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Suicide Risk Factors and Risk Assessment Tools: A Systematic Review

EXECUTIVE SUMMARY

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PREFACE

Quality Enhancement Research Initiative's (QUERI) Evidence-based Synthesis Program (ESP) was established to provide timely and accurate syntheses of targeted healthcare topics of particular importance to Veterans Affairs (VA) managers and policymakers, as they work to improve the health and healthcare of Veterans. The ESP disseminates these reports throughout VA.

QUERI provides funding for four ESP Centers and each Center has an active VA affiliation. The ESP Centers generate evidence syntheses on important clinical practice topics, and these reports help:

- develop clinical policies informed by evidence,
- guide the implementation of effective services to improve patient outcomes and to support VA clinical practice guidelines and performance measures, and
- set the direction for future research to address gaps in clinical knowledge.

In 2009, the ESP Coordinating Center was created to expand the capacity of QUERI Central Office and the four ESP sites by developing and maintaining program processes. In addition, the Center established a Steering Committee comprised of QUERI field-based investigators, VA Patient Care Services, Office of Quality and Performance, and Veterans Integrated Service Networks (VISN) Clinical Management Officers. The Steering Committee provides program oversight, guides strategic planning, coordinates dissemination activities, and develops collaborations with VA leadership to identify new ESP topics of importance to Veterans and the VA healthcare system.

Comments on this evidence report are welcome and can be sent to Nicole Floyd, ESP Coordinating Center Program Manager, at nicole.floyd@va.gov.

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INTRODUCTION

Suicide is a major public health concern in the United States (US), claiming over 36,000 lives each year and nearly 100 lives each day, and suicide among military and Veteran populations is of particular concern.[1] Veterans returning from the Iraq and Afghanistan conflicts, referred to as Operation Enduring Freedom/Operation Iraqi Freedom (OEF/OIF) Veterans, may be particularly at risk, although the limited available data has shown mixed results.[2, 3] Several aspects of military experience may increase the risk of suicide, including mental health and substance abuse. Many risk factors specific to the OEF/OIF population have yet to be thoroughly evaluated and incorporated into clinical management.

Ideally, suicide risk assessment tools need to account for the relationship among different risk factors and identify risk factors or combinations of risk factors that are particularly associated with suicidal self-directed violence. To be practically useful, such tools will be brief enough to be conducted in a primary care setting and will identify a threshold beyond which preventive action should be taken. Risk assessment tools should be able to discriminate those at high- and low-risk for suicidal self-directed violence. Likewise, studies of emerging risk factors need to evaluate the contribution of a new potential predictor of suicide and self-directed violence in the context of known risk factors in order to weigh the contribution of the new risk factor against those that are currently known.

The objective of this report is to review recent evidence about risk factors and risk assessment tools within Veteran and military populations to provide evidence for clinical practice guideline development specific to these populations.

The key questions addressed in this report were:

Key Question #1. What assessment tools are effective for assessing risk of engaging in suicidal self-directed violence in Veteran and military populations?

Key Question #2. In addition to the risk factors included by current assessment tools, what other risk factors predict suicidal self-directed violence in Veteran and military populations?

METHODS

The Veterans Affairs (VA)/Department of Defense (DoD) suicide prevention Evidence Based Practice Working Group (EBPWG) requested a systematic review of literature related to suicidal self-directed violence published since two prior reports on the topic by Mann et al. and Gaynes et al.;[4, 5] therefore, we used the end search date from the Mann et al. review as the starting point for the current search. The workgroup requested a review focused on specific countries and populations of interest because of their similarity to US Veteran and military populations, and requested a report highlighting risk factors and assessment tools most relevant to US Veteran and military populations. Due to the timeline and large body of literature identified that is focused on Veteran and military populations, as well as the existence of the recent National Institute for

Health and Clinical Excellence (NICE) 2011 review on self-harm in all populations including civilians,[6] we limited the scope of this review to articles focused on Veteran and military populations, highlighting relevant reviews on civilian populations in each section of the report. Though a previous systematic review focused on Veterans and members of the military was conducted by Shekelle et al. in 2009,[7] the EBPWG requested that the current review focus on risk factors and assessment tools, which were largely excluded from that report.

