline¶	–	2.54 (1.58–4.08)	2.52 (1.55–4.10)
Sleep‡	–	1.16 (0.71–1.88)	1.10 (0.68–1.81)
Anger‡	–	0.70 (0.32–1.53)	0.66 (0.29–1.49)
Suicidal Ideation§			
Not Asked	–	1.0 (ref)	1.0 (ref)
Did not endorse	–	0.63 (0.38–1.04)	0.56 (0.32–0.97)
Endorsed thoughts/attempt	–	2.98 (1.61–5.52)	2.27 (1.07–4.83)
Psychosocial Context			
Relationship Problems	–	–	1.96 (0.96–3.98)
Isolation‡	–	–	1.28 (0.55–2.98)
Moving‡	–	–	1.31 (0.52–3.29)
Legal‡	–	–	2.72 (0.75–9.90)
Financial‡	–	–	0.71 (0.33–1.52)
Grief‡		–	1.48 (0.78–2.78)
Job or School‡	–	–	0.73 (0.33–1.60)

Results presented as adjusted odds ratios (95 % confidence interval)
**Service connected received or receives VA disability benefits for military-related disability*
†Diagnoses received. Anxiety disorder does not include PTSD which was examined separately
‡See Table 2 for definitions
§$p< 0.05$, ‖$p< 0.01$, ¶$p< 0.001$

Our finding that the odds of white veterans dying by suicide are approximately twice those of non-white veterans is commensurate with prior research.[35,41] Similarly, though less well-studied, service connected disability status has been shown to be protective as well, presumably by increasing access to healthcare services by decreasing out of pocket costs.[5,42,43]

We found that PTSD diagnosis was not associated with suicide. Evidence syntheses have shown mixed findings for linking PTSD to suicide among veteran and military populations.[15] Some studies have suggested that PTSD treatment may attenuate the relationship between PTSD diagnosis and risk of suicide.[44] Methodological differences in assigning PTSD status may also explain some of these mixed findings (e.g., using PTSD screens rather than ICD diagnosis codes[45]). Neither did we find relationships between pain diagnoses and suicide. While Ilgen et al.[46] recently showed a relationship between pain diagnoses and suicide, this relationship may manifest over years—in our study, we examined only the 6 months prior to death. We note that the models used in most of these prior studies have generally not adjusted for several variables included in our study, including functional decline and psychosocial context.

There are several important limitations. Differences in mortality-reporting processes across states and misclassification of veteran status have the potential to affect our estimates; however, our approach of specifically linking death certificate data to CDW to identify individuals who actually received care in VA should minimize misclassification effects. While we did not use a national sample, our sample does appear to be nationally representative with respect to VA healthcare users. We did not have access to patient-level measures. Instead, our data were highly dependent on the accuracy and extent of clinician and staff documentation in the medical record. We also note that there were too few women veterans (n=24), veterans of Iraq and Afghanistan wars (n=10), and veterans with diagnoses of traumatic brain injury (n=5) to examine these factors in our multivariable analyses; however, data sets using expanded years are currently being analyzed to examine suicide risk among these groups in more depth. Finally, exploration for interaction effects among predictors was beyond the scope of this study—such analysis has potential to provide additional information on how various factors might compound to confer risk, which would be critical to emerging risk-profiling efforts.[31]

This project demonstrates the value of Health Services Research & Development investigators collaborating with VA Operations partners to address issues of key importance to the VA and the nation in a timely fashion. This collaboration enabled the investigators to study one of the first nationally representative case–control data sets of veterans who died by suicide after receiving VA healthcare. The original plan for this project involved the investigators establishing data use agreements with individual states, which would have been a very complex and lengthy process. Instead, VA Operations partners facilitated sharing of data in a way that greatly enhanced efficiency. In turn, the investigators are now able to contribute these findings to the field, which may help shape VA policy and priorities. Preliminary results of this and related work were

discussed at a summit of VA suicide prevention researchers that took place last year. In addition, since this collaboration began, several of the investigators have worked with representatives from VA Mental Health Services, the VISN-2 Center of Excellence, and other VA operations leaders through additional meetings and presentations on suicide research, and workgroups dedicated to shaping strategic planning for VA mental health.

