Predictors of Post-Discharge Suicide Attempt Among Veterans Receiving Specialized Intensive Treatment for Posttraumatic Stress Disorder

Elina A. Stefanovics, PhD,[a,b,*] and Robert A. Rosenheck, MD[a,b]

ABSTRACT

Objective: There has been increasing concern about the high risk of suicide among US veterans, especially those with posttraumatic stress disorder (PTSD). Among those at greatest risk are veterans recently discharged from inpatient or specialized intensive treatment programs, but little is known about clinical correlates of suicide attempts among such veterans and this information that might facilitate prevention efforts.

Methods: National program evaluation data were obtained at program entry and 4 months after discharge from 30,384 veterans from 57 sites (fiscal years 1993–2011) who were discharged from specialized intensive PTSD programs nationally in the Veterans Health Administration. Rates of attempted suicide were 10.6% in the 4 months prior to admission and 3.4% in the 4 months following discharge. Bivariate analyses and multivariable logistic regression were used to identify baseline characteristics, especially PTSD symptoms, associated with suicide attempts prior to admission and after discharge. Further analyses examined the association of changes in symptoms and other outcomes with reported post-discharge suicide attempts.

Results: Suicide attempts both prior to admission and after discharge were associated with psychiatric and substance abuse comorbidity and especially suicidal ideation and violent behavior. Clinical changes independently associated with post-discharge suicide attempts included increased suicidal thoughts ($\beta = 0.96$, $P < .001$), violent behavior ($\beta = 0.49$, $P < .001$), and alcohol use ($\beta = 0.56$, $P < .001$).

Conclusions: In this longitudinal study, violent behavior assessed at admission and as a change measure after discharge, along with suicidal ideation and alcohol use, were associated with suicide attempts. Additional therapeutic attention to violent behavior and alcohol use, quite likely reflecting underlying impulsivity, may help reduce the risk of suicide attempts.

J Clin Psychiatry 2019;80(5):19m12745

To cite: Stefanovics EA, Rosenheck RA. Predictors of post-discharge suicide attempt among veterans receiving specialized intensive treatment for posttraumatic stress disorder. *J Clin Psychiatry*. 2019;80(5):19m12745.

To share: https://doi.org/10.4088/JCP.19m12745

[a]Department of Veteran Affairs, VISN 1, New England Mental Illness Research Education and Clinical Center (MIRECC), West Haven, Connecticut

[b]Department of Psychiatry, Yale University School of Medicine, New Haven, Connecticut

**Corresponding author:* Elina A. Stefanovics, PhD, Yale University School of Medicine, VA Connecticut Healthcare System/116A, 950 Campbell Ave, West Haven, CT 06516 (elina.stefanovics@yale.edu).

Suicide is one of the leading causes of death in the United States, with rates rising by nearly 30% from 1999 to 2016.[1] There has been particular concern expressed both in the media[2] and in research literature[3–5] about elevated risk of suicide among US veterans.

Although multiple risk factors are associated with suicide, mental disorders are among the strongest and most consistent.[6,7] More specifically, both suicidal ideation and suicide attempts have been associated with the diagnosis of posttraumatic stress disorder (PTSD),[8–11] an especially common disorder among veterans of war zone service.[11,12] The risk of suicide is especially high in the month immediately following discharge from a Veterans Health Administration (VHA) psychiatric hospitalization,[8] and recent studies suggest that the post–hospital discharge risk of suicide attempts throughout the United States appears to have increased in recent years.[13,14]

The VHA serves over 6 million veterans annually, a clinical population with an expectably elevated suicide risk as compared with the general US population.[4,5] Treatment of military-related PTSD is a major responsibility of the VHA,[15] and the number of veterans treated for PTSD has increased by 19.2% per year in recent years.[16]

Prior research on male veterans has found that suicidality, a form of inwardly directed aggression, is often associated with outwardly directed aggression in the form of violent behavior or anger[10,17–19] and that suicidal ideation and aggression are independently associated with severity of PTSD symptoms.[20,21] However, the association of longitudinal changes in PTSD symptoms, violent behavior, and other factors with the risk of a suicide attempt in the period immediately following hospital discharge for PTSD has not been studied.

The present study uses program evaluation data from specialized intensive inpatient and residential VHA PTSD treatment programs (N = 30,384) to identify sociodemographic and clinical characteristics, especially PTSD symptoms and violent behavior, associated with a reported suicide attempt in the month prior to admission. It then examines the relationship of these admission characteristics to suicide attempt in the 4 months after discharge with special emphasis on changes in symptoms from admission to discharge that may be relevant targets for intervention.