We identified relevant systematic reviews and relevant primary studies by searching PubMed, PsycINFO, the Cochrane Database of Systematic Reviews®, and the Cochrane Central Register of Controlled Trials® from 2005 to November 18, 2011. We used suicide and related terminology, and included risk assessment, screening and validity, military, Veterans as search terms (Appendix A). We limited the search to peer-reviewed articles involving human subjects and published in the English language that were not included in a previously published systematic review on the topic.[4, 5] Additional citations were identified from reference lists, consultation with content experts, and web sources. Doctoral level investigators and project research associates trained in the critical analysis of literature reviewed all titles, abstracts and full-text articles; full-text articles were reviewed in duplicate. Data abstraction and quality assessment (risk of bias determination) of all included primary studies and systematic reviews were performed in duplicate by investigators and research associates. We assessed study quality of systematic reviews using Oxman and Guyatt criteria.[8] We assessed the risk of bias of primary studies of assessment tools and primary studies of risk factors using modified versions of the tools described by Harris 2001 and Hayden 2006.[9, 10]

DATA SYNTHESIS

We constructed evidence tables showing the study characteristics and results for all included studies, organized by key question and study design. We critically analyzed studies to compare their characteristics, methods, and findings. We compiled a summary of findings for each key question, and drew conclusions based on qualitative synthesis of the findings.

We also report findings as described in the prior systematic reviews by Mann et al., Gaynes et al., and the NICE 2011 draft report on self-harm[4-6] in order to assess contributions of pre-2005 and non-Veteran, non-military literature to this report. Due to the differences in scope and methods in these other reports, data synthesis of their findings is limited to a qualitative summary of findings.

PEER REVIEW

A draft version of this report was reviewed by seven technical experts, as well as clinical leadership. Reviewer comments were addressed and our responses were incorporated in the final report (Appendix M).

RESULTS

We reviewed 16,521 titles and abstracts from the electronic and hand searches. After applying our inclusion/exclusion criteria (see Study Selection Form, Appendix B), we rejected 15,743 at

the abstract level, and performed a more detailed full-text review on 778 articles. From these, we identified 30 observational studies and 14 systematic reviews (reported in 16 publications) that addressed at least one of the key questions.

Key Question #1. What assessment tools are effective for assessing risk of engaging in suicidal self-directed violence in Veteran and military populations?

Summary of prior reviews on risk assessment tools in non-Veteran and non-military populations

To address the body of literature that evaluated suicide assessment tools and risk prior to 2005 and in non-Veteran and non-military populations, we highlight findings from systematic reviews of suicide by Mann et al. and Gaynes et al., and one on repetition of self-harm by NICE in 2011;[4-6] as well as two non-systematic literature reviews highlighting existing suicide assessment tools for adults and older adults by Brown, and for children and adolescents by Goldston.[11, 12] Together, the Brown and Goldston papers describe the psychometric properties and cite validation studies for over 60 measures designed to assess suicidal ideation and behavior. The Brown report cites numerous measures that have demonstrated adequate internal reliability and concurrent validity, and highlights the Scale for Suicidal Ideation and the Beck Hopelessness Scale as two of very few measures that have shown associations with death by suicide. The Goldston paper reports that many promising measures for use in child and adolescent populations have insufficient psychometric data, and need further research. Goldston specifically highlights the need for prospective studies examining the association between these assessment tools and death by suicide.

The three systematic reviews on suicide and self-harm, Mann et al., Gaynes et al. and NICE 2011,[4-6] also emphasize the need for further prospective research to establish the effectiveness of these assessment tools in predicting suicidal self-directed violence. All three report that current research is insufficient to determine definitively whether or not there is a benefit in implementing existing screening tools for the prevention of suicide. The most recent and comprehensive review on the topic published by NICE describes findings from six cohort studies examining prediction of death by suicide in patients with prior non-fatal self-harm.[6] These authors report that, overall, the findings were indicative of high rates of false positive identification of individuals as being at risk for suicide. The authors also note that the short follow-up times of the studies combined with the inadequate sample sizes needed to detect effects on such a low base-rate outcome, among other limitations, preclude the ability to recommend the use of these suicide risk assessment tools in clinical practice. This report also investigated scales designed to predict repeated self-harm, and described similar limitations among these scales. Overall, the findings from the Mann, Gaynes, and NICE reviews concur in their reports of limited evidence available on the effectiveness of suicide risk assessment measures for identification of those at risk for suicidal self-directed violence in civilian populations.

