QUERI

# Evidence Brief: Suicide Prevention in Veterans

September 2018

Prepared for:
Department of Veterans Affairs
Veterans Health Administration
Quality Enhancement Research Initiative
Health Services Research & Development Service
Washington, DC 20420

Prepared by:
Evidence-based Synthesis Program (ESP)
Coordinating Center
Portland VA Health Care System
Portland, OR
Mark Helfand, MD, MPH, MS, Director

Investigators:
Kim Peterson, MS
Johanna Anderson, MPH
Donald Bourne, MPH

VA HEALTH CARE Defining EXCELLENCE in the 21st Century

# PREFACE

The VA Evidence-based Synthesis Program (ESP) was established in 2007 to provide timely and accurate syntheses of targeted healthcare topics of particular importance to clinicians, managers, and policymakers as they work to improve the health and healthcare of Veterans. QUERI provides funding for four ESP Centers, and each Center has an active University affiliation. Center Directors are recognized leaders in the field of evidence synthesis with close ties to the AHRQ Evidence-based Practice Centers. The ESP is governed by a Steering Committee comprised of participants from VHA Policy, Program, and Operations Offices, VISN leadership, field-based investigators, and others as designated appropriate by QUERI/HSR&D.

The ESP Centers generate evidence syntheses on important clinical practice topics. These reports help:

- Develop clinical policies informed by evidence;
- Implement 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.

The ESP disseminates these reports throughout VA and in the published literature; some evidence syntheses have informed the clinical guidelines of large professional organizations.

The ESP Coordinating Center (ESP CC), located in Portland, Oregon, was created in 2009 to expand the capacity of QUERI/HSR&D and is charged with oversight of national ESP program operations, program development and evaluation, and dissemination efforts. The ESP CC establishes standard operating procedures for the production of evidence synthesis reports; facilitates a national topic nomination, prioritization, and selection process; manages the research portfolio of each Center; facilitates editorial review processes; ensures methodological consistency and quality of products; produces “rapid response evidence briefs” at the request of VHA senior leadership; collaborates with HSR&D Center for Information Dissemination and Education Resources (CIDER) to develop a national dissemination strategy for all ESP products; and interfaces with stakeholders to effectively engage the program.

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

**Recommended citation:** Peterson K, Anderson J, Bourne, D. Evidence Brief: Suicide Prevention in Veterans. VA ESP Project #09-199; 2018.

This report is based on research conducted by the Evidence-based Synthesis Program (ESP) Coordinating Center located at the **Portland VA Health Care System, Portland, OR**, funded by the Department of Veterans Affairs, Veterans Health Administration, Office of Research and Development, Quality Enhancement Research Initiative. The findings and conclusions in this document are those of the author(s) who are responsible for its contents; the findings and conclusions do not necessarily represent the views of the Department of Veterans Affairs or the United States government. Therefore, no statement in this article should be construed as an official position of the Department of Veterans Affairs. No investigators have any affiliations or financial involvement (*eg*, employment, consultancies, honoraria, stock ownership or options, expert testimony, grants or patents received or pending, or royalties) that conflict with material presented in the report.

# TABLE OF CONTENTS

# FIGURES AND TABLES

# EXECUTIVE SUMMARY

Despite the US Department of Veterans Affairs' (VA) increased efforts over the past decade in implementing comprehensive Suicide Prevention Program initiatives, according to the new VA National Suicide Data Report 2005-2015, an average of 20 Veterans continue to die each day by suicide. An important barrier to the success of VA's suicide prevention initiatives may be the lack of adequate evidence in Veterans supporting recommendations of any specific risk assessment method or prevention intervention.

## Summary of Key Findings

Among 3,569 new citations identified since our 2015 review (Nelson 2015), we added 8 new studies to the 9 existing studies from the 2015 review in military and Veteran populations. These studies examined numerous different approaches including risk assessment using predictive modeling and various population-level and individual-level interventions (Executive Summary Table 1). For risk prediction, the most promising findings are from the Army Study to Assess Risk and Resilience in Service members (Army STARRS), which identified a few large risk prediction models as fairly to highly accurate in predicting suicide risk in active duty Soldiers (AUC 0.72 to 0.97). However, the applicability of these risk prediction models in service members transitioning to civilian life and/or Veteran populations is not yet known. For suicide prevention interventions, ongoing psychotherapy-focused interventions for individuals in acute suicidal crisis continue to be the most widely studied, with outpatient cognitive behavioral therapy (CBT) still being the most well-established treatment.

## Veterans Transitioning from Uniformed Service to Civilian Life

Service members who are separating from active duty into civilian life are at a particularly high risk of suicide. As we found no completed or ongoing studies that specifically focused on this subpopulation, our review confirmed the need for new research in Veterans during their transition from uniformed service to civilian life. Recommendations for future research include: (1) establishment of a clear definition of what specific post-military separation timeframe constitutes the transition period of interest, (2) prioritization of studies with well-defined inclusion criteria that are relevant to the specific post-military separation timeframe of interest, and (3) evaluation of variability in suicide prevention approaches based on differences in key patient characteristics such as the presence of mental health or substance use disorders and life stressors.

### *Background*

The ESP Coordinating Center (ESP CC) is responding to a request from Health Services Research and Development (HSR&D) for an evidence brief update of the 2015 ESP review on suicide prevention, with a special focus on research in Veterans, particularly Veterans transitioning from military to civilian life. Findings from this evidence brief will help support achievement of the goals of HSR&D's Suicide Prevention Roadmap by informing development and funding of new research in suicide prevention and related activities.

### *Methods*

To identify studies, we searched MEDLINE®, Cochrane Database of Systematic Reviews, Cochrane Central Register of Controlled Trials, and other sources up to June 2018. We used prespecified criteria for study selection, data abstraction, and rating internal validity and strength of the evidence. See our PROSPERO protocol for our full methods.

**Executive Summary Table 1: Summary of Evidence**

| Evidence | Summary of Findings (ê for reduction; = for no change) |
|---|---|
| *Suicide risk assessment models* | |
| 9 studies[1-9]: 5 case-series[1-3,5,9]; 2 RCs[4,7]; 1 PC[8];1 case-control[6]<br><br>Risk of Bias: 3 low[4-6]; 2 high[1,2]; 4 unclear[3,7-9]<br><br>SOE: NR | Models derived from databases or clinician-rated or patient self-report instruments.<br><br>Accuracy:<br>AUC range: 0.61[4] to 0.93[7] |
| *Healthcare services interventions directed towards populations* | |
| 4 studies: 3 before-after[10-12]; 1 PC[13]<br><br>Risk of bias: high (all studies)<br><br>SOE: Insufficient | Suicide rate:<br>ê 3 interventions: 2 multi-component interventions,[10,11] MHEOCC[12]<br>= 1 intervention: ASIST[13]<br><br>Suicide attempt:<br>ê 1 intervention: ASIST[13] |
| *Healthcare services interventions directed towards individuals* | |
| 4 RCTs[14-17]<br><br>Risk of bias: 1 low[14]; 3 unclear[15-17]<br><br>SOE: Low | Suicide attempt:<br>ê 1 intervention: CBT[17]<br>= 3 interventions: CRP,[14] DBT,[15] CAMS[16] |

Abbreviations: ASIST = applied suicide intervention skills training; MHEOCC = VA Mental Environment of Care Checklist; CRP = crisis response plan; DBT = dialectical behavioral therapy; CAMS = collaborative assessment and management of suicidality; CBT = cognitive behavior therapy; RCT = randomized controlled trial; RC = retrospective cohort; PC = prospective cohort; SOE = strength of evidence

## Overall Key Evidence Gaps and Future Research Recommendations

In addition to the gaps in evidence in Veterans transitioning from uniformed service to civilian life described above, the table below (Executive Summary Table 2) provides a summary of additional key evidence gaps and associated future research recommendations.

**Executive Summary Table 2: Key Evidence Gaps and Future Research Recommendations**

| Topics | Gaps | Recommendations for Future Research |
|---|---|---|
| *Populations* | | |
| Veterans transitioning from uniformed service to civilian life | · No completed or ongoing studies | · New studies in these populations. Please see above for more detailed recommendations |
| At-risk Veterans prior to reaching acute suicidal crisis | · Few available studies | · New studies in these populations |
| At-risk Veterans who have had no contact with the VA | · No completed or ongoing studies | · New studies on community outreach approaches, such as gatekeeper training |
| *Suicide Prevention Approaches* | | |
| Risk assessment | · Data on novel objective risk assessment approaches | · New studies of cognitive factors |

| | | |
|---|---|---|
| Population-level healthcare service interventions | · Identification of which specific components in multicomponent interventions are most effective<br>· Identification of specific subpopulations that may benefit most<br>· How outcomes differ from a concurrent rather than historical comparison group | · Studies that directly compare different combinations of components<br>· Studies that evaluate if and how effectiveness may vary based on differences in individual patient characteristics<br>· Studies that compare to a concurrent control group instead of a historical control group |
| Individual-level healthcare service interventions | · Although multiple studies exist on various psychotherapy approaches, we have limited confidence in their findings in general because each intervention was evaluated in only a single, small study with other potential weaknesses.<br>· No new studies of several other types of interventions | · Larger, more rigorous RCTs of DBT and Operation Worth Living may still be warranted to more definitely determine their suicide prevention effectiveness.<br>· New studies of (1) interventions designed to bolster protective factors such as psychological resilience, meaningful life, grit, gratitude, and social support, (2) innovative approaches that use technology to support or enhance care, (3) safety planning; (4) peer support specialists; (5) health coaching, (6) motivational interviewing |

Abbreviations: RCT = randomized controlled trial, DBT = dialectical behavioral therapy

# EVIDENCE BRIEF

## INTRODUCTION

### PURPOSE

The ESP Coordinating Center (ESP CC) is responding to a request from Health Services Research and Development (HSR&D) for an evidence brief update of the 2015 ESP review (Nelson 2015)[18] on suicide prevention, with a special focus on research in Veterans, particularly Veterans transitioning from military to civilian life. Findings from this evidence brief will help support achievement of the goals of HSR&D's Suicide Prevention Roadmap by informing development and funding of new research in suicide prevention and related activities.

### BACKGROUND

Suicide prevention continues to be a shared top clinical priority for the US Department of Veterans Affairs (VA) and the Veterans Health Administration (VHA). According to the new VA National Suicide Data Report 2005-2015, which is an ongoing examination of over 55 million civilian and Veteran death records, an average of 20 Veterans continue to die each day by suicide, although only 6 of these were Veterans who had recently used VHA services.[19] According to the Data Report, the youngest Veterans (aged between 18 and 29) had the highest risk of suicide in 2015.[19]

Among other priority areas, recent Veteran suicide prevention initiatives are focusing on reducing risk particularly during the first year following the transition from military service to civilian life (also referred to as 'separation from the military').[20-24] This is because a 2016 retrospective multivariate analysis of 3,795,823 US service members enrolled between 2001 and 2011 found an approximate doubling of suicide risk in the first year of separating from the military (HR 2.49; 95% CI 2.12 to 2.91).[24] Some reasons that separation from the military can be challenging include feelings of separateness, lack of a sufficient social support system or shared experiences with those systems, disconnection from families, deployment-related psychological or physical injuries, and financial, educational, and employment barriers.[25]

The finding that service members in transition to Veteran status are at higher suicide risk led President Trump to sign an Executive Order (EO 13822) in January 2018 to direct VA, the Department of Defense (DoD), and the Department of Homeland Security (DHS) to provide more seamless access to mental health care and suicide prevention resources for transitioning service members, particularly during their first year of military service separation. In response, a March 2018 Joint Action Plan For Supporting Veterans During Their Transition From Uniformed Service To Civilian Life[21] and a resulting VA Health Services Research & Development Suicide Prevention Roadmap (HSR&D)[26] were issued that describe specific planned actions to achieve the goals of EO 13822. Some examples of implementation efforts include improving mental health resource awareness through outbound education calls to service members within 90 days of separation date, expanded discussion in Transition Assistance Program (TAP) briefing, and the launch of a broad communication campaign.[21] The 2018 update of the VA National Strategy for Preventing Veteran Suicide calls for a greater focus on strengthening protective factors (*ie*, problem-solving and social support) as a strategic objective to prevent suicide in transitioning service members.[27] Additionally, HSR&D anticipates funding

new research to address gaps in knowledge about transitioning Veterans in the areas of epidemiology, risk identification, clinical and public health interventions, and health services.

## New VHA Suicide Prevention Initiatives and Standard Approaches

Although suicide risk screening is not a standard of care in US general medical practice,[28,29] it has been mandatory in the VHA for several years. For example, as primary care encounters have been identified as an important opportunity for suicide risk assessment – a majority of Veterans who die by suicide made contact with primary care in the preceding year (77%)[30] – all Veterans are screened with the Patient Health Questionnaire-2 (PHQ-2) annually in primary care. Those that screen positive based on the PHQ-2 will then then undergo more comprehensive risk assessment. Until recently, there had been no standardization of the risk assessment process. As of 2018, the VHA has launched a 3-step standardized process including a primary screen (PHQ-9), a secondary screen (Columbia-Suicide Severity Rating Scale Screener) for those who screen positive on the PHQ-9, and a comprehensive assessment of suicide risk to be conducted using the VA Comprehensive Suicide Risk Assessment (CSRA) template in the electronic medical record for those who screen positive on the secondary screen. New performance measures for this standardized risk assessment process will go into effect in Fiscal Year 2019.

Another recently implemented risk prediction initiative is the Recovery Engagement and Coordination for Health – Veterans Enhanced Treatment (REACH VET) program. REACH VET is a predictive modeling system that that uses a combination of demographic, prior suicide attempt, mental and physical health diagnoses, and VHA service and medication utilization information from Veterans' medical records to identify those at the top 0.1% of risk for various adverse events, including suicide.[6 31] REACH VET utilizes a dashboard that provides facility-level REACH VET coordinators with the names of Veterans who have been identified as being in the highest tier of risk once a month. Coordinators then notify providers, who assess need for and implement care enhancements.

Traditional approaches to suicide prevention generally include risk assessment (*eg*, self-report scales or checklists) and treatment of individuals at high risk, both at the population level (*eg*, public service announcements, national hotlines, provider education and training, *etc*) and at the individual level (*eg*, suicide-focused psychotherapy, pharmacotherapy). Newer suicide prevention approaches include predictive modeling using data from patient health records to predict risk (such as REACH VET), objective risk assessment methods (*eg*, cognitive factors, biological markers, neuroimaging), restricting access to lethal means, and, for individual-level interventions, health promotion efforts that target known risk factors in individuals before they are in acute suicide crisis, those that target protective factors such as building social support, and technology-based interventions to provide follow-up and continued contact, such as a smartphone application and caring contacts via email. Although the most recent (2013) VHA/Department of Defense (DoD) *Clinical Practice Guideline for the Assessment and Management of Suicide Risk* does not currently recommend any specific approaches due the limitations in pre-2013 research, a very broad systematic review is underway to update the guideline over the coming year.[32]

As of our last review in 2015,[18] although new evidence had emerged on some of the newer approaches, very few studies existed that evaluated the effectiveness and harms of any of these approaches specifically in Veteran populations, and particularly in service members transitioning

to civilian life. Therefore, we are updating this review to evaluate new evidence in general and with a special focus on transitioning service members.

## SCOPE

The objective of this evidence brief is to synthesize new evidence in Veterans that has emerged since the 2015 ESP suicide prevention review on diagnostic accuracy of suicide risk assessment methods and the effectiveness of healthcare service interventions in preventing suicidal self-directed violence. This evidence brief will address the following key questions and inclusion criteria:

## KEY QUESTIONS

Key Question 1: What are the accuracy and adverse effects of methods to identify Veterans and military personnel at increased risk for suicide and other suicidal self-directed violence?

a) Do accuracy and adverse effects vary by setting, delivery mode, targeted population (*ie*, transitioning Veterans (military to civilian)), or other factors?

Key Question 2: What are the efficacy/effectiveness and adverse effects of suicide prevention interventions in reducing rates of suicide and other suicidal self-directed violence in Veterans and military personnel?

a) Do efficacy/effectiveness and adverse effects vary by setting, delivery mode, targeted population (*ie*, transitioning Veterans (military to civilian)), or other factors?

Key Question 3: What are important areas of ongoing research and current evidence gaps in research on suicide prevention in Veterans and military personnel, and how could they be addressed by future research?

## ELIGIBILITY CRITERIA

The ESP included studies that met the following criteria:

- **P**opulation: US Veterans or military personnel aged ≥ 18 years, regardless of care setting or payer; or military or Veterans from the UK, Canada, New Zealand, or Australia

- **I**ntervention: Suicide risk identification methods or suicide prevention interventions. Specific interventions of interest include US-relevant population-directed healthcare services (*eg*, hotlines, outreach programs) and/or individual-directed healthcare services (*eg*, case management, follow-up) and not interventions that primarily treat co-existing conditions, including pharmacotherapy. Studies only of associations between risk and protective factors and suicide are also not included.

- **C**omparator: Any

- **O**utcomes: For KQ1, studies need to report a measure of diagnostic accuracy. For KQ2, the primary outcomes of interest are suicidal self-directed violence, including suicide

attempts and suicide-specific mortality. Additional secondary outcomes will be collected as available from studies designed primarily to capture suicidal self-directed violence.

  - Harms: Any (*eg*, potential unintentional iatrogenic effects such as anxiety, distress, stigma), including direct adverse effects of an assessment or intervention or those of subsequent interventions

- **T**iming: Any, no follow-up timeframe restrictions
- **S**etting: Veteran or military inpatient or outpatient setting
- **S**tudy design: Any, but may prioritize to accommodate timeline using a best-evidence approach

# METHODS

To identify articles relevant to the key questions, our research librarian searched MEDLINE, PubMed, PsycINFO, SocINDEX, Cochrane Central Register of Controlled Trials, and the Cochrane Database of Systematic Reviews using terms related to suicide and risk assessment (see Supplemental Materials for complete search strategies) up to June 2018. Additional citations were identified from hand-searching reference lists, relevant program websites (Military Operational Medicine Research Program, Military Suicide Research Consortium, Army STARRS), and consultation with content experts. We limited the search to published and indexed articles involving human subjects available in the English language from the date of the last systematic search (09/2015) forward. Study selection was based on the eligibility criteria described above. Titles and abstracts were first single-reviewed using Abstrackr software.[33] A second reviewer then re-screened 90% of the titles and abstracts excluded by the first reviewer until the Abstrackr software predicted no further citations were likely relevant ('sequential review').[33,34] Full-text articles were sequentially reviewed by 2 investigators. All disagreements were resolved by a third reviewer.

We used pre-specified tools to rate the internal validity of diagnostic accuracy studies,[35] randomized controlled trials,[36] and comparative cohort studies.[37] We abstracted data from all included studies and results for each included outcome. All data abstraction and internal validity ratings were first completed by one reviewer and then checked by another. All disagreements were resolved by consensus.

We graded the strength of the evidence for intervention studies for Key Question 2 based on the AHRQ Methods Guide for Comparative Effectiveness Reviews.[38] This approach incorporates 4 key domains: study limitations (includes study design and aggregate quality), consistency, directness, and precision of the evidence. It also considers other optional domains that may be relevant for some scenarios, such as a dose-response association, plausible confounding that would decrease the observed effect, strength of association (magnitude of effect), and publication bias. Strength of evidence is graded for each key outcome measure and ratings range from high to insufficient, reflecting our confidence that the evidence reflects the true effect.

Where studies were appropriately homogenous, we synthesized outcome data quantitatively using StatsDirect statistical software (StatsDirect Ltd. 2013, Altrincham, UK) to conduct random-effects meta-analysis to estimate pooled effects. We assessed heterogeneity using the Q statistic and the $I^2$ statistic. Where meta-analysis was not suitable due to limited data or heterogeneity, we synthesized the evidence qualitatively.

The complete description of our full methods can be found on the PROSPERO international prospective register of systematic reviews (http://www.crd.york.ac.uk/PROSPERO/; registration number CRD42018103412).