METHODS

Sample

Data were obtained from a national VHA administrative program evaluation of specialized intensive PTSD treatment programs between 1993 and 2011. The evaluation was coordinated by the VHA's Northeast Program Evaluation Center (NEPEC) and

Clinical Points

- There has been increasing concern about the high risk of suicide among US veterans, especially those with posttraumatic stress disorder (PTSD) and high-risk veterans recently discharged from inpatient or specialized intensive treatment programs. Little is known about clinical correlates of suicide attempts after specialized intensive PTSD treatment.
- Suicide attempts prior to admission and after discharge were associated with psychiatric and substance abuse comorbidity, suicidal ideation, and, notably, violent behavior.
- Similarly, clinical changes independently associated with post-discharge suicide attempts included increased suicidal thoughts, violent behavior, and alcohol use, all of which should be therapeutic targets.

addressed specialized programs that involved a hospital or residential treatment component and are intended to serve veterans with the most severe PTSD.[22]

Procedure

Patients received a structured baseline assessment addressing symptoms and substance use at the time of admission and again at the time of follow-up, 4 months after discharge. All interviews were to be conducted by staff members of the treating programs who were not directly involved in the treatment of veterans whom they were assigned to assess. Psychiatric diagnoses were based on clinician judgments. The study was approved by the Human Subject Subcommittee of the VHA Connecticut Healthcare System.

Measures

Background information included sociodemographic and military characteristics: age, gender, race, marital and employment status, service in a war zone, exposure to combat fire, and VA service-connected disability and pension status.

Suicide attempt was evaluated at the time of admission with the question "Have you attempted suicide in the last 4 months?" and then at 4 months after discharge with the question "Have you attempted suicide any time since discharge?" Five dichotomous variables represent veterans' exposure to traumatic events: whether they received hostile or friendly fire in a war zone; participated in, or witnessed, what they considered atrocities; experienced sexual trauma; or experienced noncombat nonsexual trauma (eg, training accidents) during active military duty.

Diagnostic variables based on clinician judgment included clinical diagnoses of PTSD, alcohol and drug abuse/dependence, and other psychiatric disorders, along with current use of psychiatric medication.

PTSD symptomatology was assessed at program entry and follow-up with the 14 items of the short form of the Mississippi Scale for PTSD[23] and the 4 items that constitute the NEPEC PTSD assessment tool.[24] These items were combined to form a total PTSD severity score and 6 subscales (numbing of feelings, arousal, re-experiencing of past trauma, avoidance, suicidal thoughts, and irritability) based on face value interpretation of the items.[21] Developed at the time the program evaluation was initiated, over 20 years ago, these measures were not updated to retain consistency over the years. A measure of recent violent behavior was based on the measure used in the National Vietnam Veterans Readjustment Study.[12]

The Addiction Severity Index (ASI) was used to assess severity of 4 additional problems: alcohol and drug use, severity of medical problems, and employment.[25]

Variables, reflecting changes from admission to post-discharge assessment, were created by subtracting the baseline value from the follow-up value.

Statistical Analysis

First, veterans who reported a suicide attempt in the 4 months prior to admission were compared to those who did not using t and χ^2 tests of admission characteristics. Statistical significance was evaluated at the .01 level. Effect size differences between groups were evaluated with risk ratios for dichotomous variables and Cohen d[26] for continuous measures.

Second, stepwise logistic regression was used to identify a more parsimonious set of risk factors that were independently associated with suicide attempts in the 4 months prior to admission.

Third, since not all veterans were successfully evaluated at follow-up, comparison of those lost to follow-up and others on sociodemographic and clinical characteristics at admission was conducted using multivariate logistic regression.

Fourth, logistic regression was used to examine baseline characteristics (including a measure of suicide attempt prior to admission) that predicted suicide attempts occurring during the 4 months after discharge.

Fifth, the associations of suicide attempt after discharge with changes from admission to post-discharge assessment in symptoms and other outcomes was examined, one change measure at a time, in a series of analyses of covariance controlling for the baseline value of each change measure and other baseline characteristics associated with suicide attempt after discharge.

Finally, sixth, stepwise logistic regression analysis was used to evaluate the independent association of change in multiple symptom measures with suicide attempts in the 4 months after discharge, adjusting for both pre-admission suicide attempts and other baseline characteristics (including the baseline values of the change measures). Change measures were included if effect sizes > 0.20 on the previous analyses, representing at least the small effect size by Cohen's criteria.[26] We used effect sizes rather than P values in selecting variables because with the large sample size in this study, clinically trivial differences can be statistically significant.