Contributors: *We wish to acknowledge April Lee MPH, Holly Bratkovich BA, Anna Beane BA, and Joe Warren MA for assistance in developing study procedures and reviewing the medical records.*

Funders: *This material is based upon work supported by the Department of Veterans Affairs, the Veterans Health Administration, and Health Services Research and Development Service Project IIR 10–331, VA Mental Health Services-Suicide Prevention Program, and VISN 2 Center of Excellence for Suicide Prevention. Dr. Dobscha is the Director of the Center to Improve Veteran Involvement in Care (CIVIC) at the Portland VA Medical Center. The views expressed in this article are those of the authors and do not necessarily reflect the position or policy of the Department of Veterans Affairs or the United States government.*

Prior Presentations: *None.*

Conflicts of Interest: *The authors declare that they do not have a conflict of interest.*

Corresponding Author: *Steven K. Dobscha, MD; Center to Improve Veteran Involvement in Care, Portland Veterans Affairs Medical Center, P.O. Box 1034 (R&D 66), Portland, OR 97207, USA (e-mail: steven.dobscha@va.gov).*

REFERENCES

1. **Power AK, McKeon R.** Preventing suicide is a national imperative. Am J Public Health. 2012;102(S1):S7.
2. **Blow FC, Bohnert ASB, Ilgen MA, et al.** Suicide mortality among patients treated by the veterans health administration from 2000 to 2007. Am J Public Health. 2012;102(S1):S98–S104.
3. U.S. Surgeon General, National Action Alliance for Suicide Prevention. 2012 national strategy for suicide prevention: Goals and objectives for action: A report of the U.S. surgeon general and of the national action alliance for suicide prevention. Accessed 8/26, 2014: http://www.ncbi.nlm.nih.gov/books/NBK109917/. 2012.
4. **Luoma JB, Martin CE, Pearson JL.** Contact with mental health and primary care providers before suicide: A review of the evidence. Am J Psychiatry. 2002;159(6):909–16.
5. **Basham C, Denneson LM, Millet L, Shen X, Duckart J, Dobscha SK.** Characteristics and VA health care utilization of U.S. veterans who completed suicide in oregon between 2000 and 2005. Suicide Life Threat Behav. 2011;41(3):287–96.
6. **Corson K, Denneson LM, Bair M, Helmer DA, Goulet JL, Dobscha SK.** Prevalence and correlates of suicidal ideation among OEF/OIF veterans. J Affect Disord. 2013;149:291–8.
7. **Durai UN, Chopra MP, Coakley E, et al.** Exposure to trauma and posttraumatic stress disorder symptoms in older veterans attending primary care: comorbid conditions and self-rated health status. J Am Geriatr Soc. 2011;59(6):1087–1092.
8. **LeardMann CA, Powell TM, Smith TC, et al.** Risk factors associated with suicide in current and former US military personnel. JAMA. 2013;310(5):496–506.
9. **Smith EG, Kim HM, Ganoczy D, Stano C, Pfeiffer PN, Valenstein M.** Suicide risk assessment received prior to suicide death by veterans health administration patients with a history of depression. J Clin Psychiatry. 2013;74(3):226–32.
10. **Ilgen MA, Conner KR, Roeder KM, Blow FC, Austin K, Valenstein M.** Patterns of treatment utilization before suicide among male veterans with substance use disorders. Am J Public Health. 2012;102(Suppl 1):S88–92.
11. **Mavandadi S, Rook KS, Newsom JT, Oslin DW.** Suicidal ideation and social exchanges among at-risk veterans referred for a behavioral health assessment. Soc Psychiatry Psychiatr Epidemiol. 2013;48(2):233–243.
12. Department of Veterans Affairs VA Information Resource Center (VIReC). VIReC corporate data warehouse (CDW). Accessed 8/26, 2014: http://www.hsrd.research.va.gov/for_researchers/vinci/cdw.cfm. 2012.
13. **Rose S, Laan MJ.** Why match? investigating matched case–control study designs with causal effect estimation. Int J Biostat. 2009;5(1):Article 1,4679.1127.