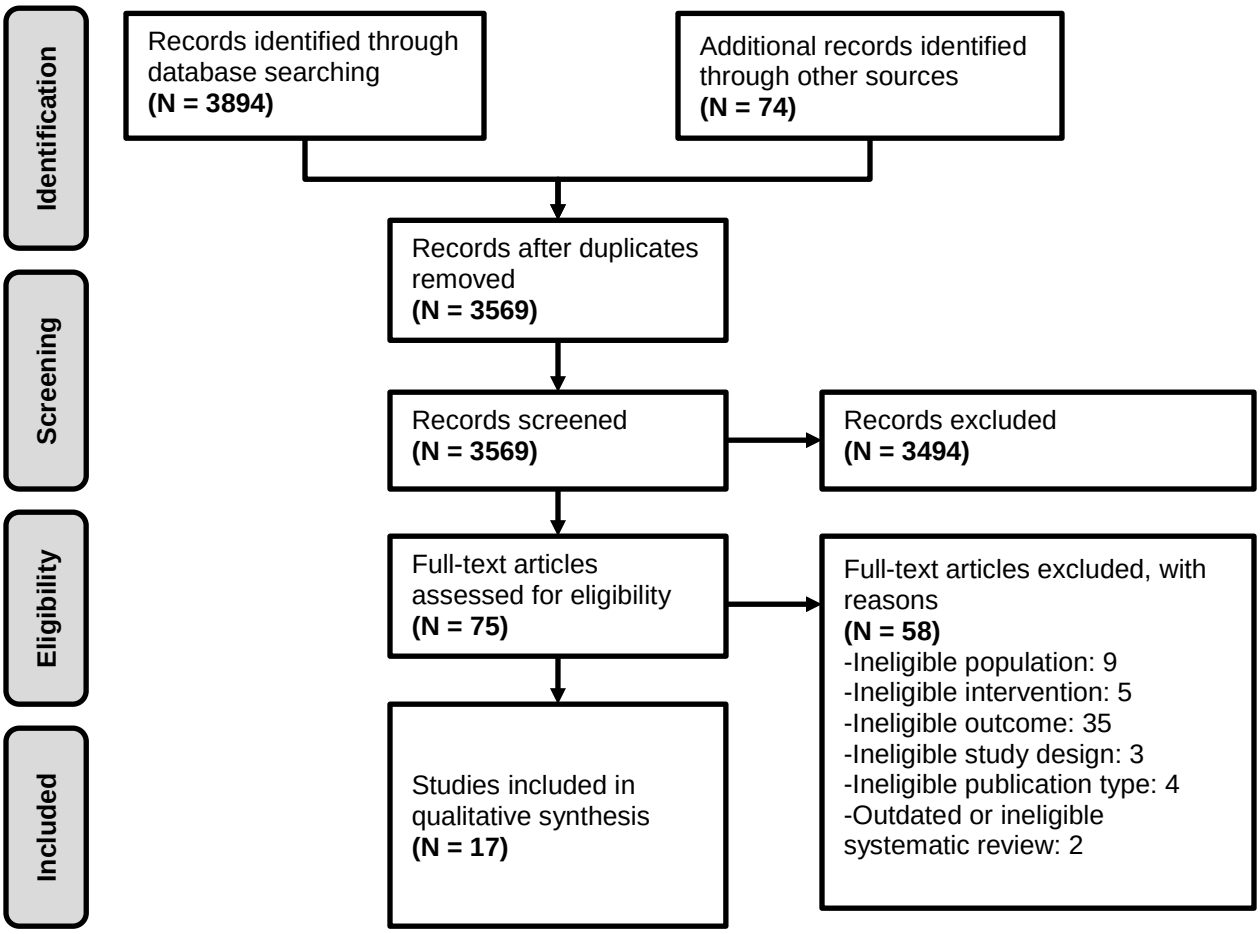
A draft version of this report was reviewed by peer reviewers as well as clinical leadership. Their comments and our responses are presented in the Supplemental Materials.

# RESULTS

## LITERATURE FLOW

The literature flow diagram (Figure 1) summarizes the results of the search and study selection processes.

**Figure 1: Literature Flowchart**




## LITERATURE OVERVIEW

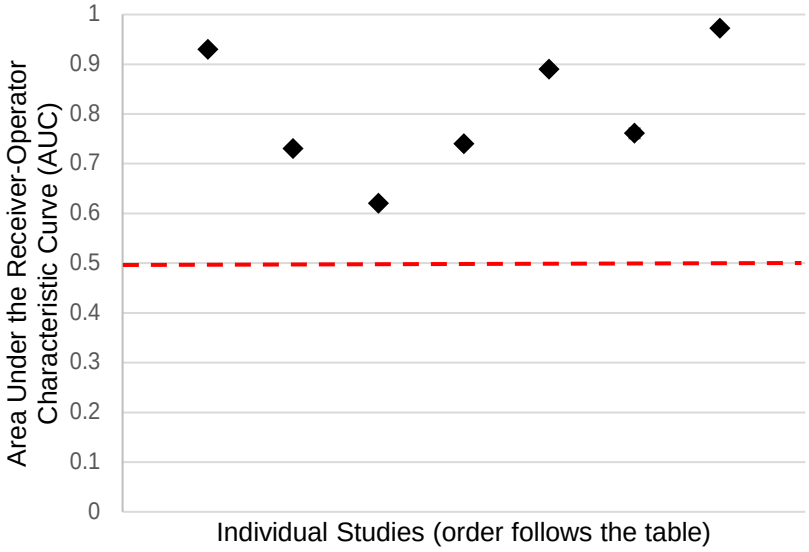
Searches resulted in 3,569 unique potentially relevant articles. We included 9 studies[1-9] for Key Question 1 and 8 studies[10-17] for Key Question 2 (see Supplemental Materials for list of excluded studies). Nine of these studies[1-3,5,6,9-11,17] were identified in the previous VA ESP review.[18] Most studies[4,5,7,8,10,11,13,14,16,17] (59%) were conducted in military populations, and the other studies[1-3,6,9,12,15] (41%) were conducted in Veterans. None focused on service members transitioning to civilian life or reported length of time since discharge. The size of these studies ranged from 91[15] to 5,969,662[6] participants. Most studies[3,7-9,15-17] had an unclear risk of bias, 4 studies[4-6,14] had a low risk of bias, and 3 studies[1,2,13] had a high risk of bias. The risk of bias was not assessed in before-after studies.[10-12] See supplemental materials for full data tables.

## KEY QUESTION 1: What are the accuracy and adverse effects of methods to identify Veterans and military personnel at increased risk for suicide and other suicidal self-directed violence?

For evaluation of the accuracy of methods to identify military members at risk for suicide and other suicidal self-directed violence, we identified 3 recently published studies[4,7,8] and 6 from the Nelson 2015 review (Table 1).[1-3,5,6,9] None specifically evaluated suicide risk in service members transitioning to civilian life. None evaluated potential adverse effects of risk assessment methods or how effects may vary based on differences in other population characteristics, timing, delivery modes, or other factors.

All 3 of the newer studies and one from the Nelson 2015 review[5] evaluated the accuracy of various population-level prediction models drawn from the Army Study to Assess Risk and Resilience in Servicemembers (Army STARRS) study.[4,7,8] Each involved a unique focus, including evaluating characteristics of suicidal thoughts hypothesized to predict incident attempts in those with lifetime suicidal ideation,[7] risk of suicide within 12 months of outpatient mental health visits in male nondeployed regular Army Soldiers,[4] risk of suicide attempt within 24 months after completing self-report surveys at the beginning of service in new Army Soldiers,[8] and prediction of suicide in the 12 months after US Army Soldier inpatient treatment of a psychiatric disorder.[5] Data sources primarily involved administrative databases[4,5,8] or survey samples.[7] Among the remaining 4 studies from Nelson 2015, 3 used one or more clinician-rated or patient self-report instruments to assess individual levels of risk.[1-3,9] These include the Suicide Potential Index and Suicidal Ideation subscales of the Personality Assessment Inventory (PAI),[1] the Affective States Questionnaire,[3] and the Beck Depression Inventory (BDI).[2] The last one used a decision tree derived from the Addiction Severity Index and variables from VA databases.[9] The majority of the studies exclusively reported predictive accuracy based on area under the receiver-operator characteristic curve (ROC AUC) analysis, which is an analysis of how well a test separates groups with and without a risk factor. Values of 1 represent perfect accuracy, whereas 0.5 represents accuracy that is no better than flipping a coin. Figure 2 illustrates the reported AUC values.[1,4-8] Three older studies previously evaluated in Nelson 2015 only reported accuracy in the form of sensitivity, specificity, positive predictive value, and negative predictive value.[2,3,9]

**Figure 2. Summary of Studies of Methods to Identify Suicide Risk Reporting Area Under the Receiver-Operator Characteristic Curve (AUC)**




| Study | AUC (95% CI) |
|---|---|
| Nock, 2018[7] | 0.93 |
| Kessler, 2017*[4] | 0.73 |
| Kessler, 2017**[4] | 0.62 |
| Rosellini, 2017[8] | 0.74 |
| Kessler, 2015[5] | 0.89 |
| McCarthy, 2015[6] | 0.716 (0.751 to 0.771) |
| Breshears, 2010[1] | 0.972 |

*w/ prior 12-month psych. hospitalization
**w/o prior 12-month psych. hospitalization

The majority of studies had few or no important methodological deficiencies.[3-5,7-9] Two older studies that used the PAI to predict suicidal behaviors in Veterans with TBI[1] and the BDI to predict suicide attempts in Veterans with PTSD,[2] respectively, were the only exceptions. The Nelson 2015 review rated these as having high risk of bias due to the studies having the major limitations of small sample sizes, high or unclear levels of missing data, and potentially biased participant selection and risk factor assessment.

The majority of the predictive model methods[1,4-8] had fair or better accuracy in discriminating between patients with and without suicide behaviors. This was demonstrated by ROC AUC estimates of ≥ 0.70 (range, 0.72 to 0.97). Accuracy was much lower among methods using clinician-rated or patient self-report instruments to assess individual levels of risk (sensitivity range, 33% to 63%).[2,3,9] Three models stand out as having the highest accuracy based on ROC AUC estimates ≥ 0.80.[1,4,7] The method with the highest accuracy (AUC 0.972) was use of a cut-point of ≥ 15 on the Suicide Potential Index plus pre-assessment suicidal behavior in a small sample of Veterans with TBI (N = 154),[1] but we have little confidence in the stability of this finding due to the major deficiencies described above. The method with the next highest predictive accuracy (AUC 0.93) used a 26-factor model of characteristics of suicidal thoughts to predict incident attempts in Army soldiers with lifetime suicidal ideation.[7] Study authors indicated that the most powerful predictors were "recent onset of ideation, presence and recent onset of a suicide plan, low controllability of suicidal thoughts, extreme risk-taking or 'tempting fate,' and failure to answer questions about the characteristics of one's suicidal thoughts." Finally, the model with the third highest predictive accuracy (AUC 0.89) was a 73-factor model of various characteristics (*ie*, sociodemographic, US Army career, criminal justice, medical, and pharmacy) used to predict suicides that occurred 12 months after US Army soldiers were discharged for inpatient treatment of a psychiatric disorder.[5] Study authors indicated that the strongest predictors included male sex, late age of enlistment, verbal violence, weapons possession, prior suicidality, number of antidepressant prescriptions filled in the past 12 months, and diagnosis of nonaffective psychosis during the focal hospitalization.

**Table 1. Studies of the Accuracy of Methods to Identify Individuals at Risk for Suicide and Other Suicidal Self-directed Violence in Veteran and Military Populations**

| Author, Year | Study Design; Approach | N; Population; Patient Characteristics; Setting | Risk Assessment Method | Outcome | Measures of Accuracy |
|---|---|---|---|---|---|
| *Recently Published Studies* | | | | | |
| Nock, 2018[7] | Retrospective analysis; used administrative data from the Historical Administrative Data System of the Army STARRS Consolidated All-Army Survey (AAS), a study that combines 3 large survey samples, each administered to a large and representative sample of active duty Soldiers. | 3,916; United States Army Soldiers, with lifetime suicide ideation, drawn from a large (N = 29,982), representative sample, serving between 2011-2013. | Population-level prediction model derived from administrative data systems. | Suicide attempt | · 26-predictor net model: AUC 0.93 |
| Kessler, 2017[4] | Retrospective analysis; used administrative data from the Historical Administrative Data System of the Army STARRS and machine learning methods (regression trees and penalized regressions) to develop a risk algorithm to predict posthospitalization suicides. | 975,057; Regular Army Soldiers serving between 2004–2009. | Population-level prediction model derived from 38 US Army and Department of Defense administrative data systems (nearly 1000 predictor variables were constructed). | Suicides within 12 months of hospital discharge. | With prior 12-month psychiatric hospitalizations:<br>· 14-predictor Elastic net model: AUC 0.72<br>· 14-predictor Logistic model: AUC 0.73<br>· 7-predictor Logistic model: AUC 0.72<br><br>Without prior 12-month psychiatric hospitalizations:<br>· 10-predictor Elastic net model: AUC 0.61<br>· 10-predictor Logistic model: AUC 0.62 |
| Rosellini, 2017[8] | Prospective cohort; used a self-administered questionnaire (New Soldier Survey) linked to outcomes data from the Historical Administrative Data System of the Army STARRS and penalized | 21,832; new regular US Army Soldiers starting in April 2011-November 2012 prior to beginning Basic Combat Training at | Population-level prediction model derived from 14 US Army and Department of Defense | Suicide attempt at 24-months post survey. | · 23-predictor Elastic net model: AUC 0.74 |

| | | | | | |
|---|---|---|---|---|---|
| | regression methods to develop a risk algorithm to predict suicide attempt. | Fort Benning, GA, Fort Jackson, SC, and Fort Leonard Wood, MO. | administrative data systems (772 individual predictor variables). | | |
| *Studies Included in Previous ESP Reviews (Nelson, 2015[18] & Haney,2012[39])* | | | | | |
| Kessler, 2015[5] | Case series; used administrative data from the Historical Administrative Data System of the Army STARRS and machine learning methods (regression trees and penalized regressions) to develop a risk algorithm to predict posthospitalization suicides. | 40,820 active duty US Army Soldiers with 53,769 psychiatric hospitalizations. | Population-level prediction model derived from 38 US Army and Department of Defense administrative data systems (421 individual predictor variables). | Suicides within 12 months of hospital discharge. | 20-predictor model: AUC 0.84<br><br>73-predictor model: AUC 0.89<br><br>421-predictor model: AUC 0.85 |
| McCarthy, 2015[6] | Nested, case-control study; predictive model derived from clinical records; included patients who died from suicide (case patients) and a random 1% of living patients (control patients), divided randomly into development and validation sets; determined AUC estimates. | 5,969,662 Veterans alive as of September 2010 and who had encounters with the Veterans Health Administration in the US in the previous 2 years. | Population-level prediction model derived from Veterans Health Administration clinical records (381 total measures including 31 interaction terms). | Suicide within 12 months according to the National Death Index. | AUC 0.761 (95% CI 0.751 to 0.771) |
| Breshears, 2010[1] | Case series; used hierarchical multiple regression and AUC estimates to determine optimum cut-points to estimate sensitivity and specificity. | 154 Veterans with traumatic brain injury in the US. | Suicide Potential Index and Suicidal Ideation subscales of the Personality Assessment Inventory. | Suicide and suicidal behavior (not defined) within 2 years of assessment. | Suicide Potential Index:<br><br>Cut-point ≥15: 90.9% sensitivity, 76.5% specificity; AUC 0.903.<br><br>Cut-point ≥15 plus pre-assessment suicidal behavior: 90.9% sensitivity, 95.1% specificity;<br>AUC 0.972.<br><br>Cut-point ≥11 plus pre-assessment suicidal behavior: 100.0% sensitivity, 86.0% specificity. |

| | | | | | |
|---|---|---|---|---|---|
| | | | | | The Suicidal Ideation subscale scores did not increase incremental validity (*P* = .65, diagnostic accuracy not determined). |
| Hendin, 2010[3] | Case series; used AUC estimates to determine sensitivity and specificity. | 283 inpatients and outpatients at a VA Medical Center in the US with affective disorder, or affective disorder plus substance abuse or anxiety disorders. | Affective States Questionnaire; a positive score was determined by rating at least 3 of the 7 affects as "severe" or "extreme." | Suicidal behavior* within 3 months of assessment. | Sensitivity 60%; Specificity 74%; PPV 32%; NPV 90%; |
| Tiet, 2006[9] | Case series; a decision tree for identifying high-risk patients was derived from the Addiction Severity Index and variables from VA databases; used AUC estimates to determine optimum cut-points to estimate sensitivity and specificity for 3 models.** | 5,671 adults with suicidal ideation from a national cohort seeking substance abuse treatment at 150 VA Medical Centers in the US. | Decision tree included significant predictors of suicide attempts.† | Suicide attempts in the past 30 days assessed with the Addiction Severity Index face-to-face interview. | · 30% model: 33% sensitivity, 87% specificity; PPV 37%, NPV 85%.<br>· 20% model: 72% sensitivity, 63% specificity; PPV 30%, NPV 90%.<br>· 10% model: 89% sensitivity, 42% specificity; PPV 25%, NPV 95%. |
| Hartl, 2005[2] | Case series; used signal detection methods and AUC estimates to determine optimum cut-points to estimate sensitivity and specificity. | 630 male Veterans with a primary posttraumatic stress disorder (PTSD) diagnosis entering a residential treatment program for PTSD in the US. | Beck Depression Inventory. | Suicide attempt within 4 months of discharge. | Beck Depression Inventory ≥ 46 and suicide attempt in the 4 months prior to intake: 63% sensitivity, 80% specificity in the exploratory sample; 11% sensitivity, 84% specificity in the replication sample. |

*Attempts, interrupted or aborted attempts, or preparatory acts/behaviors, with some degree of intent to die; or hospitalization/institutionalization.

** Based on the results of the decision tree, sensitivity and specificity were calculated for 3 hypothetical models using varying cut points of the percentages (10%, 20%, and 30%) of patients who attempted suicide in the past 30 days. A model that uses a cut-point at 30% means that the model requires the true-positive rate to be at least a 30% and that 30% or more of patients are predicted to attempt suicide.

† Suicide attempt/ideation history, recent alcohol abuse, recent cocaine abuse, violent behavior, hallucinations, and employment status.

## KEY QUESTION 2: What are the efficacy/effectiveness and adverse effects of suicide prevention interventions in reducing rates of suicide and other suicidal self-directed violence in Veterans and military personnel?

### Population-level Interventions

Three population-level interventions[10-12] reduced suicide rates in US military members[10,11] and Veterans with acute mental health admissions[12] in 2 before-after studies[10,12] and one post-intervention series (Table 2).[11] Additionally, high versus low levels of suicide intervention skills training reduced suicide attempts but not suicide death in a prospective cohort of Army Reserve members.[13] Of these, 2 were included and discussed in detail in the previous ESP report.[18]

The VA Mental Health Environment of Care Checklist (MHEOCC), developed to reduce environmental hazards and encourage architectural changes (*ie*, anchor points for hanging) related to suicide risk, was implemented in November 2007 in each VA hospital with a mental health unit treating actively suicidal patients.[12] Suicide rates significantly decreased from the time period prior to implementation of the checklist to after implementation. This study is large, including counts of suicides on a mental health unit from all VHA hospitals from 2000 to 2015, but is limited by lack of a concurrent control group.

The Applied Suicide Intervention Skills Training (ASIST), a service-wide training initiative for leadership in suicide peer assessment and counseling, was assessed among 131 Army Reserve members.[13] As all units were required to participate in training, and outcomes were compared between platoons who had relatively high (≥ 80%) and low (< 80%) percentage of Soldiers receiving training in the calendar year. There were no deaths by suicide during the assessment period, but there was a significantly greater number of attempts in the low-training group compared to the high-training group. However, methodological flaws, including no control for ongoing ASIST training (ongoing training may have changed the percentage of Soldiers trained in the designated high- and low-level training platoons), selection of participants from different platoons for pre- and post-test reporting (2 platoons at pre-test and 2 different platoons at post-test), and unclear levels of missing data (study conducted during "rapid deployment cycle") limit our confidence in these findings.