This sequence of analyses, thus, first examines baseline measures, especially symptoms, associated with pre-admission suicide attempts; then considers baseline measures

Table 1. Sociodemographic and Clinical Characteristics of the Sample at Admission

Variable	No Suicide Attempt (n = 27,118; 89.25%)		Suicide Attempt (n = 3,266; 10.57%)		*P* Value	*d*
	Mean	SD	Mean	SD		
Age, y	51.39	9.33	47.58	10.42	<.001	0.38
	n	%	n	%		RR
Gender					.00	
Male	26,109	96.82	3,109	95.78		0.99
Female	858	3.18	137	4.22		1.33
Race	n	%	n	%		RR
White	16,042	59.16	1,934	59.22	NS	1.00
Black	7,477	27.57	730	22.35	<.001	0.81
Hispanic	1,916	7.07	344	10.53	<.001	1.49
Marital status						
Married	10,274	37.89	1,170	35.82	.02	0.95
Separated/divorced	1,1585	42.72	1,435	43.94	NS	1.03
Widow	545	2.01	52	1.59	NS	0.79
Service-connected disability						
PTSD	13,287	49.00	1,388	42.50	<.001	0.87
Medical	11,771	43.41	1,344	41.15	.01	0.95
Other psychiatric non-PTSD	1,181	4.36	185	5.66	.00	1.30
Employment status					NS	
Not working	22,735	84.23	2,742	84.34		1.00
Part-time	986	3.65	106	3.26		0.89
Full-time	3,272	12.12	403	12.40		1.02
Military service characteristics						
Middle East conflict veteran	2,742	10.11	556	17.02	<.001	1.68
War zone service	24,497	90.71	2,916	89.67	.05	0.99
Trauma history						
Received incoming fire	23,835	88.25	2,848	87.55	NS	0.99
Participated in atrocities						
Witness atrocities						
Sexual trauma during active duty	1,551	5.74	254	7.82	<.001	1.36
Noncombat nonsexual trauma during military service	2,384	8.83	311	9.58	NS	1.08
Past incarceration	12,076	44.53	1,297	39.71	<.001	0.89
Past psychiatric treatment						
Psychiatric hospitalization	17,896	66.30	2,624	80.69	<.001	1.22
Outpatient treatment	24,000	88.93	2,881	88.56	NS	1.00
Prescribed medication	23,518	87.23	2,993	92.01	<.001	1.05
Psychiatric and medical diagnoses						
Alcohol abuse/ dependence	10,379	38.28	1,506	46.13	<.001	1.21
Drug abuse/dependence	8,205	30.44	1,116	34.35	<.001	1.13
Anxiety disorder	3,298	12.24	445	13.71	.02	1.12
Affective disorder	7,572	28.11	1,003	30.92	.00	1.10
Bipolar disorder	1,349	5.01	219	6.75	<.001	1.35
Schizophrenia	368	1.37	61	1.88	.02	1.37
Personality disorder	2,399	8.91	365	11.26	<.001	1.26
Psychosis other than schizophrenia	559	2.07	116	3.57	<.001	1.72
Other Axis I disorders	1,167	4.33	171	5.27	.01	1.22
	Mean	SD	Mean	SD		*d*
Total no. of medical diagnoses	0.71	0.45	0.69	0.46	.02	0.04
Total no. of psychiatric diagnoses	2.28	1.24	2.51	1.30	<.001	0.18

Abbreviations: PTSD = posttraumatic stress disorder, NS = nonsignificant, RR = risk ratio.

associated with post-discharge suicide attempts; and, third, evaluates changes in symptoms and other outcomes that are associated with post-discharge suicide attempts.

All analyses were performed using SAS version 9.3.[27]

RESULTS

Correlates of Pre-Admission Suicide Attempt

The total sample consisted of 30,384 veterans treated at 57 program sites from 1993 to 2011. Of these, 3,266 (10.6%) reported a suicide attempt 4 months prior to admission. Bivariate comparison of unchanging historical and relatively stable diagnostic factors showed that pre-admission suicide attempt was associated with younger age, female sex, less likelihood of identifying as Black and greater likelihood of identifying as Hispanic, no history of incarceration, and having served overseas in the recent Middle East conflict (Table 1). Additionally, those who had attempted suicide had several indicators of more severe mental illness, including non-PTSD psychiatric service-connected disability, sexual