Primary studies of risk assessment tools in Veteran and military populations

Given the limited evidence available on effective suicide risk assessment tools, we examined the best available evidence specifically related to Veteran and military populations. Five articles[13-17] met our inclusion criteria and described assessment tools used within military or

Veteran populations. The risk assessment tools used in these studies include: the Addiction Severity Index (ASI), a lengthy structured clinical interview designed to be used as an intake interview for a substance abuse treatment program;[17] the Personality Assessment Inventory (PAI), a lengthy assessment tool designed to be administered by a psychologist in the context of an in-depth psychological assessment;[13] the Interpersonal Psychological Survey (IPS), a 34-item measure;[16] the Beck Depression Inventory-II (BDI), a 21-item, commonly used depression screening tool that includes a question about suicidal ideation;[14] and a brief screening tool, the Affective States Questionnaire (ASQ).[15] None of these studies were rated as having a low risk of bias. Two of these were rated as having an unclear risk of bias,[15, 17] and three had methodological flaws resulting in a high risk of bias (Appendix J).[13, 14, 16] None of these performed reclassification analysis, which is the current gold standard for the evaluation of risk assessment tools. The two higher quality are discussed below;[15, 17] three other studies with high risk of bias (due to unclear selection criteria for the study population, unclear/unstandardized risk factor assessment, and lack of systematic outcome assessment, including lack of assessor blinding and retrospective estimation of scores for those who died by suicide) are described in more detail within the full report.[13, 14, 16]

Tiet et al. investigated the use of the ASI using data from over 34,000 Veterans who were assessed as part of substance abuse treatment at 150 Veterans Affairs Medical Centers (VAMCs) nationwide.[17] Sensitivity ranged from 0.33-0.89 and specificity ranged from 0.42-0.87. Despite its rating as having an unclear risk of bias, this study provides moderate strength evidence for the risk assessment capabilities of the ASI based on its large sample size (i.e., the entire population of Veterans who completed a structured and electronically documented substance abuse intake process). However, given the range of sensitivity and specificity data, it is unlikely that a cut-off with adequate sensitivity would have an acceptably low rate of false positives.[17] This assessment tool is not ideal for settings that require brief screening tools, though it was previously widely used and available in many Veterans' medical charts.

Hendin et al. examined a brief screening tool, the ASQ, as a predictor of suicidal behavior.[15] This study was conducted among a population of 283 Veterans receiving inpatient or outpatient services at a VAMC. Using a cutoff of ≥3, the ASQ resulted in sensitivity of 0.60 and specificity of 0.74 in this population. This study is limited in its applicability and received a rating of unclear risk of bias because of insufficient information on patient selection and assessor blinding to the suicidal behavior outcome. Because of this and its relatively small sample size, this study provides insufficient evidence that the ASQ predicts suicidal behavior. However, because of the initially promising results even after adjusting for known risk factors, as well as the potential utility of such a brief screening tool in primary care settings, future research on the predictive power of the ASQ is warranted.

Overall, evaluation of the effectiveness of risk assessment tools is lacking. It is unclear whether a risk assessment tool can accurately reclassify Veterans and military personnel from low risk to higher risk. Conclusive evidence of reclassification in studies with low risk of bias would be necessary to increase this overall assessment of strength of evidence for research investigating suicide risk assessment tools.

Key Question #2. In addition to the risk factors included by current assessment

tools, what other risk factors predict suicidal self-directed violence in Veteran and military populations?

Summary of prior reviews of risk factors in non-Veteran and non-military populations

To review the contributions of literature prior to 2005 and in civilian populations, we highlight findings from existing systematic reviews of risk factors in any population. These include two systematic reviews of suicide by Mann et al., Gaynes et al., and one on repetition of self-harm by NICE in 2011.[4-6] Mann and Gaynes did not address literature assessing the strength of individual risk factors, but the NICE report did perform a comprehensive review and meta-analysis of risk factors. The NICE report methodology differs from that used for this report in several ways: 1) they included only prospective studies evaluating risk for repetition of self-harm; 2) they included studies from other countries outside the scope of this report; and 3) they included studies that were not adjusted for important confounders (other risk factors that might explain the association, e.g. mental health diagnoses).

The NICE report found that the following factors predicted non-fatal repetition of self-harm in adults:[6] prior self-harm and depression symptoms, schizophrenia and related symptoms, alcohol misuse, other psychiatric history, unemployment and "registered sick," female gender (mixed and poor quality evidence), unmarried status (narrative evidence only; not predictive in pooled analysis), and younger age. The following symptoms predicted suicide among adults with prior self-harm: suicide intent/intent to die, male gender, psychiatric history, older age, violent methods of self-harm, physical health problems (mixed evidence), and alcohol abuse (mixed evidence). Risk factors for repeated self-harm among young people were similar to those identified for adults. Given these differences between our report and the NICE review, these findings should be interpreted with some caution.[6]

Primary studies on risk factors for suicide in Veteran and military populations

We identified 26 studies that evaluated risk factors to predict suicide behavior outcomes (Appendix K).[14, 18-42] Tables 1 and 2 in the main body of this report list all risk factors identified and the studies that contributed to evidence for that risk factor (Table 1), and the study design, population, outcome and risk of bias for each study (Table 2).