The 2 studies included in the previous report[10,11] showed improvements in suicide rates with a multicomponent US Air Force suicide prevention initiative[10] in over 5 million service personnel and a multicomponent deployment intervention in over 40,000 deployed service members.[11] These findings are limited by lack of concurrent control group[10] or lack of information on comparison group intervention(s).[11]

### Individual-level Interventions

We found no studies that evaluated effects of individual-focused treatments specifically in recently returned or transitioning service members or on suicide death. Compared to treatment as usual or standard safety planning, the only individual-focused treatment to statistically significantly reduce suicide attempts in active duty service members or Veterans with suicide risk irrespective of psychiatric diagnosis was outpatient cognitive behavioral therapy (CBT) (HR 0.31; 95% CI 0.13 to 0.75) after 2 years (Table 3).[17] The ESP's Nelson 2015 review already

reported this finding, indicating, "these results are consistent with earlier studies that found the cognitive therapy was effective in reducing suicide re-attempt rates compared to usual care."[18]

The 3 newer RCTs that emerged since the Nelson 2015 review evaluated comparisons of dialectical behavioral therapy versus treatment as usual in Veterans,[15] crisis response planning (CRP) versus standard safety contracts,[14] and Collaborative Assessment and Management of Suicidality (CAMS) versus enhanced usual care (Operation Worth Living) in active duty US Army Soldiers (Table 3).[16] Compared to standard contract for safety (CFS), Standard and Enhanced Crisis Response Plans (S-CRP, E-CRP) (Table 3) reduced 6-month suicide attempts in unadjusted analyses (hazard ratio = 0.24, 95% CI 0.06 to 0.96).[14] However, after adjustment for baseline suicidal ideation, which was slightly higher in the CFS group (Beck Scale for Suicidal Ideation [BSSI]: CFS = 18.5, S-CRP = 16.1, E-CRP = 15.8), the effect was no longer significant (HR = 0.29; 95% CI 0.06 to 1.18). For suicidal ideation, CRP was associated with a significantly faster decline in suicide ideation compared to CFS (F (3,195) = 18.64, $P < .001$), first detected at 1 month (BSSI: S-CRP = 5.3 vs E-CRP = 3.6 vs CFS = 5.3; $P = .006$) and sustained at 6 months (BSSI: S-CRP = 2.9 vs E-CRP = 2.0 vs CFS = 6.7; $P < .001$). Dialectical behavioral therapy (DBT) has been previously shown to reduce suicide risk in randomized trials of primarily civilians with borderline personality disorder after one year of treatment,[40-46] and has reduced service utilization and cost in an observational study of male and female Veterans seen in VA outpatient mental health service settings.[47] However, it did not significantly reduce 6-month suicide attempts or ideation in a randomized trial of 91 Veterans with high suicide risk irrespective of psychiatric diagnosis (~50% borderline personality disorder).[15] Trial authors suggested 3 possible reasons for the discrepancy between their results and previous studies in people with borderline personality disorder: (1) treatment as usual in VA may be more intensive than in other non-VA settings and there may be less room for improvement; (2) DBT's typical effectiveness may have been "diluted" due to its adaption for VA practice, including use of VA screening instruments and lower thresholds for psychiatric admission; and (3) DBT's effectiveness may not translate to patients with broader and more complex psychiatric profiles, such as those in this study in which only 50% had BPD. Other authors have more recently identified inadequate time to support full implementation of all of DBT's multiple and complex treatment modes (*ie*, phone coaching outside of business hours) and other challenges as potential key barriers to successful implementation of DBT in the VA.[48,49] Finally, in the 'Operation Worth Living' trial, Collaborative Assessment and Management of Suicidality (CAMS) also did not significantly reduce suicide attempts over 6 months versus enhanced usual care.[16] As for suicidal ideation, like with Standard and Enhanced Crisis Response Plans[14] CAMS seemed to reduce suicidal ideation earlier, with significantly fewer Soldiers having suicidal ideation at 3 months (37% vs 61%; $P = .028$) but its advantage was not sustained at 6 months (33% vs 36%; $P = .769$) or 12 months (38% vs 40%; $P = .895$). Trial authors suggested this may have primarily been due to the inadvertent over-enhancement of treatment as usual in the control group compared to "typical" clinical care as the control group sessions were also digitally recorded and potentially observed by the research team. Although these interventions generally did not statistically significantly reduce suicide attempts, CAMS[16] and CRP[14] led to faster declines in at least initial suicidal ideation and thus may be considered for preliminary use or study. Because each intervention was evaluated in only a single, small study, however, we have limited confidence in their findings in general.

**Table 2. Studies of Population-level Healthcare Service Interventions for Suicide Prevention**

| Author, Year | Study Design | N; Population; Patient Characteristics; Setting | Intervention | Outcomes | Results |
|---|---|---|---|---|---|
| *Recently Published Studies* | | | | | |
| Smith-Osborne, 2017[13] | Prospective cohort | 131 Army Reserve members (71% male) | - Applied Suicide Intervention Skills Training (ASIST): training stakeholders to serve as peer assessors/counselors with harm reduction strategies and community health education<br>- Low (< 80% of platoon members received training during calendar year) vs high levels of training | Suicide and Suicide Attempt | 0 completions + 4 attempts low training group vs 0 completions or attempts high training group (*P* = .01) |
| Watts, 2017[12] | Before-after study | 77,893 acute mental health admissions per year from 2000-2015 across all VHA medical centers | VA Mental Health Environment of Care Checklist (MHEOCC) which includes specific recommendations for use and suggested abatements for potential hazards. | Inpatient suicide | 4.2 suicides/100,000 admissions before implementation vs 0.74 suicides/100,000 admissions after implementation |
| *Studies Included in Previous ESP Reviews (Nelson, 2015[18] & Haney,2012[39])* | | | | | |
| Knox, 2010[10] | Before-after study | > 5 million service personnel in the US Air Force; 1981-2008. | 11-component initiative implemented starting in 1997: leadership involvement, suicide prevention education, commander guidelines for use of mental health services, community prevention services, community education and training, investigative interview policy, trauma stress response, integrated delivery system and community action information board, limited privilege suicide prevention program (increased confidentiality), assessment, and suicide event surveillance. | Suicide | Mean quarterly suicide rate: 3.033/100,000 pre-intervention vs 2.387/100,000 post-intervention (*P* < .01). |
| Warner, 2011[11] | Post intervention series | 40,283 in US deployed Army military unit; 15 months in Iraq (March 2007-May 2008). | Multiple component intervention for deployed unit included:<br>· Pre-Deployment Phase: suicide risk recognition and response training, early | Suicide | Suicide rate: 16.0/100,000 intervention unit during the deployment cycle vs 24.0/100,000 for service |

| | | |
|---|---|---|
| | identification, and resiliency training for Soldiers and families.<br>· Deployment: education, suicide prevention review board and suicide risk management teams, unit behavioral health needs assessment, unit behavioral health advocates, incident response, and trend monitoring.<br>· Re-Deployment: education, post deployment health assessment, and risk stratification.<br>· Reintegration: complete redeployment tasks, prepare for reuniting with families, address post-deployment health issues. | members in theater and 19.2/100,000 for US Army specifically. |

Abbreviations: CI = confidence interval

**Table 3. Studies of Individual-level Healthcare Service Interventions for Suicide Prevention**

| **Author, Year**<br>**N**<br>**Setting**<br>**Risk of Bias (RoB)** | **Suicide risk determination** | **% male**<br>**Mean age**<br>**Military status** | **Psychiatric Diagnosis**<br>**Suicide attempt history**<br>**Baseline suicide ideation severity** | **Intervention and Comparison** | **Results** |
|---|---|---|---|---|---|
| *Recently Published Studies* | | | | | |
| Bryan, 2017[14]<br>N = 97<br>Fort Carson, Colorado<br>Low RoB | Presenting for emergency behavioral health appointment with suicide ideation during the past week and/or lifetime history of suicide attempt | 78% male<br>26.1 years<br>100% active duty US Army | 44% any adjustment disorder<br>39% any depressive disorder<br>56% 1-2+ suicide attempts<br>BSSI: range, 16-18 | - Crisis response plan (CRP): suicide risk assessment, supportive listening, warning signs, self-management skills, social support, crisis resources, and referral to treatment<br>- Enhanced crisis response plan (E-CRP): same as above with addition of “reasons for living” therapy<br>- Contract for safety (CFS): suicide risk assessment, supportive listening, crisis resources, referral to treatment, and contract for safety | 6-month suicide attempt: 3.1% CRP vs 6.2% E-CRP vs 19.0% CFS<br><br>Crisis response planning (standard or enhanced) vs contract for safety HR = 0.29 (95% CI 0.06 to 1.18) adjusted for baseline suicide ideation. |

| | | | | | |
|---|---|---|---|---|---|
| Goodman, 2016[15]<br>N = 91<br>James J. Peters VA Medical Center<br>Unclear RoB | High suicide risk irrespective of diagnosis with any of the following: (1) Recent suicide attempt; (2) suicidal ideation > 3m; (3) suicide prevention coordinator | 67% male<br>38 years<br>100% Veterans | 64% MDD<br>67% substance abuse<br>50% PTSD<br>C-SSRS suicide attempts total score: 2.6 | - Dialectical behavioral therapy (DBT): weekly skills training, weekly individual treatment, telephone coaching<br>- Treatment as usual (TAU): treatment according to recommendations of mental health treatment team | 6-month trial and 6-month follow-up suicide attempt: 6.5% DBT vs 11.1% TAU (*P* < .487) |
| Jobes, 2017[16]<br>"Operation Worth Living" (OWL)<br>N = 148<br>Army medical Center<br>Unclear RoB | Index score of ≥ 13 on Beck Scale for Suicidal Ideation | 80.4% male<br>26.8 years<br>100% active duty Army | 62.6% depressive disorder<br>50.7% PTSD<br>15.8% alcohol abuse/dependence<br>Multiple lifetime suicide attempts: 27%<br>Median SSI: 19 | - Collaborative Assessment and Management of Suicidality (CAMS): multipurpose assessment, treatment-planning, tracking, and outcome tool with collaborative assessment and treatment-planning<br>- Enhanced care as usual (E-CAU): treatment by on-site military clinical social workers | Past-year suicide attempts change from baseline: 0.63 (*P* = .66) CAMS vs 1.17 (*P* = .004) E-CAU; no between-group differences |
| *Studies Included in Previous ESP Reviews (Nelson, 2015[18])* | | | | | |
| Rudd, 2015*[17]<br>N = 152<br>Ft. Carson, CO<br>Unclear RoB | Admitted to inpatient psychiatric hospitalization due to presence of suicidal ideation with intent to die during the past week and/or a suicide attempt within the past month | 87.5% male<br>27 years<br>100% Active duty US Army | 78% MDD<br>39% PTSD<br>13% substance dependence<br>Prior suicide attempts: 1 = 38%, ≥ 2 = 38%<br>62% antidepressants | · Brief outpatient cognitive behavioral therapy: 12 sessions, 1-2 weeks apart; first session 90 minutes, following sessions 60 minutes; 3 phases included assessment, cognitive strategies to reduce beliefs and assumptions that serve suicidal thoughts, and relapse prevention.<br>· Usual care: treatment as usual. | After 2 years follow-up, at least one suicide attempt by 8 individuals in therapy vs 18 in usual care (14% vs 40%, *P* = .02); multivariate Cox regression controlled for baseline risk (hazard ratio 0.31, 95% CI 0.13 to 0.75). |

Abbreviations: CI = confidence interval, DBT = dialectical behavior therapy, PTSD = post-traumatic stress disorder; HR = hazard ratio, TAU = treatment as usual

## KEY QUESTION 3: What are important areas of ongoing research and current evidence gaps in research on suicide prevention in Veterans and military personnel, and how could they be addressed by future research?

### Methods to Identify Risk

#### *Population-level Risk Assessment*

In the Nelson 2015 review, several newer innovative machine learning approaches were introduced as potentially being the most promising direction for suicide risk assessment in the near future, including use of a decision tree,[50] analysis of text from clinician notes in the electronic medical record,[51] predictive modeling based on psychiatric hospitalization data,[5] and use of taxometric evaluation of multiple indicators to stratify risk.[52] Since 2015, several more machine learning clinical applications have emerged.

For example, 2 highly-accurate predictive models (AUC 0.89 to 0.93) have been identified for active duty Army Soldiers.[4,7] However, future research on their applicability to Veteran populations is still needed. The recent implementation of REACH VET – the risk prediction initiative, Recovery Engagement and Coordination for Health – Veterans Enhanced Treatment – will provide the best opportunity to directly study risk prediction in Veteran populations.[31] Early data from the first year of implementation has already found that REACH VET has had positive impacts on 6-month patient outcomes, including greater completion of suicide prevention safety plans and less all-cause mortality.[53] A full report on REACH VET's first year of implementation is expected later in 2018. Also, ongoing research in other large integrated community health systems, such as Kaiser's risk prediction approach[54] and associated care management intervention for high-risk individuals[55] may have relevancy to VA use.

#### *Individual-level Risk Assessment*

Lack of concerted replication and in-depth examination of the most promising risk assessment and treatment approaches remains a concern. However, the ongoing study by Drs. Joiner and Gutierrez[56] identified in the Nelson 2015 review,[18] designed to compare the accuracy of Columbia-Suicide Severity Rating Scale versus the Self-Harm Behavior Questionnaire, Suicidal Behaviors Questionnaire-Revised and the Beck Scale for Suicide Ideation in 900 military personnel, has been completed and results are expected shortly (Thomas Joiner, PhD, written communication, 7/20/2018). Hopefully, the results of this study will contribute greatly to the field.

#### *Objective Risk Assessment*

The Nelson 2015 review identified several novel objective approaches to predicting suicide behaviors, including use of certain patterns of cognitive deficits and biological markers. Examples of cognitive factors explored in relation to suicide risk include semantic stimuli reaction time (Implicit Association Test),[57] eye blink reaction (Affective Startle Measure),[58] attentional bias (Stroop test),[59] and general neurocognitive function and mathematic processing.[60] Biological factors explored in relation to suicide risk include various candidate genes (*TPH1, SLC6A2, 5HTTLPR, GRIN2B, ODC1, MRAP2* and many others)[61-70] and neural correlates (*eg*, hyperactivation of prefrontal cortex and anterior cingulate, white matter hyperintensities).[71-74]

We did not find any newly completed or ongoing studies on any of these objective factors. However, the Million Veterans Program (MVP) – VA's national medical databases of blood samples and health information from one million Veteran volunteers to study how genes affect health – will likely be a valuable resource to study the association between genetic markers and suicide risk.[75]

## Healthcare Service Interventions for Suicide Prevention

### *Population-level Interventions*

The many essential gaps in evidence on population-level interventions identified by the Nelson 2015 review, including which components in multicomponent interventions are effective, whether characteristics of individuals nonresponsive to the intervention differ from those who were responsive, and how outcomes differ from a concurrent rather than historical comparison group, still largely have not been addressed.[18] In addition to the complex multicomponent interventions identified in Nelson 2015,[10,11] 2 newly identified population-level suicide prevention interventions focused on skills training[13] and the use of the VA Mental Health Environment of Care Checklist (MHEOCC).[12] These studies are similarly limited by lack of comparison to a concurrent control group[12,13] and a narrow focus on inpatient mental health units.[12] In order to further validate and establish portable services packages from the complex, multi-component, population-level interventions previously identified,[10,11] we agree with the Nelson 2015 recommendations that future studies should be conducted in additional populations, provide additional details about program implementation and fidelity, evaluate if and how effectiveness may vary based on differences in individual patient characteristics and/or specific program components, evaluate restricted access to lethal means, and be based on comparison to a concurrent control group instead of a historical control group.

### *Individual-level Interventions*

Among the highest priority individual-level intervention areas, the most notable gaps in research are studies targeting transition to civilian life, those of health-promotion approaches that target individuals who are not in acute crisis but have known suicide risk factors, and those involving peer support specialists. Ongoing psychotherapy-focused interventions continue to be the most widely studied, encompassing all of the newly completed studies and many of the newly identified ongoing studies. We identified other ongoing studies in the areas of interventions designed to bolster protective factors,[76] novel technology approaches,[77,78] safety planning-focused,[79,80] and those designed to promote access of crisis services.[81] However, we found no new completed or ongoing studies in other priority areas including interventions targeting known high-risk populations, such as transition to civilian life,[22] and peer support specialists.

The 3 recently-published[14-16] studies and the earlier study[17] that evaluated individual-level healthcare service interventions for suicide prevention in Veterans all focused on psychotherapy or care management approaches for individuals in acute suicidal crisis. Overall, outpatient cognitive behavioral therapy (CBT) is still the most well-established individual-focused treatment, as it has consistent evidence of statistically significantly reducing suicide attempts compared to treatment as usual or standard safety planning in active duty service members or Veterans with suicide risk irrespective of psychiatric diagnosis.[17] Although the other individual-focused interventions did not similarly demonstrate significant reductions in suicide attempts or suicide death, we have limited confidence in their findings in general because each intervention

was evaluated in only a single, small study with other potential weaknesses, including potential "dilution" of DBT because it was adapted for VA practice[15] and inadvertent over-enhancement of treatment as usual in the control group in the 'Operation Worth Living' trial of Collaborative Assessment and Management of Suicidality (CAMS).[16] Although we identified numerous ongoing studies on psychotherapy, none address these specific gaps (Table 4). Instead, all ongoing psychotherapy studies are focused on adaptations of cognitive behavioral therapy, including Post-Admission Cognitive Therapy (PACT),[82-84] cognitive behavioral therapy to prevent suicide specifically in Veterans with substance use disorders,[85] cognitive therapy that integrates mindfulness and meditation,[86] and another study of an adaptation of the Window to Hope for Veterans cognitive therapy for Veterans with traumatic brain injury.[87] Therefore, larger, more rigorous RCTs of DBT and Operation Worth Living may still be warranted to more definitely determine their suicide prevention effectiveness.

We did not find any new completed studies of several other types of interventions called for by the Nelson 2015 review, including (1) health-promotion approaches that target individuals with known risk factors (*eg*, depression, traumatic brain injury, recently transitioning from military service, *etc*), irrespective of recent suicide attempts; (2) those designed to bolster protective factors such as psychological resilience, meaningful life, grit, gratitude, and social support[88-92] that are negatively associated with suicidal ideation; (3) innovative approaches that use technology to support or enhance care, such as email and text message for follow-up[76,77,93] or crisis support[94] and other online chat and smartphone applications;[94-96] (4) safety planning; or (5) peer support specialists.[97,98]

Experts in the field within VA, the Department of Defense, and the Centers for Disease Control and Prevention have called for additional research to develop health-promotion approaches that target known suicide risk factors such as depression and traumatic brain injury,[99-104] such as Window to Hope for Veterans.[99] The period of separation from the military has also been identified as a period of elevated suicide risk,[23] likely due to challenges in adjusting to new family and social circumstances, deployment-related psychological and physical injuries, finances, and employment and education barriers.[22] Despite this, we did not identify any such studies in this update. Instead, studies of individual-level interventions for suicide prevention in Veterans have still exclusively targeted individuals in acute suicidal crisis.

Regarding interventions designed to bolster protective factors such as psychological resilience, meaningful life, grit, gratitude, and social support[88-92] that are negatively associated with suicidal ideation, we identified quite a bit of recent Caring Contacts work. Caring Contacts "traditionally entail the routine sending of brief nondemanding messages that express caring concern to patients following discharge from treatment" to promote a feeling of caring connection using various contact modalities (*ie*, mailed letters, postcards, greeting cards, emails, and text messages).[76,105] Recent work includes a review that provides "recommendations for the implementation of the Caring Contacts intervention across diverse settings,"[105] a preliminary study of the acceptability of Caring Contacts with Veterans,[106] a pilot implementation of centralized Caring Contacts for Veterans identified by REACH VET (Sara J. Landes, PhD, written communication, 8/30/2018), ongoing evaluation of how to implement Caring Contacts in the emergency department at VA (Sara J. Landes, PhD, written communication, 8/30/2018), and a completed study with preliminary unpublished data[107] which found that caring contacts sent via text message reduced the risk of suicide attempts and suicidal ideation over one year follow-up in 657 active duty service members. Health coaching – an intervention that focuses on

facilitation of personal goal achievement through use of reflective listening, motivational interviewing, assessment, and accountability strategies which can be delivered by a broad range or licensed or non-licensed providers – is another emerging approach that is being evaluated as a potential intervention for bolstering protective factors. For example, we identified 2 recently completed pilot studies of health coaching with findings currently under review, one of which focuses on reducing suicidal ideation in post-9/11 Veterans with recent suicidal ideation, and the other that focuses on feasibility and acceptability of implementation as an upstream suicide prevention approach in at-risk post-9/11 Veterans without current suicide ideation (Lauren Denneson, PhD, written communication, 8/30/2018). Both may include Veterans transitioning from uniformed service to civilian life as both enrolled post-9/11 Veterans with no restrictions on time since military separation and mean ages were younger than 40 years.

For novel technology approaches, since the Nelson 2015 review, new evidence emerged on the impact of the Virtual Hope Box (VHB) smartphone app.[78] In Veterans in active mental health treatment who had recently expressed suicidal ideation, the Virtual Hope Box significantly improved ability to cope with unpleasant emotions and thoughts at 3 and 12 weeks, compared with a control group. This finding is promising and provides rationale for further study of Virtual Hope Box's effect on reducing suicide behavior.[78] In addition, we identified an ongoing study of the telephone-based Coping Long Term with Active Suicide Program (CLASP-VA).[108]

Safety planning typically involves provider-led documentation of suicide warning signs, supportive resources, and the patient's commitment to avoiding suicide behavior. Despite its continued widespread use, its effectiveness continues to be questioned and concerns about its safety have been raised.[14] In fact, in one RCT included in this review, a crisis response plan intervention that outlines steps for identifying warning signs, using coping strategies, activating social support, and accessing professional services was associated with a significantly faster decline in suicide ideation than a safety plan (suicide risk assessment, supportive listening, provision of crisis resources, referral to a mental health professional, and a verbal contract for safety).[14] However, efforts to evaluate safety planning continue,[79,80] including one ongoing study that is evaluating the potential added benefit of incorporating family involvement, including construction of a parallel safety plan.[80] Another safety planning-focused intervention being evaluated in an ongoing study is the Teachable Moment Brief Intervention, which is a single-session intervention designed for delivery prior to inpatient psychiatric hospitalization discharge to promote ongoing stabilization through development of a suicide-specific treatment plan.[109] Studies designed to promote access of available crisis resources, such as crisis lines, have also begun. For example, in response to a survey of Veterans in an inpatient psychiatric unit following a suicidal crisis which revealed that less than 50 percent had accessed a suicide hotline prior to their hospitalization,[81] a study of a single-session Crisis Line Facilitation intervention has been initiated. This intervention is delivered to individuals in inpatient psychiatric units following a suicide crisis and is designed to promote use of the Crisis Line by identifying and removing perceived barriers and making practice calls.[81]

Peer support specialist interventions involve individuals who have lived through and recovered from acute suicidal crises helping to provide social support and mental health assistance to their peers in current crisis. As noted in Nelson 2015, there are ongoing efforts to evaluate use of suicide prevention peer supporters.[97,98] We did not identify any newly completed or ongoing studies that assess the impact of suicide prevention peer supporters on suicidal behavior

outcomes; thus, future research on establishing the effectiveness on these health outcomes, as well as training requirements, functions, and eligibility of peer supporters, is still a priority.