Table 2. Comparison of Symptoms and Substance Use at Baseline

Baseline Measure	No Suicide Attempt (n = 27,118; 89.25%) Mean	SD	Suicide Attempt (n = 3,266; 10.57%) Mean	SD	d^a
PTSD symptoms					
Total PTSD symptom score	3.54	0.45	3.79	0.42	0.54
Numbness	3.64	0.49	3.73	0.47	0.18
Arousal	3.45	0.56	3.60	0.54	0.27
Re-experiencing	3.86	0.72	4.07	0.71	0.29
Avoidance	4.09	0.93	4.25	0.89	0.17
Suicidal thoughts	2.71	0.95	3.56	0.95	0.90
Irritability	3.70	1.00	3.88	1.00	0.18
Violent behavior	1.54	1.36	2.13	1.40	0.44
ASI composite scores					
Alcohol	0.14	0.27	0.21	0.27	0.23
Drug	0.06	0.10	0.09	0.13	0.26
Medical	0.56	0.35	0.61	0.35	0.12
Employment	0.53	0.29	0.51	0.29	−0.07

[a]All P values are < .0001; d > 0.20 represent at least a small effect (per Cohen's criteria[26]).
Abbreviations: ASI = Addiction Severity Index, PTSD = posttraumatic stress disorder.

Table 3. Differences in Symptom Change Between Veterans With and Without Post-Discharge Suicide Attempts[a]

Change Measures (Follow-Up Less Baseline)	No Suicide Attempt (n = 20,321; 96.6%) Mean	SD	Suicide Attempt (n = 715; 3.39%) Mean	SD	d^b
PTSD symptoms					
Total PTSD symptom score	−0.24	0.54	0.05	0.49	0.54
Numbness	−0.15	0.61	0.02	0.61	0.28
Arousal	−0.23	0.69	−0.01	0.64	0.32
Re-experiencing	−0.26	0.78	0.07	0.75	0.42
Avoidance	−0.23	1.15	0.05	1.18	0.24
Suicidal thoughts	−0.38	1.04	0.22	1.06	0.58
Irritability	−0.29	1.11	0.05	1.03	0.31
Violent behavior	−0.71	1.45	0.08	1.59	0.54
ASI composite scores					
Alcohol	−0.02	0.23	0.05	0.30	0.29
Drug	−0.01	0.10	0.01	0.13	0.19
Medical	−0.05	0.43	0.00	0.43	0.12
Employment	0.01	0.23	−0.01	0.23	−0.10

[a]Least squares means of change measures adjusted for baseline characteristics, suicide attempt, and symptoms.
[b]All P values are < .0001; d > 0.20 represent at least a small effect (per Cohen's criteria[26]).
Abbreviations: ASI = Addiction Severity Index, PTSD = posttraumatic stress disorder.

trauma during active duty, previous history of psychiatric hospitalization, and use of psychiatric medications. Those who had attempted suicide also had a larger number of concurrent psychiatric diagnoses (Table 1).

On more labile symptom measures, veterans who reported a recent suicide attempt had higher scores for total PTSD symptoms (d = 0.54) (Table 2) and on several PTSD subscales, especially those reflecting suicidal ideation (d = 0.90), re-experiencing traumatic events (d = 0.29), and arousal (d = 0.27). They also showed higher scores on the measure of violent behavior (d = 0.44) and the ASI alcohol (d = 0.23) and drug (d = 0.26) composite scores.

Stepwise logistic regression analysis revealed a more parsimonious set of independent baseline correlates of pre-admission suicide attempt, including younger age (β = –0.13; P < .001), negative association with black race (OR = 0.84; 95% CI, 0.76–0.92), past Middle East conflict service (OR = 1.55; 95% CI, 1.33–1.80), less likelihood of PTSD service connection (OR = 0.82; 95% CI, 0.75–0.88), greater exposure to sexual trauma during military service (OR = 1.32; 95% CI, 1.13–1.53), past psychiatric hospitalization (OR = 1.70; 95% CI, 1.54–1.88), and use of psychiatric medications (OR = 1.28; 95% CI, 1.12–1.48). Additionally, baseline suicide attempt was associated with significantly higher scores on measures of suicidal ideation (β = 0.50; P < .001) and violent behavior (β = 0.09; P < .001), as well as on the ASI alcohol composite index (β = 0.05; P = .004) and the ASI drug composite index (β = 0.05; P < .001).

Admission Correlates of Post-Discharge Suicide Attempts

Logistic regression characterized those lost to follow-up (n = 9,348 of 30,384; 30.8%) as younger, more likely to report non-combat Middle East conflict service and previous psychiatric hospitalization, not currently working, not exposed to combat fire, and with more severe recent drug use (data available on request). Those lost to follow-up were *not* significantly different from those successfully followed up on the measures of principal interest including the proportion who reported suicide attempts prior to admission, severity of PTSD symptoms (including suicidality), or severity of violent behavior at the time of program entry. A multivariate logistic regression model of missing data had a low c statistic (0.65), indicating poor model fit and suggesting that, taken together, patient baseline characteristics were weakly associated with loss to follow-up and, thus, less likely to have biased our data on post-discharge suicide attempts.