14. **Gibbons RD, Brown CH, Hur K.** Is the rate of suicide among veterans elevated? Am J Public Health. 2012;102(S1):S17–9.
15. **Haney EM, O'Neil ME, Carson S, et al.** Suicide risk factors and risk assessment tools: A systematic review; 2012.
16. WWAMI Rural Health Research Center. Rural–urban commuting areas (RUCA) data, version 2, 2005 [data file]. Accessed 8/26, 2014 from: http://depts.washington.edu/uwruca/ruca-data.php. 2005.
17. **Morrill R, Cromartie J, Hart G.** Metropolitan, urban, and rural commuting areas: Toward a better depiction of the united states settlement system. Urban Geography. 1999;20(8):727–48.
18. **Selim AJ, Fincke G, Ren XS, et al.** Comorbidity assessments based on patient report: Results from the veterans health study. J Ambul Care Manage. 2004;27(3):281–95.
19. **Copeland LA, Zeber JE, Wang CP, et al.** Patterns of primary care and mortality among patients with schizophrenia or diabetes: A cluster analysis approach to the retrospective study of healthcare utilization. BMC Health Serv Res. 2009;9:127.
20. **Martin, J., Ghahramanlou-Holloway, M., Lou, K., Tucciarone, P.** A comparative review of U.S. military and civilian suicide behavior: Implications for OEF/OIF suicide prevention efforts. J Ment Health. 2009;31(2):101,118; 101.
21. **Mann JJ, Apter A, Bertolote J, et al.** Suicide prevention strategies: a systematic review. JAMA. 2005;294(16):2064–74.
22. **Britton PC, Ilgen MA, Rudd MD, Conner KR.** Warning signs for suicide within a week of healthcare contact in veteran decedents. Psychiatry Res. 2012;200(2–3):395–9.
23. **Smith EG, Craig TJ, Ganoczy D, Walters HM, Valenstein M.** Treatment of veterans with depression who died by suicide: Timing and quality of care at last veterans health administration visit. J Clin Psychiatry. 2011;72(5):622–9.
24. **Denneson LM, Basham C, Dickinson KC, et al.** Suicide risk assessment and content of VA health care contacts before suicide completion by veterans in oregon. Psychiatr Serv. 2010;61(12):1192–7.
25. **Crosby AE, Ortega L, Melanson C.** Self-directed violence surveillance: Uniform definitions and recommended data elements, version 1.0. Centers for Disease Control and Prevention, National Center for Injury Prevention and Control: Atlanta, GA; 2011.
26. **Kim HM, Smith EG, Ganoczy D, et al.** Predictors of suicide in patient charts among patients with depression in the veterans health administration health system: Importance of prescription drug and alcohol abuse. J Clin Psychiatry. 2012;73(10):e1269–75.
27. **Cavanagh JT, Owens DG, Johnstone EC.** Life events in suicide and undetermined death in south-east scotland: A case–control study using the method of psychological autopsy. Soc Psychiatry Psychiatr Epidemiol. 1999;34(12):645–50.
28. **Cicchetti DV, Sparrow SA.** Developing criteria for establishing interrater reliability of specific items: Applications to assessment of adaptive behavior. Am J Ment Defic. 1981;86(2):127–37.
29. Centers for Disease Control and Prevention (CDC). Suicide facts at a glance. National Center for Injury Prevention and Control. 2009;Available from http://www.cdc.gov/violenceprevention/pdf/Suicide-DataSheet-a.pdf. Accessed 8/26, 2014.
30. **Callanan VJ, Davis MS.** Gender differences in suicide methods. Soc Psychiatry Psychiatr Epidemiol. 2012;47(6):857–69.
31. **Conner KR, Bohnert AS, McCarthy JF, et al.** Mental disorder comorbidity and suicide among 2.96 million men receiving care in the veterans health administration health system. J Abnorm Psychol. 2013;122(1):256–63.
32. **Watson D, Clark LA, Carey G.** Positive and negative affectivity and their relation to anxiety and depressive disorders. J Abnorm Psychol. 1988;97(3):346–53.
33. **Clark LA, Watson D.** Tripartite model of anxiety and depression: Psychometric evidence and taxonomic implications. J Abnorm Psychol. 1991;100(3):316–36.