**Table 4. Ongoing Studies of Methods to Identify Suicide Risk***

| Principal Investigator(s)/ Institution | Sponsors and Collaborators | Study Title/ NCT Identifier | Population | Purpose of Study |
|---|---|---|---|---|
| Anestis, M.[110] University of Southern Mississippi | Military Suicide Research Consortium | Predicting Suicide Risk in a Military Population. | 1,000 Veterans at an Army National Guard base. | Test a number of models for predicting suicidal behavior to see which are most effective for Veterans. Assessments will be taken at baseline, 6, 12, and 18 months, and will include standard measures of depression and hopelessness, as well as an Implicit Association Test to objectively detect unreported suicidal thoughts. The study will also examine whether additional information provided by a collateral reporter (*ie,* the person to whom the Veteran feels closest) can improve the accuracy of predicting future suicide attempts. |
| Bagge, C. & Conner, K.[111] VISN 2 Center of Excellence for Suicide Prevention; University of Mississippi Medical Center; University of Rochester Medical Center | Military Suicide Research Consortium | Looking for Suicide Warning Signs. | 500 Veterans and civilians with recent suicide attempts. | Identify warning signs that indicate when a suicide attempt is imminent. This will be accomplished by examining a comprehensive list of potential warning signs to see which can effectively distinguish when a suicide attempt is likely to occur in the next 6, 24, and 48 hours. |
| Joiner, T. & Gutierrez, P.[56] Florida State University; Denver VA Medical Center | Military Suicide Research Consortium | Toward a Gold Standard for Suicide Risk Assessment for Military Personnel. | 900 military personnel seeking services from or referred to inpatient psychiatry, outpatient behavioral health services, or an emergency department because of concerns about suicide risk. | Identify a gold standard for clinical suicide risk assessment by testing 4 widely used measures against each other to determine which measure or combination of measures offers the most accurate prediction of suicide-related behaviors 3 months later. Measures include Columbia Suicide Severity Rating Scale, the Self-Harm Behavior Questionnaire, the Suicidal Behaviors Questionnaire-Revised, and the Beck Scale for Suicide Ideation. |

*Ongoing studies were selected from websites and other sources identified by a search of grey literature based on their relevance to the key questions. The list of ongoing studies is likely incomplete because not all ongoing studies are included in these accessible sources.

**Table 5. Ongoing Studies of Healthcare Service Interventions for Suicide Prevention***

| Principal Investigator(s)/ Institution | Sponsors and Collaborators | Study Title/ NCT Identifier | Population | Suicidal Self-Directed Violence Outcomes | Purpose of Study | Estimated Study Completion/ Updates |
|---|---|---|---|---|---|---|
| Barnes, S.M.[112] VA Eastern Colorado Health Care System, Denver, CO | VA Office of Research and Development | ACT for Life: A Brief Intervention for Maximizing Recovery After Suicidal Crises<br><br>NCT02751983 | VHA patients (number not reported). | None** | A novel protocol detailing the application of Acceptance and Commitment Therapy (ACT) to recovery from suicidal crises. | October 2018<br><br>As of March 2018, status is active and enrolling by invitation. |
| Brenner, L.[87] VA Eastern Colorado Health Care System | Military Suicide Research Consortium (MSRC) | Window to Hope - Evaluating a Psychological Treatment for Hopelessness Among Veterans With Traumatic Brain Injury (WtoH)<br><br>NCT01691378 | Up to 15 US military personnel/Veterans | None** | To adapt Window to Hope for psychological treatment for suicide prevention in individuals with moderate to severe traumatic brain injury. | January 2020<br><br>As of May 2017, status is active and not recruiting. |
| Holloway, M.[82] Uniformed Services University of the Health Sciences | Henry M. Jackson Foundation for the Advancement of Military Medicine; Department of Veterans Affairs | Post Admission Cognitive Therapy (PACT) for the Inpatient Treatment of Military Personnel with Suicidal Behaviors.<br><br>NCT01359761 | 218 military service members and beneficiaries hospitalized for severe suicide ideation or recent suicide attempt. | Repeat suicide attempt at 12 months (using the C-SSRS). | Evaluate the efficacy of a cognitive behavioral intervention program, the Post Admission Cognitive Therapy (PACT), for military service members and beneficiaries admitted for inpatient care due to severe suicide ideation and/or recent suicide attempt. | February 2019<br><br>As of June 2017, status is active and recruiting. |
| Holloway, M.[83] | Henry M. Jackson Foundation for the | Inpatient Post Admission | 24 service members and beneficiaries | Repeat suicide attempt at 3 | Evaluate a new manual of Post-Admission Cognitive | December 2018 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Uniformed Services University of the Health Sciences | Advancement of Military Medicine; National Alliance for Research on Schizophrenia and Depression | Cognitive Therapy (PACT) for the Prevention of Suicide Attempts.<br><br>NCT01340859 | hospitalized for recent suicide attempts. | months (using the C-SSRS). | Therapy (PACT) as a targeted inpatient treatment for individuals admitted for a recent suicide attempt to a military hospital. | As of April 2018, status is active not recruiting. |
| Holloway, M.[84]<br>Uniformed Services University of the Health Sciences | Henry M. Jackson Foundation for the Advancement of Military Medicine, Congressionally Directed Medical Research Programs | Pilot Trial of Inpatient Cognitive Therapy for the Prevention of Suicide in Military Personnel (CDMRP).<br><br>NCT01356186 | 50 service members and beneficiaries with symptoms of acute stress disorder or posttraumatic stress disorder hospitalized for a recent suicide attempt. | Repeat suicide attempt at 3 months (using the C-SSRS). | Evaluate an inpatient-based cognitive behavioral care plan, the Post-Admission Cognitive Therapy (PACT), for service members and beneficiaries with symptoms of either Acute Stress Disorder or Posttraumatic Stress Disorder, who are admitted for hospitalization following a recent suicide attempt. | December 2018<br><br>As of April 2018, status is active not recruiting. |
| Holloway, M.[113]<br>VA Eastern Colorado Health Care System | VA Eastern Colorado Health Care System; Department of Veterans Affairs; Department of Defense | A Brief intervention to Reduce Suicide Risk in Military Service Members and Veterans – Study 1 (SAFE VET).<br><br>NCT01334541 | 600 Veterans at VA emergency departments. | Suicide attempt at 6 months (using CSSRS). | Evaluate the Suicide Assessment and Follow-up Engagement: Veteran Emergency Treatment (SAFE VET) intervention, designed to attenuate suicide risk by helping Veterans manage suicidal thoughts and behaviors, and adhere to prescribed clinical care. | December 2018<br><br>As of June 2017, status is active and not recruiting. |
| Holloway, M.[79]<br>Henry M. Jackson Foundation for the Advancement of Military Medicine | Henry M. Jackson Foundation for the Advancement of Military Medicine; US Army Medical Research and Materiel Command; United States Department | A Brief Intervention to Reduce Suicide Risk in Military Service Members and Veterans - Study 2 (SAFEMIL) | 186 patients | None** | To evaluate the efficacy of the Safety Planning for Military (SAFE MIL) on suicide ideation, suicide-related coping, and attitudes toward help seeking for hospitalized military personnel at high suicide risk. | December 2018<br><br>As of April 2018, status is active and not recruiting. |

| | | | | | | |
|---|---|---|---|---|---|---|
| | of Defense; VA Office of Research and Development; University of Pennsylvania; University of Rochester; Columbia University | NCT01360736 | | | | |
| Ilgen, M.[81] VA Ann Arbor Healthcare System | Department of Veterans Affairs | Crisis Line Facilitation (CLF). NCT02459587 | 500 Veterans under treatment for a suicidal crisis in a Veterans Health Administration inpatient psychiatric unit. | Suicide attempt at 12 months (using CSSRS). | Test a new single-session intervention, Crisis Line Facilitation (CLF), which addresses Veterans' perceived barriers and facilitators of crisis line use during periods of suicidal crisis. The intervention will be compared to an enhanced usual care condition, with outcomes including suicide attempt and utilization of the Veterans Crisis Line. | June 2019 As of June 2018, status is active and recruiting. |
| Ilgen, M.[85] University of Michigan | University of Michigan; US Army Medical Research and Materiel Command; Department of Defense; Department of Veterans Affairs | Intervening to Reduce Suicide Risk in Veterans with Substance Use Disorders. NCT02439762 | 300 Veterans with a Substance Use Disorder and current suicidal ideation. | Suicide attempt at 24 months (using the C-SSRS). | Evaluate the impact of a Cognitive Behavioral Therapy intervention compared to a Supportive Psychoeducational Control in reducing the frequency and intensity of suicidal thoughts and behaviors in Veterans with substance use disorders over a 2-year follow-up period. | June 2020 As of May 2018, status is active and recruiting. |
| Interian, A.[86] Lyons Campus of the VA New Jersey Health Care System | Department of Veterans Affairs | Mindfulness-Based Cognitive Therapy for Suicide Prevention (MBCTS). | 164 Veterans at high risk for suicide. | Suicidal behaviors at 12 months (using VA's Self-Directed Violence | Test a psychotherapeutic intervention, the Mindfulness-Based Cognitive Therapy, which integrates cognitive therapy and mindfulness meditation | July 2018 As of March 2018, status is active and |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | NCT01872338 | | Classification System); Suicide attempt at 12 months (using C-SSRS). | techniques to prevent suicide in military Veterans. | enrolling by invitation. |
| Luxton, D.[76] National Center for Telehealth and Technology | National Center for Telehealth and Technology, Department of Defense, US Army Medical Research and Materiel Command | Caring Letters for Military Suicide Prevention.<br><br>NCT01473771 | 4,730 active duty military members or Veterans who are current psychiatric inpatients. | Suicide at 2 years (using death certificates in the National Death Index Plus); suicidal behaviors requiring hospital admission (using electronic medical records). | Determine if the Caring Letters intervention is effective in preventing suicide and suicidal behaviors among US service members and Veterans. | February 2018<br><br>As of September 2017, status is active and not recruiting. |
| Goodman, M.[80] | VA Office of Research and Development | SAFER: A Brief Intervention Involving Family Members in Suicide Safety Planning (SAFER)<br><br>NCT03034863 | 60 moderate suicide risk Veterans and their family members. | None** | To integrate family and couples communication skills training with suicide safety planning. The goal is the sharing of Veteran suicide safety plans with family members and the construction of a parallel family member safety plan, in efforts to mobilize and support family involvement. | February 2020<br><br>As of June 2018, status is active and recruiting. |
| O'Connor, S.[109] Louisville VA Medical Center | Louisville VA Medical Center; University of Louisville | Teachable Moment Brief Intervention for Veterans Following a Suicide Attempt<br><br>NCT03533075 | 50 Veterans at VA inpatient psychiatry unit | Beck Scale for Suicide Ideation and Suicide Attempt Self-Injury Count at 3 months. Self-Directed Violence at 12 months. | Determine whether there is a signal of effectiveness supporting the TMBI in improving the recovery trajectory of Veterans following discharge to the community. | April 2019<br><br>As of May 2018, status is active and recruiting. |

| | | | | | | |
|---|---|---|---|---|---|---|
| Primack, J. M.[108] Providence VA Medical Center | Department of Veterans Affairs; Butler Hospital | Veterans Coping Long-term With Active Suicide (CLASP-VA).<br><br>NCT01894841 | 300 Veterans at high risk for suicide discharged from a VA hospital | Suicidal attempts at 12 months (using CSSRS). | Test the efficacy of the Veterans Coping Long Term with Active Suicide Program (CLASP-VA) intervention to reduce suicide behaviors in Veterans. CLASP-VA is a telephone-based intervention that combines elements of individual therapy, case management, and significant other/family therapy, and directly targets high-risk patients at the time of hospital discharge. | August 2018<br><br>As of May 2018, status is active and not recruiting. |

*Ongoing studies were selected from websites and other sources identified by a search of grey literature based on their relevance to the key questions. The list of ongoing studies is likely incomplete because not all ongoing studies are included in these accessible sources.**Included suicidal ideation outcomes that do not fit inclusion criteria of current review

# SUMMARY AND DISCUSSION

Veteran suicide rates remain high despite VA's increased efforts over the past decade in implementing the comprehensive Suicide Prevention Program initiatives, such as the Veterans Crisis Line, hiring Suicide Prevention Coordinators (SPCs) at every VA hospital, and enhanced monitoring. Two important barriers to the success of these suicide prevention initiatives are that a majority of Veterans who die by suicide are non-VHA users and for those that are, there is a lack of adequate evidence in Veterans supporting recommendations of any specific risk assessment method or prevention intervention. As the number of suicide prevention studies in military populations has increased since our 2015 review,[18] this update was needed to determine whether any new, stronger evidence had emerged to support any specific suicide prevention approach – particularly for innovative methods and/or in certain high-risk subpopulations, such as service members in transition to civilian life.

Despite an almost doubling of the number of studies in active duty service member and Veteran populations since our last review in 2015, several previously identified major evidence gaps remain. The 8 new studies in military populations we identified in this update evaluated numerous different approaches including risk assessment using predictive modeling[4,7,8] and various population-level[12,13] and individual-level interventions.[14-16] The potentially most promising findings are from the Army Study to Assess Risk and Resilience in service members (Army STARRS) study, which identified a few large risk prediction models as fairly to highly accurate in predicting suicide risk in active duty Soldiers (AUC 0.72 to 0.97).[4,7,8] However, the applicability of these risk prediction models in service members transitioning to civilian life and/or Veteran populations is not yet known. Perhaps the most surprising finding is that dialectical behavioral therapy (DBT) did not significantly reduce 6-month suicide attempts or ideation in a trial of 91 Veterans with high suicide risk irrespective of psychiatric diagnosis.[15] This finding conflicts with previous research showing that DBT reduces suicide risk in civilian populations with borderline personality disorder.[41-46] Trial authors suggested that possible reasons for their contrasting results include that treatment as usual in VA may be more intensive than in other non-VA settings and so there may be less room for improvement, DBT's effectiveness may have been "diluted" due to its adaption for VA practice, and DBT's effectiveness may not translate to representative Veterans with broader and more complex psychiatric profiles. Otherwise, as in previous studies, newer evidence on various other population-level[12,13] and individual-level interventions[14,16] remained limited because they involved single small studies that were likely underpowered to detect impact on suicide behavior outcomes and other important methodological deficiencies.

## Veterans Transitioning from Uniformed Service to Civilian Life

Service members who are separating from active duty into civilian life are at high risk of suicide. In response to the January 2018 Executive Order 13822 directing improved suicide prevention resources to Veterans during their transition from uniformed service to civilian life, HSR&D anticipates funding new research to address gaps in knowledge about risk identification and clinical and public health interventions – particularly in the highest-risk first year of separation. Our review confirmed the need for such research in Veterans during their transition from uniformed service to civilian life as we found no completed or ongoing studies that specifically focus on this subpopulation. However, we did identify 2 recently completed studies that evaluated the effects of health coaching on suicidal ideation in post-9/11 era Veterans with or

without suicidal ideation that may be considered to include Veterans during their transition from civilian life because the population mean age was under 40 years of age and there were no enrollment restrictions related to time since military separation (Lauren Denneson, PhD, written communication, 8/30/2018). Although there appears to be general consensus around the first year following the transition from military service to civilian life as being a primary transition period of interest, to increase consistency and thus facilitate comparison of effects across studies, we recommend that HSR&D establish clearer guidelines about what specific post-separation timeframe constitutes the transition period of interest. To improve applicability of research to the target population, we suggest prioritizing studies with inclusion criteria that clearly focus on a specific and relevant post-military separation time frame. Finally, to determine whether certain subgroups of Veterans transitioning from uniformed service to civilian life may benefit more or less from particular risk assessment or health service interventions, we recommend evaluating whether suicide prevention approaches differ based on patient characteristics such as the presence of mental health or substance use disorders and non-military life stressors (*eg*, financial stability, housing, employment status and relationships).

Other evidence gaps include evaluation of the potential direct and indirect adverse effects of suicide prevention efforts and evaluation of suicide prevention efforts that specifically target other high-risk populations, such as Veterans with a history of repeat suicide attempts, and those that focus on key social determinants of health and access to lethal means.

For risk assessment, although 2 highly accurate predictive models (AUC 0.89 to 0.93) have been identified for active duty Army Soldiers, future research on their applicability to Veteran populations is still needed. The recent implementation of REACH VET – the risk prediction initiative, Recovery Engagement and Coordination for Health – Veterans Enhanced Treatment – will provide the best opportunity to directly study risk prediction in Veteran populations. A full report on REACH VET's first year of implementation is expected later in 2018.[53] Also, ongoing research in other large integrated community health systems, such as Kaiser's risk prediction approach and associated care management intervention for high-risk individuals, may have relevancy to VA use. Regardless, future research is still needed on novel approaches to suicide risk assessment, including use of cognitive deficits, biological markers, and neuroimaging.

As most population-level interventions have involved complex, multi-component interventions, more research is needed in additional populations, on implementation factors and fidelity, and on determination of key components to establish portable service packages that are more easily and widely translatable to other settings.

For individual-level interventions, it is encouraging that some progress has been made in newly completed and ongoing research in addressing previous evidence gaps. For example, there are a few ongoing cognitive behavioral therapy studies that are planned to potentially be more adequately powered than in the previous study (N = 200 to 300 vs N = 152). Also, for technology-based interventions, new evidence has emerged about impact on suicidal ideation and more is in progress. Studies are still needed that evaluate eligibility and training requirements of peer support specialists and that target known risk factors in Veterans before they are in acute suicide crisis – particularly in service members transitioning to civilian life and those with a history of repeat attempts.

One overarching critical barrier to the success of any of the suicide prevention approaches discussed in this report is that they are not yet reaching the large proportion of Veterans who die by suicide who are not VHA users. Many community-based gatekeeper outreach initiatives exist to engage Veterans in suicide prevention activities through contact at schools, colleges and universities, primary care, emergency departments, faith communities, workplaces, and more.[114] For example, many gatekeeper trainings exist that can last anywhere form an hour to 5 days and are designed to help community members identify and refer persons at risk of suicide to appropriate treatment or supporting services in VHA.[114,115] Such gatekeeper trainings typically aim to convey knowledge about suicide, change beliefs and attitudes about prevention, reduce stigma, and increase self-efficacy to intervene unintentionally. Operation S.A.V.E. (***S***=*signs of suicidal thinking,* ***A***=*ask questions,* ***V***=*validate the person's experience, and* ***E***=*encourage treatment and expedite getting help*) is one such VA suicide prevention gatekeeper training that has been piloted in 5 states and received good ratings from its participants.[116] However, more research on these and other types of community outreach programs is still needed.

**Table 6. Summary of Findings**

| Evidence | Risk of Bias, SOE, Limitations | Summary of Findings |
|---|---|---|
| *KQ 1: What are the accuracy and adverse effects of methods to identify Veterans and military personnel at increased risk for suicide and other suicidal self-directed violence?* | | |
| 9 studies[1-9]: 5 case-series[1-3,5,9]; 2 RCs[4,7]; 1 PC[8];1 case-control[6] | · Risk of bias: 3 studies low[4-6]; 2 high[1,2]; 4 unclear.[3,7-9]<br>· SOE: Not applicable.<br>· Limitations: Unclear selection criteria for the study populations; non-standardized risk assessment procedures. | · Studies used models derived from databases or clinician-rated or patient self-report instruments.[1-9]<br>· Accuracy varied across methods and cut-points; AUC: 0.61[4] to 0.93[7]<br>· Adverse effects: Not reported. |
| *KQ 2: What are the efficacy/effectiveness and adverse effects of suicide prevention interventions in reducing rates of suicide and other suicidal self-directed violence in Veterans and military personnel?* | | |
| **Healthcare services directed towards populations** | | |
| 4 studies[10-13]: 3 before-after[10-12]; 1 PC[13] | · Risk of bias: 4 studies high[10-13]<br>· SOE: Insufficient[10-13]<br>· Limitations: unclear selection criteria for the study populations; risk of performance bias; lack of adjustment for confounders; unclear loss to follow-up. | · Suicide rates were lower in 3 interventions[10-12] and unchanged in one intervention.[13]<br>· Suicide attempts were lower in one intervention.[13]<br>· Adverse effects: Not reported. |
| **Healthcare services directed towards individuals** | | |
| 4 studies[14-17]: 4 RCTs[14-17] | · Risk of bias: 1 study low[14]; 3 unclear.[15-17]<br>· SOE: Low[14-17]<br>· Limitations: unclear randomization methods; unclear allocation concealment; unclear handling of missing data. | · Suicide attempts were lower in one intervention[17] and unchanged in 3 interventions.[14-16]<br>· Adverse effects: Not reported. |
| *KQ 3: What are important areas of ongoing research and current evidence gaps in research on suicide prevention in Veterans and military personnel, and how could they be addressed by future research?* | | |
| 18 studies[56,76,77,79-87,108-113] | Not applicable | · 3 studies[56,110,111] focusing on methods to identify suicide risk; 15 studies[76,77,79-87,108,109,112,113] focusing on healthcare service interventions for suicide prevention. |

Abbreviations: KQ = key question; RCT = randomized controlled trial; RC = retrospective cohort; PC = prospective cohort; SOE = strength of evidence

# CONCLUSIONS

Recent years have brought an almost doubling of the number of new studies in active duty service member and Veteran populations that have evaluated numerous different approaches to suicide prevention, including risk assessment using predictive modeling based on Army STARRS and various population-level and individual-level interventions. For suicide risk prediction, models incorporating health record and other data appear most promising and REACH VET will provide the best opportunity to directly study this approach in Veterans. For suicide prevention interventions, ongoing psychotherapy-focused interventions for individuals in acute suicidal crisis continue to be the most widely studied, with outpatient cognitive behavioral therapy (CBT) still being the most well-established treatment. The largest gaps in evidence that may be the highest priorities for future VHA research are evaluation of the adverse effects of suicide prevention efforts and evaluation of suicide prevention efforts that specifically target high-risk populations, such as those service members transitioning to civilian life and those with a history of repeat suicide attempts, and those that focus on key social determinants of health and access to lethal means.