At the 4-month follow-up, 715 of 21,036 (3.39%) veterans reported a suicide attempt in the previous 4 months. The results of stepwise logistic regression analysis of baseline predictors of post-discharge suicide attempt identified multiple significant predictors including suicide attempt prior to admission (OR = 2.62; 95% CI, 2.19–3.13), younger age (β = –0.13; P < .001), Hispanic origin (OR = 1.31; 95% CI, 1.05–1.63), being widowed (OR = 1.74; 95% CI, 1.18–2.58), having non-PTSD psychiatric service-connected disability (OR = 1.35; 95% CI, 1.03–1.77), sexual trauma during active duty (OR = 1.83; 95% CI, 1.46–2.30), past psychiatric hospitalization (OR = 1.33; 95% CI, 1.14–1.55), and a schizophrenia diagnosis (OR = 1.62; 95% CI, 1.05–2.50). Also, veterans reporting post-discharge suicide attempts had higher scores at baseline on both the suicidal ideation subscale of the PTSD symptom measure (β = 0.20; P < .001) and the violent behavior scale (β = 0.08; P < .001) but not on the measure of baseline alcohol use.

Symptom Improvement

To investigate whether the program was successful in general, we ran paired t tests assessing the significance of

change from admission to follow-up for the entire follow-up sample. These analyses showed that changes on all 12 outcome measures were all significant at $P < .0001$, with moderate effect sizes for total PTSD symptoms ($d = 0.5$) and for the 6 PTSD subscales ($d = 0.23$ to $d = 0.50$). Effect size for violent behavior was $d = 0.50$. The 4 ASI measures, while significant, had smaller effect sizes ($d = 0.14$ to $d = 0.03$).

Comparison of Post-Discharge Symptom Change and Post-Discharge Suicide Attempts

Comparison of veterans who made a suicide attempt after discharge and those who did not on the amount of change from admission to post-discharge assessment on measures, each considered separately (controlling for baseline characteristics associated with post-discharge suicide attempt), showed the biggest differences between the groups in changes in the total PTSD symptom score ($d = 0.54$), suicidal thoughts ($d = 0.58$), and the violent behavior measure ($d = 0.54$) (Table 3). Differences on other subscales, though smaller, were also substantial ($0.28 < d < 0.42$). Veterans who attempted suicide showed little or no improvement on these measures in stark contrast to other veterans.

In the final stepwise logistic regression model, which included change variables with effect sizes greater than 0.20, clinical changes significantly and independently associated with post-discharge suicide attempt (in logistic regression with $P < .01$ net of baseline covariates) included relative increases in the suicidal thoughts subscale ($\beta = 0.96$, $P < .001$), increases on the violent behavior scale ($\beta = 0.49$, $P < .001$), and increases on the ASI alcohol composite index ($\beta = 0.56$, $P < .001$), along with a small decrease in symptoms of agitation ($\beta = -0.137$, $P = .0042$). Further examination of the interaction of change in violent behavior and in the ASI composite alcohol index showed no significant interaction.

DISCUSSION

This study found that about 10% of veterans reported a suicide attempt in the 4 months prior to admission and 3.8% in the 4 months after discharge from specialized intensive VHA PTSD treatment programs; in both instances, attempts were associated with concurrent psychiatric and substance abuse diagnoses and higher levels of both suicidal ideation and violent behavior and, at follow-up, with increases in alcohol use.

Studies of rates and correlates of suicide death among VHA patients have made sophisticated use of the data from VHA electronic health records to both develop predictive models of suicide risk and to evaluate changing rates of suicide deaths in VHA following preventive interventions.[3,4,28,29] Survey data from the general population of veterans[30] and from 2 longitudinal studies of clinical samples have identified factors that predict suicide attempts over a 2-year period,[11,31] many of which were similar to those identified in this study including past suicide attempts, suicide ideation, PTSD symptoms, alcohol use, and anger. However, these studies did not examine longitudinal changes in these symptoms during the vulnerable period following hospitalization nor identify changes in violent behavior as a predictor of suicide attempt.