The populations represented in these studies are US Veterans in 17 studies, active duty US military personnel in three studies and other military populations in six studies. Outcomes include death by suicide in 13 studies, self-reported suicide attempts in 11 studies, suicidal behavior assessed by chart review or clinician referral, or admission for suicide attempt.

Risk of bias for the 26 identified studies is included in Appendix L. Four studies had a high risk of bias, and therefore will not be discussed further in this report.[33, 34, 39, 40] The remaining 22 studies were rated as having unclear risk of bias. Limitations of the studies evaluated here that accounted for low or unclear risk of bias include: assessment of suicidal behavior by chart review only, a method that is biased by whether the provider chooses to document suicidal behavior; use of International Classification of Diseases (ICD) codes for risk factor assessment; assessment of suicide attempts by self-report; failure to report specific details of recruitment process (how many screened, how many agreed to participate and actually provided data); failure to report on the handling of missing data; and recruitment of potentially biased study population (as in

patient sample with non-random treatment assignment when medication is the risk factor). As explained in the Methods section, we excluded studies that had inadequate control for potential confounding variables and randomized controlled trials that did not account for treatment group.

Suicide attempts

Nine studies of suicide attempts used longitudinal, cross-sectional and case-control analyses to assess risk factors. (2 studies not discussed further because they had high risk of bias). Suicide attempt outcomes were often self-report and occasionally objectively documented (by clinician referral or hospital admission). Factors that were significant predictors of suicide attempts were: prior suicide attempt and depressive symptoms as measured by the BDI,[14] suicide or psychiatric symptoms (a composite of variables based on multiple aspects of suicidality from the ASI), alcohol and cocaine abuse.[28] Protective factors included: involvement with the criminal justice system and number of days participating in substance abuse treatment program. In a study of Canadian military personnel, having purposely injured or killed, toxic chemical exposure, life-threatening illness, and having lived as a civilian in a place where there was ongoing terror of civilians for political, ethnic, religious or other reasons ("religious terror") were significant predictors of suicide attempts among men.[18, 19] In this study, women differed from men as to which variables predicated suicide attempt; risk factors for women tended to be classified as "traumatic".

Death by suicide

Death by suicide was assessed in 17 studies. Outcome determination was most commonly performed using National Death Index (NDI) data linked with other types of registries and hospital records. Risk factors that were associated with death by suicide in more than one study include: white race, bipolar disorder and substance abuse (Table 1). Several risk factors were only significant (or reported) in one study of death by suicide: education, alcohol abuse, traumatic brain injury (TBI), diabetes, cerebrovascular disease, lower Mental Component Summary (MCS) scores reflective of mental health functioning, severe pain, and activity limitations. Others had mixed results, with some but not other studies finding significant association with suicide: male gender, age, anxiety, number of psychiatric conditions, post-traumatic stress disorder (PTSD), depression, anxiety, schizophrenia, history of inpatient psychiatric hospitalization, alcohol abuse and non-service connected Veteran status. Admission to a nursing home was found to be protective in one study.

Combining risk factors for suicide attempts and death by suicide may give a more thorough picture of suicide risk factors; however, doing so with the studies reviewed here does not shed substantially greater light on which risk factors are most predictive. Using data from both suicide and suicide attempts, PTSD and depression, and psychiatric conditions appear to have adequate evidence to support their acceptance as a risk factor for suicide. Many other risk factors remain evaluated in only one study, thereby limiting conclusions about their utility for predicting suicide.

Limitations of these studies include heterogeneous populations, settings and risk factors assessments. Specifically, risk factors may differ between populations with different underlying conditions. In cases where there is discrepancy about whether a factor conveys risk, protection

or is neutral (as is the case with PTSD), population differences may be part of the explanation. In addition to using different populations, studies do not assess the same risk factors. This limits the ability to either quantitatively or qualitatively compare across studies. This fact also limits the ability to adequately assess a new risk factor. For example, when a study of a new risk factor fails to include or adequately report on the contribution of another known risk factor, one cannot be certain that the new risk factor is independent in its prediction of the outcome.

Some of the factors determined by these studies are specific to the populations studied. For instance, Ilgen et al. 2007 found that number of treatment days was an important protective factor in their study of suicide after admission to inpatient substance use disorders program.[28] Clearly, this protective factor is not generalizable to populations of Veterans that have not been admitted to an inpatient treatment unit. There may be other risk factors that differ substantively between populations for other less readily apparent reasons.

Future research is necessary to better understand differences in risk factors among populations. In particular, the differences between risk factors for suicide among men and women are understudied.