# ACKNOWLEDGMENTS

This topic was developed in response to a nomination by Health Services Research and Development (HSR&D) for the purpose of updating the 2015 ESP review on suicide prevention, with a special focus on research in Veterans, particularly Veterans transitioning from military to civilian life. The scope was further developed with input from the topic nominators (*ie*, Operational Partners), the ESP Coordinating Center, and the review team.

The authors gratefully acknowledge Julia Haskin, MS for editorial support, Sam Aldape for citation management support, Monireh Moghadam, LCSW for content consultation, Lauren Denneson, MS, PhD for content consultation, and Katherine Mackey, MD, MPP and the following individuals for their contributions to this project:

## Operational Partners

Operational partners are system-level stakeholders who have requested the report to inform decision-making. They recommend Technical Expert Panel (TEP) participants; assure VA relevance; help develop and approve final project scope and timeframe for completion; provide feedback on draft report; and provide consultation on strategies for dissemination of the report to field and relevant groups.

Naomi Tomoyasu, PhD
Deputy Director, HSR&D

Robert O'Brien, PhD, MA
Scientific Project Manager, Mental and Behavioral Health Portfolio

## Peer Reviewers

The Coordinating Center sought input from external peer reviewers to review the draft report and provide feedback on the objectives, scope, methods used, perception of bias, and omitted evidence. Peer reviewers must disclose any relevant financial or non-financial conflicts of interest. Because of their unique clinical or content expertise, individuals with potential conflicts may be retained. The Coordinating Center and the ESP Center work to balance, manage, or mitigate any potential nonfinancial conflicts of interest identified.

# REFERENCES


1. Breshears RE, Brenner LA, Harwood JE, Gutierrez PM. Predicting suicidal behavior in veterans with traumatic brain injury: The utility of the personality assessment inventory. *J Pers Assess.* Jul 2010;92(4):349-355.
2. Hartl TL, Rosen C, Drescher K, Lee TT, Gusman F. Predicting high-risk behaviors in veterans with posttraumatic stress disorder. *J Nerv Ment Dis.* Jul 2005;193(7):464-472.
3. Hendin H, Al Jurdi RK, Houck PR, Hughes S, Turner JB. Role of intense affects in predicting short-term risk for suicidal behavior: A prospective study. *J Nerv Ment Dis.* Mar 2010;198(3):220-225.
4. Kessler RC, Stein MB, Petukhova MV, et al. Predicting suicides after outpatient mental health visits in the Army study to assess risk and resilience in servicemembers (Army STARRS). *Mol Psychiatry.* Apr 2017;22(4):544-551.
5. Kessler RC, Warner CH, Ivany C, et al. Predicting suicides after psychiatric hospitalization in us army soldiers: The army study to assess risk and resilience in servicemembers (Army STARRS). *JAMA Psychiatry.* 2015;72(1):49-57.
6. 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.* Sep 2015;105(9):1935-1942.
7. Nock MK, Millner AJ, Joiner TE, et al. Risk factors for the transition from suicide ideation to suicide attempt: Results from the Army study to assess risk and resilience in servicemembers (Army STARRS). *J Abnorm Psychol.* Feb 2018;127(2):139-149.
8. Rosellini AJ, Stein MB, Benedek DM, et al. Using self-report surveys at the beginning of service to develop multi-outcome risk models for new soldiers in the U.S. Army. *Psychol Med.* Oct 2017;47(13):2275-2287.
9. Tiet QQ, Ilgen MA, Byrnes HF, Moos RH. Suicide attempts among substance use disorder patients: An initial step toward a decision tree for suicide management. *Alcohol Clin Exp Res.* Jun 2006;30(6):998-1005.
10. Knox KL, Pflanz S, Talcott GW, et al. The US air force suicide prevention program: Implications for public health policy. *Am J Public Health.* Dec 2010;100(12):2457-2463.
11. Warner CH, Appenzeller GN, Parker JR, Warner C, Diebold CJ, Grieger T. Suicide prevention in a deployed military unit. *Psychiatry.* Summer 2011;74(2):127-141.
12. Watts BV, Shiner B, Young-Xu Y, Mills PD. Sustained effectiveness of the mental health environment of care checklist to decrease inpatient suicide. *Psychiatric Services.* Apr 2017;68(4):405-407.
13. Smith-Osborne A, Maleku A, Morgan S. Impact of applied suicide intervention skills training on resilience and suicide risk in army reserve units. *Traumatology.* Mar 2017;23(1):49-55.
14. Bryan CJ, Mintz J, Clemans TA, et al. Effect of crisis response planning vs. Contracts for safety on suicide risk in U.S. Army soldiers: A randomized clinical trial. *J Affect Disord.* Apr 1 2017;212:64-72.
15. Goodman M, Banthin D, Blair NJ, et al. A randomized trial of dialectical behavior therapy in high-risk suicidal veterans. *J Clin Psychiatry.* Dec 2016;77(12):e1591-e1600.
16. Jobes DA, Comtois KA, Gutierrez PM, et al. A randomized controlled trial of the collaborative assessment and management of suicidality versus enhanced care as usual with suicidal soldiers. *Psychiatry (New York).* 2017;80(4):339-356.

**17.** Rudd M, Bryan CJ, Wertenberger EG, et al. Brief cognitive-behavioral therapy effects on post-treatment suicide attempts in a military sample: Results of a randomized clinical trial with 2-year follow-up. *The American Journal of Psychiatry.* May 2015;172(5):441-449.

**18.** Nelson HD, Denneson L, Low A, et al. Systematic review of suicide prevention in veterans. 2015;VA ESP Project #05-225.

**19.** *VA national suicide data report 2005-2015* https://www.mentalhealth.va.gov/suicide_prevention/Suicide-Prevention-Data.asp: 2018.

**20.** Kang HK, Bullman TA, Smolenski DJ, Skopp NA, Gahm GA, Reger MA. Suicide risk among 1.3 million veterans who were on active duty during the iraq and afghanistan wars. *Annals of Epidemiology.* 2015;25(2):96-100.

**21.** *Joint action plan for supporting veterans during their transition from uniformed service to civilian life.* https://www.hsdl.org/?view&did=811185: 2018.

**22.** Pease J, Billera, M., Gerard, G., . Military culture and the transition to civilian life: Suicide risk and other considerations. *Social Work.* 2016;61(1):83-86.

**23.** Reger MA, Smolenski DJ, Skopp NA, et al. Risk of suicide among us military service members following operation enduring freedom or operation iraqi freedom deployment and separation from the us military. *JAMA Psychiatry.* 2015;72(6):561-569.

**24.** Shen Y-C, Cunha JM, Williams TV. Time-varying associations of suicide with deployments, mental health conditions, and stressful life events among current and former US military personnel: A retrospective multivariate analysis. *The Lancet Psychiatry.* 2016;3(11):1039-1048.

**25.** Pease JL, Billera M, Gerard G. Military culture and the transition to civilian life: Suicide risk and other considerations. *Social Work.* 2016;61(1):83-86.

**26.** *HSR&D suicide prevention research roadmap: Transition to veteran status.* Department of Veterans Affairs; 2018.

**27.** National strategy for preventing veteran suicide 2018-2028. Office of Mental Health and Suicide Prevention, U.S. Department of Veterans Affairs; 2018.

**28.** Lefevre ML. Screening for suicide risk in adolescents, adults, and older adults in primary care: U.S. Preventive services task force recommendation statement. *Ann Intern Med.* 2014;160(10):719.

**29.** O'Connor E, Gaynes BN, Burda BU, Soh C, Whitlock EP. Screening for and treatment of suicide risk relevant to primary care: A systematic review for the U.S. Preventive services task force. *Ann Intern Med.* 2013;158(10):741-754.

**30.** Luoma JB MC, Pearson JL. Contact with mental health and primary care providers before suicide: A review of the evidence. *American Journal of Psychiatry* 2002;159(6):909-916.

**31.** *Suicide prevention.* https://www.hsrd.research.va.gov/publications/forum/spring18/: Department of Veterans Affairs; 2018.

**32.** VA/DoD. Clinical practice guideline for assessment and management of patients at risk for suicide. 2013.

**33.** Wallace B, Small K, Brodley C, Lau J, Trikalinos T. Deploying an interactive machine learning system in an evidence-based practice center: Abstrackr. 2012:819-824.

**34.** Rathbone J, Hoffmann T, Glasziou P. Faster title and abstract screening? Evaluating abstrackr, a semi-automated online screening program for systematic reviewers. *Systematic Reviews.* 2015;4(1).

**35.** Hayden JA, Cote P, Bombardier C. Evaluation of the quality of prognosis studies in systematic reviews. *Ann Intern Med.* 2006;144(6):427.

**36.** Higgins JP, Altman DG, Gotzsche PC, et al. The cochrane collaboration's tool for assessing risk of bias in randomised trials. *BMJ.* 2011;343:d5928.

**37.** Sterne J, Higgins J, Reeves B. A cochrane risk of bias assessment tool: For non-randomized studies of interventions (ACROBAT-NRSI). 2014.

**38.** Berkman ND, Lohr KN, Ansari M, et al. Grading the strength of a body of evidence when assessing health care interventions for the effective health care program of the agency for healthcare research and quality: An update methods guide for effectiveness and comparative effectiveness reviews. Rockville MD: Agency for Healthcare Research and Quality; 2013.

**39.** Haney EM, O'Neil ME, Carson S, et al. Suicide risk factors and risk assessment tools: A systematic review. Washington (DC): Department of Veterans Affairs (US); 2012.

**40.** DeCou CR, Comtois KA, Landes SJ. Dialectical behavior therapy is effective for the treatment of suicidal behavior: A meta-analysis. *Behavior Therapy.* 2018.

**41.** Bohus M, Haaf B, Simms T, et al. Effectiveness of inpatient dialectical behavioral therapy for borderline personality disorder: A controlled trial. *Behaviour Research and Therapy.* 2004;42(5):487-499.

**42.** Carter GL, Willcox CH, Lewin TJ, Conrad AM, Bendit N. Hunter DBT project: Randomized controlled trial of dialectical behaviour therapy in women with borderline personality disorder. *Australian and New Zealand Journal of Psychiatry.* 2010;44(2):162-173.

**43.** Koons CR, Robins CJ, Lindsey Tweed J, et al. Efficacy of dialectical behavior therapy in women veterans with borderline personality disorder. *Behavior Therapy.* 2001;32(2):371-390.

**44.** McMain SF, Links PS, Gnam WH, et al. A randomized trial of dialectical behavior therapy versus general psychiatric management for borderline personality disorder. *American Journal of Psychiatry.* 2009;166(12):1365-1374.

**45.** Mehlum L, Tørmoen AJ, Ramberg M, et al. Dialectical behavior therapy for adolescents with repeated suicidal and self-harming behavior: A randomized trial. *Journal of the American Academy of Child & Adolescent Psychiatry.* 2014;53(10):1082-1091.

**46.** Soler J, Pascual JC, Tiana T, et al. Dialectical behaviour therapy skills training compared to standard group therapy in borderline personality disorder: A 3-month randomised controlled clinical trial. *Behaviour Research and Therapy.* 2009;47(5):353-358.

**47.** Meyers LL, Landes SJ, Thuras P. Veterans' service utilization and associated costs following participation in dialectical behavior therapy: A preliminary investigation. *Mil Med.* 2014;179(11):1368-1373.

**48.** Landes SJ, Matthieu MM, Smith BN, et al. Dialectical behavior therapy training and desired resources for implementation: Results from a national program evaluation in the veterans health administration. *Mil Med.* Aug 2016;181(8):747-752.

**49.** Landes SJ, Rodriguez AL, Smith BN, et al. Barriers, facilitators, and benefits of implementation of dialectical behavior therapy in routine care: Results from a national program evaluation survey in the veterans health administration. *Translational Behavioral Medicine.* 02/06 2017;7(4):832-844.

**50.** Ilgen MA, Downing K, Zivin K, et al. Exploratory data mining analysis identifying subgroups of patients with depression who are at high risk for suicide. *The Journal of Clinical Psychiatry.* 2009;70(11):1495.

**51.** Poulin C, Shiner B, Thompson P, et al. Predicting the risk of suicide by analyzing the text of clinical notes. *PLoS ONE.* 2014;9(1):e85733.

**52.** Holm-Denoma J, Witte T. A. Taxometric study of suicide risk. 2015.

**53.** Brenner l, Crow B, Landes SJ, Simon GE. Prevention suicides: VA/DoD, and community health system strategies for research-to-practice effots. Presented at: Academy Health Annual Research Meeting2018; Seattle, WA.

**54.** Simon GE, Johnson E, Lawrence JM, et al. Predicting suicide attempts and suicide deaths following outpatient visits using electronic health records. *American Journal of Psychiatry.* 2018:appi.ajp.2018.17101167.

**55.** Simon GE, Coleman KJ, Rossom RC, et al. Risk of suicide attempt and suicide death following completion of the patient health questionnaire depression module in community practice. *J Clin Psychiatry.* Feb 2016;77(2):221-227.

**56.** Joiner TE, Gutierrez PM. Toward a gold standard for suicide risk assessment for military personnel. *Military Suicide Research Consortium* https://msrc.fsu.edu/funded-research/toward-gold-standard-suicide-risk-assessment-military-personnel. Accessed July 17, 2018.

**57.** Nock MK, Park JM, Finn CT, Deliberto TL, Dour HJ, Banaji MR. Measuring the suicidal mind: Implicit cognition predicts suicidal behavior. *Psychol. Sci.* 2010;21(4):511-517.

**58.** Hazlett E, Goodman M. Affective startle assessment in high risk suicidal veterans (DoD supplement). *VISN 3 Mental Illness Research, Education & Clinical Center.*

**59.** Cha CB, Najmi S, Park JM, Finn CT, Nock MK. Attentional bias toward suicide-related stimuli predicts suicidal behavior. *J. Abnorm. Psychol.* 2010;119(3):616-622.

**60.** Naifeh JA, Colpe LJ, Aliaga PA, et al. Barriers to initiating and continuing mental health treatment among soldiers in the Army study to assess risk and resilience in servicemembers (Army STARRS). *Mil Med.* Sep 2016;181(9):1021-1032.

**61.** Galfalvy H, Huang YY, Oquendo MA, Currier D, Mann JJ. Increased risk of suicide attempt in mood disorders and tph1 genotype. *J. Affect. Disord.* 2009;115(3):331-338.

**62.** Kim YK, Hwang JA, Lee HJ. Association between norepinephrine transporter gene (slc6a2) polymorphisms and suicide in patients with major depressive disorder. *J. Affect. Disord.* 2014;158:127-132.

**63.** Shinozaki G, Romanowicz M, Passov V, Rundell J, Mrazek D, Kung S. State dependent gene-environment interaction: Serotonin transporter gene-child abuse interaction associated with suicide attempt history among depressed psychiatric inpatients. *J. Affect. Disord.* 2013;147(1-3):373-378.

**64.** Sokolowski M, Ben-Efraim YJ, Wasserman J, Wasserman D. Glutamatergic grin2b and polyaminergic odc1 genes in suicide attempts: Associations and gene-environment interactions with childhood/adolescent physical assault. *Mol. Psychiatry.* 2013;18(9):985-992.

**65.** Sunnqvist C, Westrin A, Traskman-Bendz L. Suicide attempters: Biological stressmarkers and adverse life events. *Eur. Arch. Psychiatry Clin. Neurosci.* 2008;258(8):456-462.

**66.** Jokinen J, Ouda J, Nordstrom P. Noradrenergic function and hpa axis dysregulation in suicidal behaviour. *Psychoneuroendocrinology.* 2010;10:1536-1542.

**67.** Brundin L, Bjorkqvist M, Traskman-Bendz L, Petersen A. Increased orexin levels in the cerebrospinal fluid the first year after a suicide attempt. *J. Affect. Disord.* 2009;113(1-2):179-182.

**68.** Guintivano J, Brown T, Newcomer A. Identification and replication of a combined epigenetic and genetic biomarker predicting suicide and suicidal behaviors. *Am. J. Psychiatry.* 2014;171(12):1287-1296.

**69.** Sparks DL, Hunsaker JC, Amouyel P. Angiotensin I-converting enzyme I/d polymorphism and suicidal behaviors. *Am. J. Med. Genet. B Neuropsychiatr. Genet.* 2009;150B(2):290-294.

**70.** Stein MB, Ware EB, Mitchell C, et al. Genomewide association studies of suicide attempts in US soldiers. *Am J Med Genet B Neuropsychiatr Genet.* Dec 2017;174(8):786-797.

**71.** Matthews S, Spadoni A, Knox K, Strigo I, Simmons A. Combat-exposed war veterans at risk for suicide show hyperactivation of prefrontal cortex and anterior cingulate during error processing. *Psychosom. Med.* 2012;74(5):47-55.

**72.** Serafini G, Pompili M, Innamorati M. Affective temperamental profiles are associated with white matter hyperintensity and suicidal risk in patients with mood disorders. *J. Affect. Disord.* 2011;129(1-3):47-55.

**73.** Brundin L, Sellgren CM, Lim CK, et al. An enzyme in the kynurenine pathway that governs vulnerability to suicidal behavior by regulating excitotoxicity and neuroinflammation. *Translational Psychiatry.* 2016;6(8):e865.

**74.** Sudol K, Mann JJ. Biomarkers of suicide attempt behavior: Towards a biological model of risk. *Current Psychiatry Reports.* 2017/05/03 2017;19(6):31.

**75.** National Institute for Health and Clinical Excellence. Guide to the single technology appraisal process. 2009.

**76.** Luxton D, National Center for Telehealth and Technology, Department of Defense, U. S. Army Medical Research and Materiel Command. Caring letters for military suicide prevention. *ClinicalTrials.gov* https://ClinicalTrials.gov/show/NCT01473771. Accessed July 17, 2018.

**77.** Comtois KA. Military continuity project (MCP). *Military Suicide Research Consortium* https://clinicaltrials.gov/ct2/show/NCT01829620. Accessed July 17, 2018.

**78.** Bush NE, Smolenski DJ, Denneson LM, Williams HB, Thomas EK, Dobscha SK. A virtual hope box: Randomized controlled trial of a smartphone app for emotional regulation and coping with distress. *Psychiatr Serv.* Apr 1 2017;68(4):330-336.

**79.** Holloway M, Henry M. Jackson Foundation for the Advancement of Military Medicine, U.S. Army Medical Research and Materiel Command, Department of Defense. A brief intervention to reduce suicide risk in military service members and veterans - study 2 (safemil). *ClinicalTrials.gov* https://ClinicalTrials.gov/show/NCT01360736. Accessed July 17, 2018.

**80.** Goodman M. Safer: A brief intervention involving family members in suicide safety planning (safer). *ClinicalTrials.gov* https://clinicaltrials.gov/ct2/show/NCT03034863. Accessed July 17, 2018.

**81.** Ilgen M, Department of Veterans Affairs. Crisis line facilitation. *ClinicalTrials.gov* https://ClinicalTrials.gov/show/NCT02459587. Accessed July 17, 2018.

**82.** Holloway M, Henry M. Jackson Foundation for the Advancement of Military Medicine, Department of Veterans Affairs, Duke University. Post admission cognitive therapy (PACT) for the inpatient treatment of military personnel with suicidal behaviors. *ClinicalTrials.gov* https://ClinicalTrials.gov/show/NCT01359761. Accessed July 17, 2018.

**83.** Holloway M, Henry M. Jackson Foundation for the Advancement of Military Medicine, National Alliance for Research on Schizophrenia and Depression. Inpatient post admission cognitive therapy (PACT) for the prevention of suicide attempts.

*ClinicalTrials.gov* https://ClinicalTrials.gov/show/NCT01340859. Accessed July 17, 2018.