While administrative and survey data provide an invaluable system-wide perspective on suicide risk,[30] they are largely limited to sociodemographic and diagnostic traits that are relatively stable over time, and none, to our knowledge, have examined the association of suicide attempts with symptom and behavior changes following specialized intensive treatment in a hospital or other acute care program. One study using clinical trial data showed that changes in suicidal ideation were associated with changes in other PTSD symptoms[32] but did not examine associations with suicide attempts. Program evaluation data presented here are, thus, distinctive in offering information on a large enough sample to allow meaningful analysis of differences in clinical change associated with the risk of suicide attempts in clinically high risk circumstances.

While there have been retrospective reports of cross-sectional associations between aggression and suicidality,[10,19] the short-term association between changes in violent behavior and suicide attempts in the period after discharge from intensive treatment has not previously been reported and may offer a target for intervention.

Psychological treatment of impulsive anger has a substantial history of demonstrated effectiveness.[33] Most recently, a VHA sponsored research program has specifically targeted violent behavior among veterans with PTSD[34,35] using a manualized therapy originally developed for adults with alcohol use problems and violent behavior.[36] This approach includes both a cognitive component and calming skills,[37] with the latter appearing to be the component most effective with veterans. This approach has been evaluated in both face-to-face and videoconference treatment of outpatients[35] but has yet to be evaluated in acute care settings such as the specialized intensive PTSD programs under consideration in this report. The data reported here provide encouragement for the evaluation of this approach as an additional component of specialized intensive PTSD treatment programs, along with medications (however controversial, for suicidality)[38–40] and other psychotherapies for PTSD.

Over the past several years, the VHA has supplemented its mental health services with specific programs for suicide prevention through outreach and careful monitoring,[41] although these have not yet involved new, more effective interventions. Suicide rates in total population of VHA patients have been stable, without decreases that can be attributed to these enhancements.[42] The stable rates, however, stand in contrast to increased suicide rates in other US populations, especially middle-aged men,[43] and in veterans who do not use VHA services.[3,44]

Several limitations of this study require comment. First, this is an exploratory observational study based on retrospective data, and thus definitive causal conclusions are not possible. We used multiple regression analysis to control for factors that could potentially confound the

analysis of baseline and longitudinal factors associated with post-discharge suicide attempts. A strength of the latter findings of this study is that they are based on longitudinal analyses and that the baseline and longitudinal correlates of suicide attempts were consistent with one another. A further limitation is that follow-up symptoms were recorded at the same time as the history of suicide attempts and thus could have occurred any time since discharge, even after any suicide attempt. While we have assumed a relative temporal concurrence of suicide attempts and symptom changes, that assumption cannot be validated. Second, we did not have data at discharge to predict the risk of suicide attempt in the next 4 months. For practical reasons, this could not be done in the context of a national program evaluation. However, the consistent information on baseline correlates of past suicide attempts, baseline predictors of post-discharge suicide attempts, and roughly concurrent post-discharge change data correlated to post-discharge suicide attempts are informative, if less than ideal for prediction. Third, while strengths of the study are the large sample size and that data were collected under real-world circumstances, diagnoses were not based on standard measurement procedures, and outcome measures were those available for use in the national program evaluation effort and were collected by program staff rather than trained independent research assistants. Finally, data are not available documenting details of program operation, services offered, or use of evidence-based practices. It is uncertain whether the results are generalizable to other programs, but, paradoxically, this suggests a robustness of these findings as they emerge from a diverse set of programs.

In spite of these limitations, violent behavior and suicidal ideation emerged as robust correlates of recent suicide attempts at admission, and, along with alcohol use, change in these measures was associated with suicide attempts after discharge. Therapeutic attention to violent behavior and alcohol use, perhaps reflecting underlying impulsivity, may help reduce the risk of suicide attempts in veterans recently discharged from specialized intensive treatment programs for PTSD.

Submitted: January 16, 2019; accepted April 9, 2019.

Published online: August 13, 2019.

Author contributions: Both authors had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

Potential conflicts of interest: None.

Funding/support: This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Disclaimer: The views expressed in this article are those of the authors and do not necessarily reflect the opinions of any of the sponsoring organizations, agencies, or the US government.