34. **Kaplan MS, McFarland BH, Huguet N, Newsom JT.** Physical illness, functional limitations, and suicide risk: A population-based study. Am J Orthopsychiatry. 2007;77(1):56–60.
35. **Kaplan MS, Huguet N, McFarland BH, Newsom JT.** Suicide among male veterans: A prospective population-based study. J Epidemiol Community Health. 2007;61(7):619–24.
36. **Conwell Y, Duberstein PR, Caine ED.** Risk factors for suicide in later life. Biol Psychiatry. 2002;52(3):193–204.
37. VetPop2011 table 1L and table 3L. Available at: http://www1.va.gov/vetdata/Veteran_Population.asp. Accessed 8/26, 2014.
38. Centers for Disease Control and Prevention. Web-based injury statistics query and reporting system (WISQARS) fatal injury reports. Atlanta, GA: National Center for Injury Prevention and Control; 2007.
39. **Simon GE, Rutter CM, Peterson D, et al.** Does response on the PHQ-9 depression questionnaire predict subsequent suicide attempt or suicide death? Psychiatr Serv. 2013;64(12):1195–202.
40. **Ganzini L, Denneson L, Press N, et al.** Trust is the basis for effective suicide risk assessment in veterans. J Gen Intern Med. 2013;28:1215–21.
41. **Kemp J, Bossarte R.** Suicide data report: 2012. Mental Health Services, Suicide Prevention Program: Department of Veterans Affairs; 2013.
42. **Desai RA, Dausey DJ, Rosenheck RA.** Mental health service delivery and suicide risk: The role of individual patient and facility factors. Am J Psychiatry. 2005;162(2):311–8.
43. **Zivin K, Kim HM, McCarthy JF, et al.** Suicide mortality among individuals receiving treatment for depression in the veterans affairs health system: Associations with patient and treatment setting characteristics. Am J Public Health. 2007;97(12):2193–8.
44. **Gradus JL, Suvak MK, Wisco BE, Marx BP, Resick PA.** Treatment of posttraumatic stress disorder reduces suicidal ideation. Depress Anxiety. 2013;30(10):1046–53.
45. **Jakupcak M, Cook J, Imel Z, Fontana A, Rosenheck R, McFall M.** Posttraumatic stress disorder as a risk factor for suicidal ideation in iraq and afghanistan war veterans. J Trauma Stress. 2009;22(4):303–6.
46. **Ilgen MA, Kleinberg F, Ignacio RV, et al.** Noncancer pain conditions and risk of suicide. JAMA Psychiatry. 2013;70(7):692–7.
47. FY09 end of year: uniques by VERA category – facility. Available at: http://vaww.arc.med.va.gov/reports/annual/not_vera09_toc.htm. Accessed 8/26, 2014.
48. 2009 VHA facility quality and safety report. Available at: http://www.va.gov/health/docs/HospitalReportCard2009.pdf. Accessed 8/26, 2014.
49. Suicide risk assessment guide. Available at: http://www.mentalhealth.va.gov/docs/Suicide_Risk_Assessment_Reference_Guide.pdf. Accessed 8/26, 2014.