**84.** Holloway M, Henry M. Jackson Foundation for the Advancement of Military Medicine, Congressionally Directed Medical Research Programs. Pilot trial of inpatient cognitive therapy for the prevention of suicide in military personnel. *ClinicalTrials.gov* https://ClinicalTrials.gov/show/NCT01356186. Accessed July 18, 2018.

**85.** Ilgen M, University of Michigan, U. S. Army Medical Research and Materiel Command, Department of Defense, Department of Veterans Affairs. Intervening to reduce suicide risk in veterans with substance use disorders. *ClinicalTrials.gov* https://ClinicalTrials.gov/show/NCT02439762. Accessed July 17, 2018.

**86.** Interian A, Department of Veterans Affairs, Columbia University Department of Psychology College of Physicians & Surgeons, Rutgers University Bloustein Center for Survey Research. Mindfulness-based cognitive therapy for suicide prevention. *ClinicalTrials.gov* https://ClinicalTrials.gov/show/NCT01872338. Accessed July 17, 2018.

**87.** Brenner L, Military Suicide Research Consortium, VA Eastern Colorado Health Care System. Window to hope-evaluating a psychological treatment for hopelessness among veterans with traumatic brain injury (WtoH). *ClinicalTrials.gov* https://ClinicalTrials.gov/show/NCT01691378. Accessed July 17, 2018.

**88.** Heisel MJ, Flett GL. Psychological resilience to suicide ideation among older adults. *Clinical Gerontologist: The Journal of Aging and Mental Health.* 2008;31(4):51-70.

**89.** Kleiman EM, Adams LM, Kashdan TB, Riskind JH. Gratitude and grit indirectly reduce risk of suicidal ideations by enhancing meaning in life: Evidence for a mediated moderation model. *Journal of Research in Personality.* 2013;47(5):539-546.

**90.** Kleiman EM, Beaver JK. A meaningful life is worth living: Meaning in life as a suicide resiliency factor. *Psychiatry Res.* 2013;210(3):934-939.

**91.** Tsai AC, Lucas M, Sania A, Kim D, Kawachi I. Social integration and suicide mortality among men: 24-year cohort study of U.S. Health professionals. *Ann. Intern. Med.* 2014;161(2):85-95.

**92.** Tsai AC, Lucas M, Kawachi I. Association between social integration and suicide among women in the United States. *JAMA Psychiatry.* 2015.

**93.** University of Washington, Military Suicide Research Consortium, Department of Veterans Affairs, Department of Defense. Military continuity project. 2013, https://ClinicalTrials.gov/show/NCT01829620.

**94.** US Department of Veterans Affairs. Veterans crisis line. http://www.veteranscrisisline.net/. Accessed July, 2018.

**95.** National Center for Telehealth and Technology, The Geneva Foundation, Portland V. A. Medical Center. Virtual hope box - effectiveness of a smartphone app for coping with suicidal ideation.2015, https://ClinicalTrials.gov/show/NCT01982773.

**96.** Bush NE, Dobscha SK, Crumpton R, et al. A virtual hope box smartphone app as an accessory to therapy: Proof-of-concept in a clinical sample of veterans. *Suicide and Life-Threatening Behavior.* Feb 2015;45(1):1-9.

**97.** Smith G. Denver PHI peer project. *Funded by VA Office of Patient Centered Care & Cultural Transformation.*

**98.** Pfeiffer P, University of Michigan, National Institutes of Health. Peer mentorship to reduce suicide risk following psychiatric hospitalization (prevail study). *ClinicalTrials.gov*. https://ClinicalTrials.gov/show/NCT02365116.2015.

**99.** Matarazzo BB, Hoffberg AS, Clemans TA, Signoracci GM, Simpson GK, Brenner LA. Cross-cultural adaptation of the window to hope: A psychological intervention to reduce hopelessness among U.S. Veterans with traumatic brain injury. *Brain Injury* 2014;28(10):1238-1247.

**100.** Caine ED. Forging an agenda for suicide prevention in the United States. *Am J Public Health.* 2013;103(5):822-829.

**101.** University of Wisconsin-Madison Integrative Medicine. *Personalized, proactive and patient-driven care: Whole health and suicide prevention.*: 2014.

**102.** Bates MJ, Bowles SV. Review of well-being in the context of suicide prevention and resilience. *Defense Centers of Excellence for Psychological Health & Traumatic Brain Injury (DCoE).* 2011.

**103.** Hegerl U, Wittenburg L, Arensman E. Optimizing suicide prevention programs and their implementation in Europe (OSPI Europe): An evidence-based multi-level approach. *BMC Public Health.* 2009;9(428).

**104.** Hegerl U, Wittenburg L. The european alliance against depression: A multilevel approach to the prevention of suicidal behavior. *Psychiatric Services* 2009;60(5):596-599.

**105.** Reger MA, Luxton DD, Tucker RP, et al. Implementation methods for the caring contacts suicide prevention intervention. *Professional psychology: research and practice.* 2017;48(5):369.

**106.** Reger M. Veteran preferences for the caring contacts suicide prevention intervention. *Unpublished: In Progress*.

**107.** Kerbrat AH, Comtois K, DeCou CR. Caring contacts via text message: Results of a randomized controlled trial with active duty military personnel. Presented at: Ammerican Association for Suicidology Annual Conference. 2018; Washington, DC.

**108.** Primack JM, Department of Veterans Affairs, Butler Hospital. Veterans coping long-term with active suicide (clasp-VA). *ClinicalTrials.gov* https://ClinicalTrials.gov/show/NCT01894841. Accessed July 17, 2018.

**109.** O'Connor S. Teachable moment brief intervention for veterans following a suicide attempt. *ClinicalTrials.gov* https://clinicaltrials.gov/ct2/show/NCT03533075. Accessed July 17, 2018.

**110.** Anestis M. Predicting suicide risk in a military population. *Military Suicide Research Consortium* https://msrc.fsu.edu/funded-research/predicting-suicide-risk-military-population. Accessed July 17, 2018.

**111.** Bagge C, Conner K. Looking for suicide warning signs. *Military Suicide Research Consortium* https://msrc.fsu.edu/funded-research/looking-suicide-warning-signs. Accessed July 17, 2018.

**112.** Barnes S, VA Eastern Colorado Health Care System. Act for life: A brief intervention for maximizing recovery after suicidal crises. *ClinicalTrials.gov* https://clinicaltrials.gov/ct2/show/NCT02751983. Accessed July 17, 2018.

**113.** Holloway M, VA Eastern Colorado Health Care System. A brief intervention to reduce suicide risk in military service members and veterans- study 1 (safe vet). *ClinicalTrials.gov* https://ClinicalTrials.gov/show/NCT01334541. Accessed July 17, 2018.

**114.** Burnette C, Ramchand R, Ayer L. Gatekeeper training for suicide prevention: A theoretical model and review of the empirical literature. *Rand Health Quarterly.* Jul 15 2015;5(1):16.

**115.** Isaac M, Elias B, Katz LY, et al. Gatekeeper training as a preventative intervention for suicide: A systematic review. *Canadian Journal of Psychiatry - Revue Canadienne de Psychiatrie.* Apr 2009;54(4):260-268.

**116.** Waliski A, Matthieu MM, Townsend JC, Castro M, Kirchner J. Training as a recruitment strategy for building military and community partnerships with faith-based organizations: The partners in care program. *Military and Government Counseling.* 2016;4(1):2.

QUERI

# Evidence Brief: Suicide Prevention in Veterans

# Supplemental Materials

September 2018

Prepared for:
Department of Veterans Affairs
Veterans Health Administration
Quality Enhancement Research Initiative
Health Services Research & Development Service
Washington, DC 20420

Prepared by:
Evidence-based Synthesis Program (ESP)
Coordinating Center
Portland VA Health Care System
Portland, OR
Mark Helfand, MD, MPH, MS, Director

Investigators:
Kim Peterson, MS
Johanna Anderson, MPH
Donald Bourne, MPH

VA HEALTH CARE Defining EXCELLENCE in the 21st Century

# TABLE OF CONTENTS

# SEARCH STRATEGIES

| **1. Database Search (limited to 2015 forward)**<br>**Date Searched: 5/29/18** | |
|---|---|
| **Sources:** | **Evidence:** |
| MEDLINE via PubMed | Database: PubMed<br>Search Strategy:<br>---<br>1 (("Suicide"[Mesh]) OR "Suicidal Ideation"[Mesh]) OR "Suicide, Attempted"[Mesh] OR (suicide[Title/Abstract] OR suicidal[Title/Abstract] OR suicidality[Title/Abstract] OR parasuicide[Title/Abstract] OR self-harm[Title/Abstract] OR "self-directed violence"[Title/Abstract] OR parasuicidal[Title/Abstract]) NOT "non-suicidal self injury"[Title/Abstract]) (84351)<br>2 ("prevention and control" [Subheading] OR "Tertiary Prevention"[Mesh] OR "Secondary Prevention"[Mesh] OR "Primary Prevention"[Mesh] OR (prevent*[Title/Abstract] OR control[Title/Abstract])) (4088706)<br>3 ((((("Risk"[Mesh]) OR "Risk Reduction Behavior"[Mesh]) OR "Risk Assessment"[Mesh]) OR "Risk Factors"[Mesh]) OR "Mass Screening"[Mesh]) OR "Validation Studies" [Publication Type] OR (risk[Title] OR screening[Title] OR screen[Title] OR assessment[Title] OR assessments[Title] OR questionnaire[Title] OR questionnaires[Title] OR instrument[Title] OR instruments[Title] OR tool[Title] OR tools[Title] OR scale[Title] OR scales[Title] OR measure[Title] OR measures[Title] OR correlate*[Title] OR “risk-stratification”[Title] OR predict[Title] OR predicts[Title] OR predictor[Title] OR predictors[Title]) OR (((((((ReACT Self Harm Rule[Title/Abstract]) OR Suicidal Ideation Attributes Scale[Title/Abstract]) OR Suicide Trigger Scale[Title/Abstract]) OR Cultural Assessment of Risk for suicide[Title/Abstract]) OR Affective Intensity Rating Scale[Title/Abstract]) OR Columbia Suicide Severity Rating Scale[Title/Abstract]) OR Edinburgh Risk of Repetition Scale[Title/Abstract]) OR Manchester Self Harm tool[Title/Abstract]) (2002667)<br>4 ((((("Letter" [Publication Type]) OR "Editorial" [Publication Type]) OR "Comment" [Publication Type]) (1630455)<br>5 1 AND 2 AND 3 NOT 4 (7504)<br>6 Filters: Publication date from 2015/09/11 to 2018/12/31; Humans; English; Adult: 19+ years (645)<br><br>********** |
| PsycINFO | Database: PsycINFO <1806 to May Week 3 2018><br>Search Strategy:<br>---<br>1 suicide/ or attempted suicide/ or suicidal ideation/ (35165)<br>2 (suicide or suicidal or suicidality or parasuicide or self-harm or "self-directed violence" or parasuicidal).mp. (61684)<br>3 1 or 2 (61684)<br>4 exp Suicide Prevention/ or prevention.mp. or exp Suicide Prevention Centers/ (124488)<br>5 exp Risk Assessment/ or risk.mp. or exp Risk Factors/ (330836)<br>6 (risk or screening or screen or assessment or assessments or questionnaire or questionnaires or instrument or instruments or tool or tools or scale or scales or measure or measures or correlate* or "risk stratification" or predict or predicts or predictor or predictors).mp. (1734831)<br>7 ReACT Self Harm Rule.mp. (5)<br>8 Suicidal Ideation Attributes Scale.mp. (6)<br>9 Suicide Trigger Scale.mp. (9)<br>10 Cultural Assessment of Risk for suicide.mp. (9) |

| | |
|---|---|
| | 11 Affective Intensity Rating Scale.mp. (3)<br>12 Columbia Suicide Severity Rating Scale.mp. (511)<br>13 Edinburgh Risk of Repetition Scale.mp. (2)<br>14 Manchester Self Harm tool.mp. (0)<br>15 or/5-14 (1734831)<br>16 4 or 15 (1783173)<br>17 3 and 16 (39797)<br>18 limit 17 to (peer reviewed journal and human and english language and treatment & prevention and adulthood <18+ years> and yr="2015 -Current") (1425)<br><br>********** |
| CCRCT: Cochrane Central Registrar of Controlled Trials | Database: EBM Reviews - Cochrane Central Register of Controlled Trials <April 2018><br>Search Strategy:<br>---<br>1 suicide/ or attempted suicide/ or suicidal ideation/ (730)<br>2 (suicide or suicidal or suicidality or parasuicide or self-harm or "self-directed violence" or parasuicidal).mp. (3266)<br>3 1 or 2 (3266)<br>4 exp Suicide Prevention/ or prevention.mp. or exp Suicide Prevention Centers/ (68915)<br>5 exp Risk Assessment/ or risk.mp. or exp Risk Factors/ (148353)<br>6 (risk or screening or screen or assessment or assessments or questionnaire or questionnaires or instrument or instruments or tool or tools or scale or scales or measure or measures or correlate* or "risk stratification" or predict or predicts or predictor or predictors).mp. (454558)<br>7 ReACT Self Harm Rule.mp. (0)<br>8 Suicidal Ideation Attributes Scale.mp. (0)<br>9 Suicide Trigger Scale.mp. (0)<br>10 Cultural Assessment of Risk for suicide.mp. (0)<br>11 Affective Intensity Rating Scale.mp. (0)<br>12 Columbia Suicide Severity Rating Scale.mp. (100)<br>13 Edinburgh Risk of Repetition Scale.mp. (0)<br>14 Manchester Self Harm tool.mp. (0)<br>15 or/5-14 (454558)<br>16 4 or 15 (484495)<br>17 3 and 16 (2673)<br>18 limit 17 to (yr="2015 -Current" and english language) (1001)<br><br>********** |
| SocINDEX | Database: SocINDEX with Full Text<br>Search Strategy:<br>---<br>S1 TI suicide OR suicidal OR suicidality OR parasuicide OR self-harm OR "self directed violence" OR parasuicidal (7607)<br>S2 DE "HEALTH risk assessment" OR DE "SUICIDAL behavior -- Risk factors" (2009)<br>S3 DE "SUICIDE" OR DE "SUICIDAL behavior" (3799)<br>S4 DE "SUICIDE prevention" OR DE "PREVENTIVE medicine" (1878)<br>S5 TI prevent* OR control OR risk OR screen OR screen OR assessment OR assessments OR questionnaire OR questionnaires OR instrument OR instruments OR tool OR tools OR scale OR scales OR measure OR measures OR correlate* OR "risk-stratification" OR predict OR predicts OR predictor OR predictors (536895)<br>S6 S1 OR S3 (8273)<br>S7 S2 OR S4 OR S5 (537472) |

| | |
|---|---|
| | S8 S6 AND S7 (4375)<br>S9 Limiters - Date of Publication: 20150101-20181231 (713)<br><br>********** |

| **2. Grey Literature Search (limited to 2015 forward)**<br>**Date Searched: 6/14/18** | |
|---|---|
| **Source:** | **Evidence:** |
| **Conferences and Organizations:** | |
| American Association of Suicidology | http://www.suicidology.org/ |
| DOD VA Suicide Prevention Conference | http://www.suicideoutreach.org |
| International Suicide Summit | http://www.suicide-research.org/ |
| American Foundation of Suicide Prevention | https://www.afsp.org/ |
| Military Suicide Research Consortium | https://msrc.fsu.edu/ |
| The Mental Illness Research, Education and Clinical Centers (MIRECC) | http://www.mirecc.va.gov/ |
| Study To Assess Risk & Resilience In Servicemembers — Longitudinal Study (STARRS-LS) | http://starrs-ls.org/#/list/publications |
| **Other Sources:** | |
| ClinicalTrials.gov | http://clinicaltrials.gov |
| NIH RePORTER | http://projectreporter.nih.gov/reporter.cfm |
| **Journals Searched Individually:** | |
| Depression and Anxiety | http://onlinelibrary.wiley.com/journal/10.1002/%28ISSN%291520-6394 |
| JAMA Psychiatry | http://archpsyc.jamanetwork.com/Solr/advancedSearch.aspx |
| Injury Prevention | http://injuryprevention.bmj.com/search |
| Suicide and Life-threatening Behavior | http://onlinelibrary.wiley.com/journal/10.1111/%28ISSN%291943-278X |
| Journal of Affective Disorders | http://www.jad-journal.com/search/advanced?seriesIssn=0165-0327&searchType=advanced&journalCode=jad |

| | |
|---|---|
| Psychiatry: Interpersonal and Biological Processes | http://www.tandfonline.com/loi/upsy20#.VTEnqpPVr0w |

| **3. Update Search for MOMRP and MSRC Studies<br>Date Searched: 8/29/18** | |
|---|---|
| **Sources:** | **Evidence:** |
| MEDLINE via PubMed | Database: PubMed<br>Search Strategy:<br>----------<br>1 ("Military Operational Medicine Research Program") OR ("Military Suicide Research Consortium") (115)<br><br>********** |
| Military Operational Medicine Research Program | https://momrp.amedd.army.mil/ |
| Military Suicide Research Consortium | https://msrc.fsu.edu/ |

# LIST OF EXCLUDED STUDIES

Exclude reasons: B= Background, 1=Ineligible population (*eg*, not Veteran/DoD), 2=Ineligible intervention (*eg*, not specifically targeting suicide), 3=Ineligible comparator, 4=Ineligible outcome, 5=Ineligible setting, 6=Ineligible study design (*eg*, case report), 7=Ineligible publication type (*eg*, editorial, narrative review) 8=Outdated or ineligible systematic review, 10=Included in previous ESP review

| # | Citation | Exclude reason |
|---|---|---|
| 1. | Barnes SM, Bahraini NH, Forster JE, et al. Moving beyond self-report: Implicit associations about death/life prospectively predict suicidal behavior among veterans. Suicide Life Threat Behav. 2017;47(1):67-77. | E4 |
| 2. | Barnes SM, Monteith LL, Gerard GR, Hoffberg AS, Homaifar BY, Brenner LA. Problem-solving therapy for suicide prevention in veterans with moderate-to-severe traumatic brain injury. Rehabilitation Psychology. 2017;62(4):600-608. | E4 |
| 3. | Bernecker SL, Rosellini AJ, Nock MK, et al. Improving risk prediction accuracy for new soldiers in the U.S. Army by adding self-report survey data to administrative data. BMC Psychiatry. 2018;18(1):87. | E4 |
| 4. | Baucom BRW, Georgiou P, Bryan CJ, et al. The Promise and the Challenge of Technology-Facilitated Methods for Assessing Behavioral and Cognitive Markers of Risk for Suicide among U.S. Army National Guard Personnel. Int J Environ Res Public Health. 2017;14(4):. Epub 2017 Mar 2031 doi:2010.3390/ijerph14040361. | E4 |
| 5. | Blount T, Fredman SJ, Pukay-Martin ND, Macdonald A, Monson CM. Cognitive-behavioral conjoint therapy for PTSD: application to an Operation Enduring Freedom veteran. Cognitive and Behavioral Practice. 2015;22(4):458-467. | E6 |
| 6. | Brenner L, Barnes S, Monteith L, et al. Evaluating the acceptability and feasibility of problem-solving therapy for suicide prevention among veterans with moderate-to-severe TBI. Brain Injury. 2016; 30(5-6):718-719. | E4 |
| 7. | Brenner L, Simpson G. Two promising evidence-based interventions for suicide prevention among veterans with moderate-to-severe TBI. Brain Injury. 2017;31(6-7):805. | E4 |
| 8. | Britton PC, Bohnert KM, Ilgen MA, Kane C, Stephens B, Pigeon WR. Suicide mortality among male veterans discharged from Veterans Health Administration acute psychiatric units from 2005 to 2010. Soc Psychiatry Psychiatr Epidemiol. 2017;52(9):1081-1087. | E4 |
| 9. | Brown GK, Karlin BE, Trockel M, Gordienko M, Yesavage J, Taylor C. Effectiveness of cognitive behavioral therapy for veterans with depression and suicidal ideation. *Archives of Suicide Research.* 2016;20(4):677-682. | E4 |
| 10. | Brown GR, Jones KT. Mental health and medical health disparities in 5135 transgender veterans receiving healthcare in the Veterans' Health Administration: A case-control study. LGBT Health. 2016;3(2):122-131. | E2 |
| 11. | Bryan CJ, Rudd MD, Wertenberger E. Individual and environmental contingencies associated with multiple suicide attempts among U.S. Military personnel. Psychiatry Res. 2016;242:88-93. | E4 |
| 12. | Bucy RA, Hanisko KA, Kamphuis LA, Nallamothu BK, Iwashyna TJ, Pfeiffer PN. Suicide risk management protocol in post-cardiac arrest survivors: development, feasibility, and outcomes. Ann Am Thorac Soc. 2017;14(3):363-367. | E1 |
| 13. | Bush NE, Dobscha SK, Crumpton R, et al. A virtual hope box smartphone app as an accessory to therapy: proof-of-concept in a clinical sample of veterans. Suicide Life Threat Behav. 2015;45(1):1-9. | E4 |
| 14. | Bush NE, Smolenski DJ, Denneson LM, Williams HB, Thomas EK, Dobscha SK. A virtual hope box: randomized controlled trial of a smartphone app for emotional regulation and coping with distress. Psychiatr Serv. 2017;68(4):330-336. | E4 |