REFERENCES

1. Stone DM, Simon TR, Fowler KA, et al. Vital signs: trends in state suicide rates—United States, 1999–2016 and circumstances contributing to suicide—27 states, 2015. *MMWR Morb Mortal Wkly Rep*. 2018;67(22):617–624.
2. Ricks TE. Why so many veterans commit suicide. *Chicago Tribune* website. https://www.chicagotribune.com/news/opinion/commentary/ct-perspec-military-veterans-suicide-0406-story.html. June 6, 2018; Accessed November 18, 2018.
3. Katz IR, McCarthy JF, Ignacio RV, et al. Suicide among veterans in 16 states, 2005 to 2008: comparisons between utilizers and nonutilizers of Veterans Health Administration (VHA) services based on data from the National Death Index, the National Violent Death Reporting System, and VHA administrative records. *Am J Public Health*. 2012;102(suppl 1):S105–S110.
4. Blow FC, Bohnert AS, Ilgen MA, et al. Suicide mortality among patients treated by the Veterans Health Administration from 2000 to 2007. *Am J Public Health*. 2012;102(suppl 1):S98–S104.
5. McCarthy JF, Valenstein M, Kim HM, et al. Suicide mortality among patients receiving care in the Veterans Health Administration health system. *Am J Epidemiol*. 2009;169(8):1033–1038.
6. Coryell W, Young EA. Clinical predictors of suicide in primary major depressive disorder. *J Clin Psychiatry*. 2005;66(4):412–417.
7. Bolton JM, Robinson J. Population-attributable fractions of Axis I and Axis II mental disorders for suicide attempts: findings from a representative sample of the adult, noninstitutionalized US population. *Am J Public Health*. 2010;100(12):2473–2480.
8. 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):311–318.
9. Pompili M, Sher L, Serafini G, et al. Posttraumatic stress disorder and suicide risk among veterans: a literature review. *J Nerv Ment Dis*. 2013;201(9):802–812.
10. Kimbrel NA, Calhoun PS, Elbogen EB, et al; VA Mid-Atlantic MIRECC Registry Workgroup. The factor structure of psychiatric comorbidity among Iraq/Afghanistan-era veterans and its relationship to violence, incarceration, suicide attempts, and suicidality. *Psychiatry Res*. 2014;220(1–2):397–403.
11. Wilks CR, Morland LA, Dillon KH, et al; VA Mid-Atlantic MIRECC Workgroup. Anger, social support, and suicide risk in US military veterans. *J Psychiatr Res*. 2019;109:139–144.
12. Kulka RA, Schlenger WE, Fairbank JA, et al. *Trauma and the Vietnam War Generation: Report of Findings from the National Vietnam Veterans Readjustment Study*. Philadelphia, PA: Brunner/Mazel; 1990.
13. Chung DT, Ryan CJ, Hadzi-Pavlovic D, et al. Suicide rates after discharge from psychiatric facilities: a systematic review and meta-analysis. *JAMA Psychiatry*. 2017;74(7):694–702.
14. Olfson M. Suicide risk after psychiatric hospital discharge. *JAMA Psychiatry*. 2017;74(7):669–670.
15. Rosenheck R, Fontana A. Impact of efforts to reduce inpatient costs on clinical effectiveness: treatment of posttraumatic stress disorder in the Department of Veterans Affairs. *Med Care*. 2001;39(2):168–180.
16. Hermes ED, Rosenheck RA, Desai R, et al. Recent trends in the treatment of posttraumatic stress disorder and other mental disorders in the VHA. *Psychiatr Serv*. 2012;63(5):471–476.
17. Angkaw AC, Ross BS, Pittman JO, et al. Post-traumatic stress disorder, depression, and aggression in OEF/OIF veterans. *Mil Med*. 2013;178(10):1044–1050.
18. Hellmuth JC, Stappenbeck CA, Hoerster KD, et al. Modeling PTSD symptom clusters, alcohol misuse, anger, and depression as they relate to aggression and suicidality in returning US veterans. *J Trauma Stress*. 2012;25(5):527–534.
19. Watkins LE, Sippel LM, Pietrzak RH, et al. Co-occurring aggression and suicide attempt among veterans entering residential treatment for PTSD: The role of PTSD symptom clusters and alcohol misuse. *J Psychiatr Res*. 2017;87:8–14.
20. Jakupcak M, Hoerster KD, Varra A, et al. Hopelessness and suicidal ideation in Iraq and Afghanistan War veterans reporting subthreshold and threshold posttraumatic stress disorder. *J Nerv Ment Dis*. 2011;199(4):272–275.
21. Buchanan A, Stefanovics E, Rosenheck RA. Correlates of reduced violent behavior among patients receiving intensive treatment for posttraumatic stress disorder. *Psychiatr Serv*. 2018;69(4):424–430.
22. Fontana A, Rosenheck R. Effectiveness and cost of the inpatient treatment of posttraumatic stress disorder: comparison of three models of treatment. *Am J Psychiatry*. 1997;154(6):758–765.
23. Fontana A, Rosenheck R. A short form of the Mississippi Scale for measuring change in combat-related PTSD. *J Trauma Stress*. 1994;7(3):407–414.
24. Rosenheck RA, Fontana A. Post-September 11 admission symptoms and treatment response among veterans with posttraumatic stress disorder. *Psychiatr Serv*. 2003;54(12):1610–1617.
25. McLellan AT, Luborsky L, Cacciola J, et al. New data from the Addiction Severity Index: reliability and validity in three centers. *J Nerv Ment Dis*. 1985;173(7):412–423.
26. Cohen J. *Statistical Power Analysis for the Behavioral Sciences*. 2nd ed. Hillsdale, NJ: L. Erlbaum; 1988.
27. SAS Institute I. SAS 9.3 [computer software]. Cary, NC: SAS Institute, Inc; 2011.
28. Ilgen MA, McCarthy JF, Ignacio RV, et al. Psychopathology, Iraq and Afghanistan service, and suicide among Veterans Health Administration patients. *J Consult Clin Psychol*.