| | | |
|---|---|---|
| 15. | Christofferson DE, Hamlett-Berry K, Augustson E. Suicide prevention referrals in a mobile health smoking cessation intervention. American Journal of Public Health. 2015;105(8):e7-e9. | E4 |
| 16. | Chu C, Podlogar M, Hagan CR, et al. The Interactive Effects of the Capability for Suicide and Major Depressive Episodes on Suicidal Behavior in a Military Sample. Cognit Ther Res. 2016;40(1):22-30. Epub 2015 Sep 2029 doi:2010.1007/s10608-10015-19727-z. | E4 |
| 17. | Copeland LA, Finley EP, Bollinger MJ, Amuan ME, Pugh MJ. Comorbidity correlates of death among new veterans of Iraq and Afghanistan deployment. Med Care. 2016;54(12):1078-1081. | E2 |
| 18. | Cox KS, Mouilso ER, Venners MR, et al. Reducing suicidal ideation through evidence-based treatment for posttraumatic stress disorder. Journal of Psychiatric Res. 2016;80:59-63. | E2 |
| 19. | Currier GW, Brown GK, Brenner LA, et al. Rationale and study protocol for a two-part intervention: safety planning and structured follow-up among veterans at risk for suicide and discharged from the emergency department. Contemporary Clinical Trials. 2015;43:179-184. | E7 |
| 20. | Deutsch AM, Lande RG. The reasons for living scale-military version: assessing protective factors against suicide in a military sample. Mil Med. 2017;182(7):e1681-e1686. | E4 |
| 21. | Finley EP, Bollinger M, Noël PH, et al. A national cohort study of the association between the polytrauma clinical triad and suicide-related behavior among US veterans who served in Iraq and Afghanistan. American Journal of Public Health. 2015;105(2):380-387. | E4 |
| 22. | Gallegos AM, Streltzov NA, Stecker T. Improving treatment engagement for returning Operation Enduring Freedom and Operation Iraqi Freedom veterans with posttraumatic stress disorder, depression, and suicidal ideation. Journal of Nervous and Mental Disease. 2016;204(5):339-343. | E4 |
| 23. | Galynker I, Yaseen ZS, Briggs J, Hayashi F. Attitudes of acceptability and lack of condemnation toward suicide may be predictive of post-discharge suicide attempts. *BMC Psychiatry Vol 15 2015, ArtID 87.* 2015;15. | E1 |
| 24. | Harmon LM, Cooper RL, Nugent WR, Butcher JJ. A review of the effectiveness of military suicide prevention programs in reducing rates of military suicides. *Journal of Human Behavior in the Social Environment.* 2016;26(1):15-24. | E8 |
| 25. | Jones N, Fear N, Wessely S, Thandi G, Greenberg N. Forward psychiatry-early intervention for mental health problems among UK armed forces in Afghanistan. Eur. Psychiatry. 2017;39:66-72. | E4 |
| 26. | Karras E, Lu N, Elder H, et al. Promoting help seeking to veterans: a comparison of public messaging strategies to enhance the use of the veteran's crisis line. Crisis: The Journal of Crisis Intervention and Suicide Prevention. 2017;38(1):53-62. | E4 |
| 27. | Kasckow J, Zickmund S, Gurklis J, et al. Using telehealth to augment an intensive case monitoring program in veterans with schizophrenia and suicidal ideation: a pilot trial. Psychiatry Res. 2016;239:111-116. | E1 |
| 28. | Kline A, Chesin M, Latorre M, et al. Rationale and study design of a trial of mindfulness-based cognitive therapy for preventing suicidal behavior (MBCT-S) in military veterans. Contemporary Clinical Trials. 2016;50:245-252. | E7 |
| 29. | Lehavot K, Simpson TL, Shipherd JC. Factors associated with suicidality among a national sample of transgender veterans. Suicide Life Threat Behav. 2016;46(5):507-524. | E4 |
| 30. | Logan J, Bohnert A, Spies E, Jannausch M. Suicidal ideation among young Afghanistan/Iraq war veterans and civilians: individual, social, and environmental risk factors and perception of unmet mental healthcare needs, United States, 2013. Psychiatry Res. 2016;245:398-405. | E4 |
| 31. | Lopez-Castroman J, Jaussent I, Gorwood P, Courtet P. Suicidal depressed patients respond less well to antidepressants in the short term. Depression and Anxiety. 2016;33(6):483-494. | E1 |

| | | |
|---|---|---|
| 32. | Marriott BP, Hibbeln JR, Killeen TK, et al. Design and methods for the better resiliency among veterans and non-veterans with omega-3's (BRAVO) study: a double blind, placebo-controlled trial of omega-3 fatty acid supplementation among adult individuals at risk of suicide. Contemporary Clinical Trials. 2016;47:325-333. | E2 |
| 33. | Matarazzo BB, Farro SA, Billera M, Forster JE, Kemp JE, Brenner LA. Connecting veterans at risk for suicide to care through the home program. Suicide Life Threat Behav. 2017;47(6):709-717. | E4 |
| 34. | 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. *American Journal of Public Health.* 2015;105(9):1935-1942. | E10 |
| 35. | Mezuk B, Lohman M, Leslie M, Powell V. Suicide risk in nursing homes and assisted living facilities: 2003-2011. American Journal of Public Health. 2015;105(7):1495-1502. | E1 |
| 36. | Monteith LL, Bahraini NH, Matarazzo BB, Soberay KA, Smith CP. Perceptions of institutional betrayal predict suicidal self-directed violence among veterans exposed to military sexual trauma. J Clin Psychol. 2016;72(7):743-755. | E4 |
| 37. | Naifeh JA, Nock MK, Ursano RJ, et al. Neurocognitive function and suicide in U.S. Army soldiers. Suicide Life Threatening Behav. 2017;47(5):589-602. | E4 |
| 38. | Helson H, Denneson L, Low A, Bauer B, O'Neil M, Kansagara D, Teo A. Systematic Review of Suicide Prevention in Veterans. VA ESP Project #05-225; 2015. | B |
| 39. | Pease JL, Billera M, Gerard G. Military culture and the transition to civilian life: suicide risk and other considerations. Social Work. 2016;61(1):83-86. | E7 |
| 40. | Pigeon WR, Funderburk J, Bishop T, Crean H, Titus C. Results of a pilot RCT comparing brief CBT-I to treatment as usual in primary care patients endorsing suicidal ideation. Sleep Conference: 30th Annual Meeting of the Associated Professional Sleep Societies, LLC, SLEEP. 2016;39. | E7 |
| 41. | Pittman JO, Floto E, Lindamer L, Baker DG, Lohr JB, Afari N. VA Escreening program: technology to improve care for post-9/11 veterans. Psychological Services. 2017;14(1):23-33. | E4 |
| 42. | Possemato K, Bergen-Cico D, Treatman S, Allen C, Wade M, Pigeon W. A randomized clinical trial of primary care brief mindfulness training for veterans with PTSD. J Clin Psychol. 2016;72(3):179-193. | E4 |
| 43. | Predmore Z, Ramchand R, Ayer L, et al. Expanding suicide crisis services to text and chat: responders' perspectives of the differences between communication modalities. Crisis: The Journal of Crisis Intervention and Suicide Prevention. 2017;38(4):255-260. | E1 |
| 44. | Resick PA, Wachen JS, Dondanville KA, et al. Effect of group vs individual cognitive processing therapy in active-duty military seeking treatment for posttraumatic stress disorder: a randomized clinical trial. JAMA Psychiatry. 2017;74(1):28-36. | E2 |
| 45. | Riblet N, Shiner B, Mills P, Rusch B, Hemphill R, Watts BV. Systematic and organizational issues implicated in post-hospitalization suicides of medically hospitalized patients: A study of root-cause analysis reports. General hospital psychiatry. 2017;46:68-73. | E4 |
| 46. | Rosellini AJ, Street AE, Ursano RJ, et al. Sexual assault victimization and mental health treatment, suicide attempts, and career outcomes among women in the US Army. American Journal of Public Health. 2017;107(5):732-739. | E4 |
| 47. | Rudd M, Bryan CJ, Wertenberger EG, et al. Brief cognitive-behavioral therapy effects on post-treatment suicide attempts in a military sample results of a randomized clinical trial with 2-year follow-up. *Am J Psychiatry.* 2015;172(5):441-449. | E10 |
| 48. | Schuman DL, Schuman DL. A value-critical choice analysis of a policy to prevent suicide in veterans and service members. Soc Work Public Health. 2016;31(6):537-548. | E6 |

| | | |
|---|---|---|
| 49. | Shelef L, Tatsa-Laur L, Derazne E, Mann JJ, Fruchter E. An effective suicide prevention program in the Israeli Defense Forces: a cohort study. Eur Psychiatry. 2016;31:37-43. | E1 |
| 50. | Stanley B, Brown GK, Currier GW, Lyons C, Chesin M, Knox KL. Brief intervention and follow-up for suicidal patients with repeat emergency department visits enhances treatment engagement. American Journal of Public Health. 2015;105(8):1570-1572. | E4 |
| 51. | Stanley B, Chaudhury SR, Chesin M, et al. An emergency department intervention and follow-up to reduce suicide risk in the VA: acceptability and effectiveness. Psychiatr Serv. 2016;67(6):680-683. | E4 |
| 52. | Stein MB, Ware EB, Mitchell C, et al. Genomewide association studies of suicide attempts in US soldiers. Am J Med Genet. 2017;174(8):786-797. | E4 |
| 53. | Tolliver B, Marriott B, Hibbeln J, et al. Comparison of the implicit association test with established clinical rating scales in suicide risk assessment: baseline data from the better resiliency among veterans and non-veterans with omega-3 s (bravo) study. Neuropsychopharmacology Conference: 55th Annual Meeting of the American College of Neuropsychopharmacology, ACNP. 2016;41:S487-S488. | E1 |
| 54. | Tripp JC, McDevitt-Murphy ME. Trauma-related guilt mediates the relationship between posttraumatic stress disorder and suicidal ideation in OEF/OIF/OND veterans. Suicide Life Threat Behav. 2017;47(1):78-85. | E4 |
| 55. | Ursano RJ, Kessler RC, Stein MB, et al. Medically documented suicide ideation among U.S. Army soldiers. Suicide Life Threat Behav. 2017;47(5):612-628. | E4 |
| 56. | Villatte JL, O'Connor SS, Leitner R, Kerbrat AH, Johnson LL, Gutierrez PM. Suicide Attempt Characteristics Among Veterans and Active-Duty Service Members Receiving Mental Health Services: A Pooled Data Analysis. Mil Behav Health. 2015;3(4):316-327. Epub 2015 Sep 2018 doi:2010.1080/21635781.21632015.21093981. | E4 |
| 57. | Wolfe-Clark AL, Bryan CJ. Integrating two theoretical models to understand and prevent military and veteran suicide. Armed Forces & Society. 2017;43(3):478-499. | E6 |
| 58. | Zimmerman L, Villatte JL, Kerbrat AH, Atkins DC, Flaster A, Comtois KA. Current Suicidal Ideation among Treatment-Engaged Active Duty Soldiers and Marines. *Mil Behav Health.* 2015;3(4):296-305. Epub 2015 Sep 2016 doi:2010.1080/21635781.21632015.21093980. | E4 |

# EVIDENCE TABLES

## QUALITY ASSESSMENT OF INCLUDED DIAGNOSTIC/SCREENING ACCURACY STUDIES

| Author, Year | Adequate description of population? | Non-biased selection? | Adequate sample size for study design? | Low loss to follow-up/ missing data? | Standard-ized method of risk factor assessment and scoring clearly described or referenced? | Unbiased risk factor assessment by independ-ent assessors? | Adequate outcome Measure-ment? | Unbiased outcome measureme nt by independ-ent assessors? | Adequate accounting for potential confounders ? | Overall assessment of potential for bias (Low/ Unclear/ High) |
|---|---|---|---|---|---|---|---|---|---|---|
| *Recently Published Studies* | | | | | | | | | | |
| Nock, 2018[2] | Yes<br>Demo-graphics and inclusion criteria described | Yes<br>Representat-ive of all active duty soldiers | Yes<br>N=3,916; 803 with suicide attempts | Unclear<br>Not reported | Yes<br>Assessments were described and referenced | Unclear<br>Not reported | Yes<br>Suicide attempt assessed by Columbia Suicidal Severity Rating scale | Unclear<br>Not reported | Yes<br>Adjusted for socio-demographic and Army history factors | Unclear |
| Kessler, 2017[3] | Yes<br>Demograph-ics previously described; inclusion criteria described | Yes<br>Representat-ive of all active duty soldiers | Yes<br>N= 975,057; 1,070 with suicide deaths | Yes<br>Missing values and inconsistenc-ies were resolved using rational imputation. | Yes<br>Assessments were described and referenced | Yes, data from existing medical records. | Yes<br>ICD-9-CM treatment codes, previously described | Yes<br>DoD Suicide Event Reporting system, previously described | Yes<br>Adjusted for prior psychiatric hospitalizat-ion, gender and deployment status | Low |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Rosellini, 2017[4] | Unclear<br>Subset of a group in which demographics previously described; inclusion criteria described | Yes<br>Representative of new Army soldiers prior to beginning Basic Combat Training | Yes<br>N=21,832; unreported number of suicide attempts | Unclear<br>Not reported | Yes<br>Assessments were described and referenced | Unclear<br>Not reported | Yes<br>Suicide attempt was defined based on ICD-9-CM treatment codes | Yes<br>Suicide attempt was defined based on the DoD Suicide Event Reporting system | Yes<br>Adjusted for sociodemographic factors, lifetime history of mental disorder, and lifetime suicidality/ non-suicidal self-injury | Unclear |
| *Studies Included in Previous ESP Reviews (*Nelson, 2015 & Haney,2012) | | | | | | | | | | |
| Kessler, 2015[5] | No, population characteristics not described. | Yes, included all patients with psychiatric hospitalizations within the study period. | Yes, N= 40,820; 68 suicides. | Yes, 12-month follow-up not available for all patients due to termination of military service; imputation used for missing data. | Yes, risk prediction model described, although list of predictors used for each model was not provided. | Yes, data from existing medical records. | Unclear, suicide data were extracted from administrative databases, but did not explicitly report how suicide deaths were determined. | Not applicable.† | Not applicable.‡ | Low |
| McCarthy, 2015[6] | Yes | Yes, included all cases of suicide and a random 1% sample of the rest of the population as controls. | Yes, N=5.9 million; 2,138 suicides. | Unclear, not reported. | Yes, risk prediction model described. | Yes, data from existing medical records. | Yes, suicide death according to the National Death Index. | Not applicable.† | Not applicable.‡ | Low |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Breshears, 2010[7] | Yes | Unclear, not reported. | No, N=154; 11 with suicide behavior. | Unclear, included only patients with medical record information to confirm traumatic brain injury and assess injury severity. | Unclear, all risk factors were assessed by chart review; scoring of the Personality Assessment Inventory was likely standardized. | Unclear, not reported. | No, chart review was used as the reference standard for suicidal behavior. | Unclear, not reported. | Not applicable.‡ | High |
| Hendin, 2010[8] | Yes | Unclear, not reported. | No, N=283; 40 with suicidal behavior. | Yes, 240/283 patients completed both assessments. | Yes, assessments were described and referenced. | Yes, research assistant assessors were independent. | Yes, procedures were described; all patients were assessed at follow-up. | Unclear, not reported. | Not applicable.‡ | Unclear |
| Tiet, 2006[9] | Yes | Unclear, recruitment time frame not described. | Yes, N=5,671; 1,163 with attempts within 30 days. | Yes, 2% missing data (95/5671). | Yes, assessments were described and referenced. | Unclear, not reported. | Yes, assessed during face-to-face interview with Addiction Severity Index. | Unclear, not reported. | Not applicable.‡ | Unclear |
| Hartl, 2005[1] | Yes | Yes, consecutive admissions. | No, N=630; 7 with attempts 4 months prior to intake. | Unclear, missing data not reported. | Unclear, intake question-naires were not described. | Unclear, not reported. | Unclear, suicide attempt items were reportedly added to the Northeast Program Evaluation Center survey and are not standard. | Unclear, not reported. | Not applicable.‡ | High |

Abbreviations: ICD-9-CM= International Classification of Diseases, Ninth Revision, Clinical Modification
* Risk of Bias tool modified from Hayden, 2006 and Harris, 2001
† Deaths confirmed by reliable external sources (eg, death certificate).
‡ Not relevant to this study.
§ "Undetermined cause" was combined with "suicide" in this study consistent with customary practice in the United Kingdom (UK).

## QUALITY ASSESSMENT OF INCLUDED RANDOMIZED CONTROLLED TRIALS (COCHRANE RCT TOOL)

| Author, Year | Sequence Generation: Was the allocation sequence adequately generated? | Allocation concealment: Was allocation adequately concealed? | Blinding: Was knowledge of the allocated intervention adequately prevented during the study? | Incomplete outcome data: Were incomplete outcome data adequately addressed? | Selective outcome reporting: Are reports of the study free of suggestion of selective outcome reporting? | Other sources of bias: Was the study apparently free of other problems that could put it at a high risk of bias? | Overall assessment of potential for bias: Low/ Unclear/High |
|---|---|---|---|---|---|---|---|
| *Recently Published Studies* | | | | | | | |
| Bryan, 2017[10] | Yes<br>Computerized randomization | Yes<br>Color coding of intervention groups | Yes<br>Participant, therapist, and outcome assessor blinding | Yes<br>No differences between groups in attrition (22-28%). ITT analysis used with censoring of missing data. Model analysis found missing data did not impact results. | Yes<br>All outcomes reported. Focused reporting on favorable unadjusted results in abstract when adjusted results were not significant, but did report adjusted results in text. | Yes<br>None noted | Good |
| Goodman, 2016[11] | Yes<br>Computerized randomization | Unclear<br>Not described | No<br>No discussion of blinding of patients, clinicians, or outcome assessors | Unclear<br>40-60% attrition. Used general linear mixed models using all available data. | Yes<br>Reported all primary and secondary outcomes | Yes<br>None noted | Unclear |
| Jobes, 2017[12] | Unclear<br>"minimization" matching strategy | Unclear<br>Not described | Unclear<br>Single "blind" assessment but no | Yes<br>No differences between groups (13% missing | Yes<br>Reported all primary and | Yes<br>None noted | Unclear |

| Author, Year | Sequence Generation: Was the allocation sequence adequately generated? | Allocation concealment: Was allocation adequately concealed? | Blinding: Was knowledge of the allocated intervention adequately prevented during the study? | Incomplete outcome data: Were incomplete outcome data adequately addressed? | Selective outcome reporting: Are reports of the study free of suggestion of selective outcome reporting? | Other sources of bias: Was the study apparently free of other problems that could put it at a high risk of bias? | Overall assessment of potential for bias: Low/ Unclear/High |
|---|---|---|---|---|---|---|---|
| *Recently Published Studies* | | | | | | | |
| | | | other discussion of blinding | overall). ITT analysis and analysis of missing data | secondary outcomes | | |
| *Studies Included in Previous ESP Reviews (Nelson 2015, O'Neil 2012)* | | | | | | | |
| Rudd, 2015[13] | Yes, computerized randomization program. | Unclear, computer program was used for randomization, but unclear if allocation was concealed until enrollment complete. | Assessors: Yes. Participants and providers: Unclear. | Yes, analysis of missing data patterns indicated that self-report data were missing completely at random for both treatment conditions; missing data handled with maximum likelihood estimation and multiple imputation of 10 data sets. | Unclear, only self-report data from baseline to the 18-month follow-up assessment were used in analyses because of higher than planned attrition rate during later follow-up assessments. | Yes, none noted. | Unclear |

## QUALITY ASSESSMENT OF INCLUDED OBSERVATIONAL STUDIES (COCHRANE NRSI TOOL)

| Author, Year | Risk of selection bias? (yes, no unclear) | Risk of performance bias? (yes/no/unclear) | Risk of detection bias? (yes, no, unclear) | Risk of bias due to confounding? (yes, no, unclear) | Risk of Attrition bias? (yes, no, unclear) | Risk of reporting bias? (yes, no, unclear) | Overall Quality (Good/Fair/Poor) |
|---|---|---|---|---|---|---|---|
| *Recently Published Studies* | | | | | | | |
| Smith-Osborne, 2017[14] | Unclear<br>Selection across different time periods. | Yes<br>ASIST training ongoing during time period and categorization of "high/low" training only at baseline | No<br>Validated scales | Yes<br>No adjustment, baseline differences in age and gender | Unclear<br>Levels of missing data unclear, imputed missing data | No | Poor |
| *Studies Included in Previous ESP Reviews (Nelson 2015, O'Neil 2012)* | | | | | | | |
| None | | | | | | | |