2012;80(3):323–330.
29. Kessler RC, Hwang I, Hoffmire CA, et al. Developing a practical suicide risk prediction model for targeting high-risk patients in the Veterans health Administration. *Int J Methods Psychiatr Res*. 2017;26(3):e1575.
30. Pietrzak RH, Goldstein MB, Malley JC, et al. Risk and protective factors associated with suicidal ideation in veterans of Operations Enduring Freedom and Iraqi Freedom. *J Affect Disord*. 2010;123(1–3):102–107.
31. Lee DJ, Kearns JC, Wisco BE, et al. A longitudinal study of risk factors for suicide attempts among Operation Enduring Freedom and Operation Iraqi Freedom veterans. *Depress Anxiety*. 2018;35(7):609–618.
32. Holliday R, Holder N, Monteith LL, et al. Decreases in suicide cognitions after cognitive processing therapy among veterans with posttraumatic stress disorder due to military sexual trauma: a preliminary examination. *J Nerv Ment Dis*. 2018;206(7):575–578.
33. DiGiuseppe R, Tafrate RC. Anger treatment for adults: a meta-analytic review. *Clin Psychol Sci Pract*. 2003;10(1):70–84.
34. Mackintosh MA, Morland LA, Kloezeman K, et al. Predictors of anger treatment outcomes. *J Clin Psychol*. 2014;70(10):905–913.
35. Morland LA, Greene CJ, Rosen CS, et al. Telemedicine for anger management therapy in a rural population of combat veterans with posttraumatic stress disorder: a randomized noninferiority trial. *J Clin Psychiatry*. 2010;71(7):855–863.
36. Reilly PM, Shopshire MS. *Anger Management for Substance Abuse and Mental Health Clients: Cognitive Behavioral Therapy Manual*. US Department of Health & Human Services; 2002.
37. Mackintosh M-A, Morland LA, Frueh BC, et al. Peeking into the black box: mechanisms of action for anger management treatment. *J Anxiety Disord*. 2014;28(7):687–695.
38. Weitz E, Hollon SD, Kerkhof A, et al. Do depression treatments reduce suicidal ideation? the effects of CBT, IPT, pharmacotherapy, and placebo on suicidality. *J Affect Disord*. 2014;167:98–103.
39. Cuijpers P, de Beurs DP, van Spijker BA, et al. The effects of psychotherapy for adult depression on suicidality and hopelessness: a systematic review and meta-analysis. *J Affect Disord*. 2013;144(3):183–190.
40. Baldessarini RJ, Tondo L. *Psychopharmacology for Suicide Prevention, Evidence-Based Practice in Suicidology: A Sourcebook*. Gottingen, Germany: Hogrefe Publishing, GmbH; 2010:243–264.
41. Katz I. Lessons learned from mental health enhancement and suicide prevention activities in the Veterans Health Administration. *Am J Public Health*. 2012;102(suppl 1):S14–S16.
42. Kemp JE. Suicide rates in VHA Patients through 2011 with comparisons with other Americans and other veterans through 2010. Warrior Support Team website. http://wiimarine.org/downloads/Suicide_Data_Report_Update_January_2014.pdf. 2014.
43. Kochanek KD, Murphy SL, Xu J, et al. Mortality in the United States, 2013. *NCHS Data Brief*. 2014;(178):1–8.
44. McCarthy JF, Bossarte RM, Katz IR, et al. Predictive modeling and concentration of the risk of suicide: implications for preventive interventions in the US Department of Veterans Affairs. *Am J Public Health*. 2015;105(9):1935–1942.

Editor's Note: We encourage authors to submit papers for consideration as a part of our Focus on Suicide section. Please contact Philippe Courtet, MD, PhD, at pcourtet@psychiatrist.com.