## STRENGTH OF EVIDENCE FOR INCLUDED STUDIES

### Strength of Evidence for Studies of the Efficacy/Effectiveness of Population-level Healthcare Service Interventions for Suicide Prevention

| Outcome | Study Design/ Number of Studies (N) | Study Limitations | Directness | Consistency | Precision | Reporting Bias | Overall Effect | Strength of Evidence/GRADE* |
|---|---|---|---|---|---|---|---|---|
| **Recently Published Studies** | | | | | | | | |
| *Applied Suicide Intervention Skills Training (High Training vs Low Training)* | | | | | | | | |
| Suicide attempt | 1 prospective cohort[14] (N=131) | High | Direct | Unknown | Imprecise | Undetected | Decrease | Insufficient |
| Suicide | 1 prospective cohort[14] (N=131) | High | Direct | Unknown | Imprecise | Undetected | None | Insufficient |
| *VA Mental Health Environment of Care Checklist* | | | | | | | | |
| Suicide | 1 before-after study[15] (N=77,893) | High | Direct | Unknown | Precise | Undetected | Decrease | Insufficient |
| **Studies Included in Previous ESP Reviews** | | | | | | | | |
| *Multicomponent Leadership and Community Initiative* | | | | | | | | |
| Suicide | 1 before-after study[16] observational (N>5 million) | High | Direct | Unknown | Precise | Undetected | Decrease | Insufficient |
| *Multicomponent Deployment Intervention* | | | | | | | | |
| Suicide | 1 post intervention series[17] (N=40,283) | High | Direct | Unknown | Precise | Undetected | Decrease | Insufficient |

## Strength of Evidence for Studies of the Efficacy/Effectiveness of Individual-level Healthcare Service Interventions for Suicide Prevention

| Outcome | Study Design/ Number of Studies (N) | Study Limitations | Directness | Consistency | Precision | Reporting Bias | Overall Effect | Strength of Evidence/GRADE* |
|---|---|---|---|---|---|---|---|---|
| **Recently Published Studies** | | | | | | | | |
| *Crisis Response Plan vs Enhanced Crisis Response Plan vs Contract for Safety* | | | | | | | | |
| Suicide attempt | 1 RCT[10] (N=97) | Low | Direct | Unknown | Imprecise | Undetected | None | Low |
| *Dialectical Behavioral Therapy vs Usual Care* | | | | | | | | |
| Suicide Attempt | 1 RCT[11] (N=91) | Moderate | Direct | Unknown | Imprecise | Undetected | None | Low |
| *Collaborative Assessment and Management of Suicidality vs Usual Care* | | | | | | | | |
| Suicide Attempt | 1 RCT[12] (N=148) | Moderate | Direct | Unknown | Imprecise | Undetected | None | Low |
| **Studies Included in Previous ESP Review** | | | | | | | | |
| *Cognitive Behavioral Therapy vs Usual Care* | | | | | | | | |
| Suicide Attempt | 1 RCT[13] (N=152) | Moderate | Direct | Unknown | Imprecise | Undetected | Decrease | Low |

# PEER REVIEW

| Comment # | Reviewer # | Comment | *Author Response* |
|---|---|---|---|
| *Are the objectives, scope, and methods for this review clearly described?* | | | |
| 1 | 1 | Yes | *None* |
| 2 | 2 | Yes | *None* |
| 3 | 3 | Yes | *None* |
| 4 | 4 | Yes | *None* |
| 5 | 5 | Yes | *None* |
| 6 | 6 | Yes | *None* |
| *Is there any indication of bias in our synthesis of the evidence?* | | | |
| 7 | 1 | No | *None* |
| 8 | 2 | No | *None* |
| 9 | 3 | No | *None* |
| 10 | 4 | No | *None* |
| 11 | 5 | No | *None* |
| 12 | 6 | No | *None* |
| *Are there any published or unpublished studies that we may have overlooked?* | | | |
| 13 | 1 | No | *None* |
| 14 | 2 | Yes - I didn't see Peter Britton's recently completed study of MI among veterans post-psychiatric discharge. I believe the outcome for that study was suicidal self-directed violence. Also, if ongoing/recently completed intervention studies that use suicidal ideation as the outcome are eligible (as it appears in Table 5), then there are two studies Lauren Denneson recently completed that might be included. These examined health coaching among transitioning (Post-9/11) veterans at varying levels of suicide risk. | *Thank you. No additional public information is yet available about Dr. Britton's motivational interviewing study. But, we did add details to KQ3 about Lauren Denneson's 2 recently completed pilot studies of health coaching with findings currently under review, one of which focuses on reducing suicidal ideation in Post-9/11 Veterans with recent suicidal ideation, and the other that focuses on feasibility and acceptability of implementation as an upstream suicide prevention approach in at-risk Post-9/11 Veterans without current suicide ideation. We also noted that some participants in Dr. Denneson's studies may be considered transitioning as no restrictions were placed on time since military separation.* |
| 15 | 3 | Yes - I've included information on these studies and papers in my review below. | *Thank you. We address individual studies and papers in the comments below.* |
| 16 | 4 | No | *None* |
| 17 | 5 | No | *None* |

| | | | |
|---|---|---|---|
| 18 | 6 | Were studies from MSRC or MOMRP (DoD) included? | *Yes. From our original searching we included Bryan 2017, Nock 2018, and Jobes 2018 from MSRC and MOMRP. We did further searching of these studies and did not find any additional studies to include.* |
| *Additional suggestions or comments can be provided below. If applicable, please indicate the page and line numbers from the draft report.* | | | |
| 19 | 1 | It would be helpful to clarify the definition of "veteran" for purposes of this review. Specifically, is the review intended to consider people who are veterans receiving (or not receiving) care in any healthcare setting or system? Or does it intend to consider care provided by VHA? Or care paid for by VHA? It would be helpful for descriptions of individual study to clarify individual veteran status as well as care setting. | *We added clarification to the eligibility criteria that we would include studies of any Veteran groups, regardless of payer or setting.* |
| 20 | 1 | The mention of possible adverse effects of risk identification could use some clarification. It is possible that completion of a self-report assessment or participation in a clinician assessment could have adverse effects. But it does not seem possible that computation of a records-based risk score would have direct adverse effects. Of course, an outreach program or some other intervention triggered by a computed risk score could have adverse effects. But it is really important to distinguish between direct adverse effects of assessment and adverse effects of subsequent interventions. | *Agreed. Added this clarification to page 11 in Harms eligibility criteria: Any including direct adverse effects of an assessment or intervention or those of subsequent interventions* |
| 21 | 1 | The discussion about safety planning (top of page 23) seems inaccurate to me. While there are many flavors of safety plans or crisis plans, most (if not all) of them include a significant focus on "what to do" (coping strategies, sources of support, etc.). The authors may be conflating safety plans with "contracts for safety". | *This description was taken directly from the Bryan 2017 RCT, which is why we put the "outlines what to do" and "outlines what not do to" in quotes. These descriptions are meant to relate to focus of the specific interventions used in that Bryan 2017 RCT as they were described, not in reference to safety planning in general: crisis response plan=outlines what to do and safety planning=outlines what not to do. But, to avoid misinterpretation, we took these phrases out and listed the specific components of the interventions.* |
| 22 | 1 | The discussion of future priorities might mention the expected arrival of glutamate receptor modulator drugs (esketamine and others to follow). It is likely that these drugs will be approved based on evidence for reducing depressive symptoms and reducing suicidal ideation. But we will likely lack (and desperately need) data regarding effects of these drugs on actual suicidal behavior. | *Thank you for this comment. However, because this review focused on population-directed healthcare services (eg, hotlines, outreach programs) and/or individual-directed healthcare services (eg, case management, follow-up) and not interventions that primarily treat co-existing conditions, including pharmacotherapy, mentioning the expected arrival of glutamate receptor modulator drugs is outside of our scope.* |

| | | | |
|---|---|---|---|
| 23 | 2 | One minor thing is that page 2, lines 19-27, this paragraph is unclear as written. I'm not sure what previous study is being referred to in line 21 and the last sentence is unclear. | *On line 21, we added clarification that the previous CBT study we were referring to is the Rudd 2017 study. In the last sentence, consistent with comment 21 below, we removed reference to "suicide pathway" and simplified the sentence to increase its clarity: Studies are still needed that (1) evaluate eligibility and training requirements of peer support specialists, (2) target known risk factors in Veterans before acute suicide crisis, and (3) focus on service members transitioning to civilian life and those with a history of repeat attempts.* |
| 24 | 2 | The eligibility criteria outlined no pages 6-7 state that eligible outcomes for interventions are suicidal self-directed violence, but it appears that the outcome for some of the ongoing studies included in table 5 is suicidal ideation (e.g., Barnes, et al; Brenner et al; Holloway, et al). | *Thank you for noting this discrepancy. You are correct that the eligible outcomes for this review are suicidal self-directed violence behavior and that that ideation outcomes are outside of our scope. We have replaced listings of ideation outcomes for the ongoing studies to entries of "None" to indicate that the protocols did not list any suicidal behavior outcomes.* |
| 25 | 2 | It would be helpful on page 21, lines 36-42, if the interventions referred to in this section were identified (instead of the count) in parentheses. | *We have added citations instead of counts to clarify which studies are discussed.* |
| 26 | 3 | Not all active duty service members are soldiers. Recommend calling them service members when discussing in general to include all branches of service and only using soldiers when discussing studies with Army participants (which is a majority of them). In addition, service member is not consistently capitalized (or not) throughout the document. I believe it is Service member (as you have it on p. 4, line 59) | *We have changed "soldier" to "service member" except in instances when we discuss studies specific to the Army. Per VA style guidelines, we have capitalized "Solider" and not capitalized "service member".* http://vaww.va.gov/webcom/style.asp |
| 27 | 3 | I'm not sure what the phrase "suicide pathway" refers to and worry that it is stigmatizing. Is there another phrase that can be used to describe using a public health approach that targets individuals before they are in acute crisis? Identifying the public health approach as one that VA has adopted may be helpful as well. | *Removed "suicide pathway" in 3 locations and replaced with "in individuals before they are in acute suicide crisis"* |
| 28 | 3 | The phrase Veterans Health Administration does not have an apostrophe in Veterans. Need to fix on p. 4, line 23. | *Changed.* |
| 29 | 3 | Word missing on p. 5, line 12. Looks like it should be primary care, but care is missing. | *Added.* |
| 30 | 3 | The use of the phrase "completed suicide" is discouraged. Recommend death by suicide, suicide death, or suicide. This phrase is used a number of times (see p. 15 – line 15, line 34, line 55). | *Changed to either "suicide death" or "death by suicide".* |

| | | | |
|---|---|---|---|
| 31 | 3 | Executive summary<br>1. First paragraph. You may want to include a statement regarding how many Veterans of the 20 who die each day are not users of VHA care. This may limit the effectiveness of VA suicide prevention efforts as well. | *We have added a statement of how many of these have recently used VHA services to the background section.* |
| 32 | 3 | In the table (p. 2), it would be helpful to include all abbreviations at the bottom. KQ and SOE are missing. | *Added.* |
| 33 | 3 | There is an existing publication that describes the model used in REACH VET that would be more appropriate to cite than personal communication (p. 5, line 31). It is McCarthy et al. 2015 https://ajph.aphapublications.org/doi/abs/10.2105/AJPH.2015.302737 | *Thank you we added this here.* |
| 34 | 3 | I would discourage describing REACH VET as providing lists of Veterans. The REACH VET program utilizes a dashboard that provides REACH VET Coordinators with the names of Veterans who have been identified as being in the highest tier of risk (0.1%) at their facility | *We have modified this section as suggested.* |
| 35 | 3 | The model is re-run once monthly (not twice, as listed on p. 5). | *Changed.* |
| 36 | 3 | Recommend removing polypharmacy and falls as adverse events that REACH VET predictive model predicts, as I don't think this is not accurate. | *Removed.* |
| 37 | 3 | There have been a number of public presentations on both the initial impact of REACH VET on patient outcomes and the plan to evaluate implementation that could be cited if needed. I believe Dr. Bridget Matarazzo presented one of these at AAS in April and Dr. Sara Landes presented on at Academy Health in June. | *Thank you. Based on Dr. Landes' public presentation at the June Academy Health Annual Research Meeting, we added the following to page 24 of our report: "Early data from the first year of implementation has already found that REACH VET has had positive impacts on 6-month patient outcomes, including greater completion of suicide prevention safety plans and less all-cause mortality. A full report on REACH VET's first year of implement is expected later in 2018."* |
| 38 | 3 | Caring Contacts are discussed throughout the document as caring emails or caring letters. I'd recommend calling them all Caring Contacts and then identifying the mode of contact (emails, letter). For example, I'd change p. 5, line 50 to Caring Contacts. | *Changed.* |
| 39 | 3 | Dr. Mark Reger at the Seattle VA led a review of Caring Contact methods to inform VA work to implement Caring Contacts. May want to conclude:<br>Reger, M. A., Luxton, D. D., Tucker, R., Comtois, K. A., Katz, I. R., Keen, A. D., Landes, S. J., Matarazzo, B. B., & Thompson, C. (2017). Implementation methods for the caring contacts suicide prevention | *Thank you for all the information about all the ongoing Caring Contact work. To address comments 39-43, we have added the following:*<br>*Regarding interventions designed to bolster protective factors such as psychological resilience, meaningful life, grit, gratitude, and social support[18-22] that are negatively associated with suicidal ideation, we identified quite a bit* |

| | | | |
|---|---|---|---|
| | | intervention. Professional Psychology: Research and Practice, 48, 369-377. | *of recent Caring Contacts work. Caring contacts "traditionally entails the routine sending of brief nondemanding messages that express caring concern to patients following discharge from treatment" to promote a feeling of caring connection using various contact modalities (i.e., mailed letters, postcards, greeting cards, emails, and text messages).[Reger 2017].[23] Recent work includes a review that provides "recommendations for the implementation of the Caring Contacts intervention across diverse settings,"[Reger 2017] a preliminary study of the acceptability of Caring Contacts with Veterans,[cite Portland VA presentation] a pilot implementation of centralized Caring Contacts for Veterans identified by REACH VET,[personal communication by Dr. Sara Landes] ongoing evaluation of how to implement Caring Contacts in the emergency department at VA,[personal communication by Dr. Sara Landes] and a completed study with preliminary unpublished data[24] which found that caring contacts sent via text message reduced the risk of suicide attempts and suicidal ideation over 1 year follow-up in 657 active duty service members* |
| 40 | 3 | Dr. Reger has also conducted preliminary studies on the acceptability of Caring Contacts with Veterans. I don't believe these are in press yet. May want to contact him. | *Added reference to this work. See response to comment #39.* |
| 41 | 3 | Dr. Reger and Dr. Landes are conducting a pilot implementation of centralized Caring Contacts for Veterans identified by REACH VET. This is being funded by OMHSP. | *Added reference to this work. See response to comment #39.* |
| 42 | 3 | Dr. Landes is evaluating how to implement Caring Contacts in the emergency department at VA with VISN funding and has a grant under review to continue this. | *Added reference to this work. See response to comment #39.* |
| 43 | 3 | You mention the Comtois Caring Contact study as ongoing on p. 22. That study is now complete. They presented their initial findings at AAS in April 2018, but no paper is currently available. Here is information from that presentation:<br>Kerbrat, A. H., Comtois, K. A., & DeCou, C. R. (2018, April). Caring contacts via text message: Results of a randomized controlled trial with active duty military personnel. Paper presented at the annual conference of the American Association for Suicidology, Washington, DC. | *Changed our reference to this study as completed and cited these preliminary findings. See response to comment #39.* |

| | | | |
|---|---|---|---|
| | | - Active duty personnel recruited from Army and Marine Corps (N=657)<br>- Caring Contacts reduced the risk of suicidal ideation and suicide attempt throughout 12-month follow-up:<br>§ 45% less likely to have experienced any suicidal ideation (OR = 0.55 [0.32 – 0.94])<br>§ 45% less likely to have made a suicide attempt (OR = 0.55 [0.31 – 0.99])<br>- Caring Contacts were effective:<br>§ Via text message<br>§ With a predominately male, active duty military sample<br>§ Across the spectrum of very low to very high suicidality<br>- Recommend contacting Dr. Comtois if it is better to cite personal communication than a presentation (comtois@uw.edu) | |
| 44 | 3 | The most recent study of DBT with Veterans is described first on p. 16. It might be helpful to point out that most DBT studies include treatment for 1 year and this was 6 months (although a previous RCT with Veterans with positive results was only 6 months of treatment – Koons et al.). | *Added clarification of this different in follow-up.* |
| 45 | 3 | I wonder if it would be helpful to include any other information here, as the outcome of this study was surprising? For example, there are 2 papers that describe the challenges of implementing DBT in the VA system (Landes et al. 2016, 2017). | *Yes, added this statement as additional context around why DBT had a surprising finding in Veterans: Other authors have more recently identified inadequate time to support full implementation of all of DBT's multiple and complex treatment modes (i.e., phone coaching outside of business hours) and other challenges as potential key barriers to successful implementation of DBT in the VA.[Landes 2016, Landes 2017]* |
| 46 | 3 | There have been other papers on DBT with Veterans that were not RCTs, but that might help provide better context and support of this evidence-based psychotherapy. For example, Meyers et al. showed that DBT was helpful to male and female Veterans and reduced service utilization in VA and cost. There have been other presentations of program evaluations of DBT in VA as well. The DBT SharePoint has these and research papers mentioned if needed: vaww.portal.va.gov/sites/OMHS/dbt | *Added Meyers 2014 as context that DBT has shown some service utilization and cost benefits in Veterans.* |
| 47 | 3 | While not with Veterans, there is a new meta-analysis on DBT that may also provide useful context – DeCou, Comtois, & Landes 2018. | *Thank you. We added this as additional support to our existing statement that DBT has been shown to reduce suicide risk primarily in civilians with borderline personality disorder.* |

| | | | |
|---|---|---|---|
| 48 | 3 | On p. 23, safety planning is described as an approach that "outlines what not to do." I would disagree with this description. This does not match the VA template for safety planning, nor the VA manual for it (Stanley & Brown). | *This description was taken directly from the Bryan 2017 RCT, which is why we put the "outlines what to do" and "outlines what not do to" in quotes. These descriptions are meant to relate to focus of the specific interventions used in that Bryan 2017 RCT as they were described, not in reference to safety planning in general: crisis response plan=outlines what to do and safety planning=outlines what not to do. But, to avoid misinterpretation, we took these phrases out and listed the specific components of the interventions.* |
| 49 | 3 | Does the review include the SAFE VET trial, or was that included in the previous review? | *SAFE VET is included in our list of ongoing studies table, but we did not find any published results* |
| 50 | 4 | Is there any possibility of putting in the summary a bulleted list of gaps and recommendations? I think that would be helpful for decision makers to focus on | *Added.* |
| 51 | 4 | I think it would be helpful at the start to indicate that you will be referring to the 2015 ESP Report as Nelson (2015). The Nelson reference does not show until page 10, and I had to look around to figure that it was a actually the ESP report. | *Thank you. Added this in the Executive Summary and Purpose paragraph of the Introduction.* |
| 52 | 4 | there are a number of references to 'protective factors;' does that include resilience? Later on there are two mentions of 'psychological resilience,' but I know DoD looks at resilience as a key point to focus on. I am surprised there seems to be no study on that from the MSRC or MOMRP (DoD). | *Yes, we included resilience in the list of protective factors. We specifically searched for MSRC or MOMRP studies focusing on resilience, but did not find any.* |
| 53 | 4 | In Exec Summ Table, I assume SOE stand for Summary of Evidence? I am not sure what that refers to in the context of the table. | *A definition for this has been added to the footnotes* |
| 54 | 4 | Page 5, line 12: should it read "...made contact with primary care provider in the preceding year..."? | *Yes, this has been changed.* |
| 55 | 4 | page 7: By "Timing: Any", is that indicating there were no time (date of publication) restrictions on the selection of papers? | *This was meant to reflect that we did not impose any restrictions based on follow-up time frames and clarified this in the eligibility criteria.* |
| 56 | 4 | Page 9, Figure 1: Seems odd that the first number you report in the text (3,495; and this is the number that was in the Exec Summ) is not in the table...should it be matching with the 3459? | *Yes, these have been changed to match the figure "3,459"* |
| 57 | 4 | page 9/page 1: I probably missed this in the approach you detailed (my apologies), but I am not sure how to reconcile that on page 1, you write that there are "...3,495 new citations identified since our | *We added clarification to the executive summary of how many studies were included from the previous ESP review.* |

| | | | |
|---|---|---|---|
| | | 2015 review...." but quite a few studies and citations that are in the text and the tables are from well before that. | |
| 58 | 4 | pages 10-11: For me, the ROC AUC piece needs more explanation as to what it means and how it informs this report | *We added the following about the ROC AUC: "…is an analysis of how well a test separates groups with and without the risk factor. Values of 1 represent perfect accuracy; whereas 0.5 represents accuracy that is no better than flipping a coin."* |
| 59 | 4 | page 20: MVP is already supporting work on suicide; I recommend contacting the MVP Director, Dr. Muralidhar to see what she thinks is appropriate to put in the report.<br>Similarly, STARRS has objective data to assess the utility of biomarkers for determining risk - the lead on this work for STARRS is Dr. Murray Stein, who is at the San Diego VA. | *Thank you for identifying these potential sources of ongoing work. We have already noted MVP and STARRS as potential resources for biomarker information. But, due to the short timeline of this rapid review, we were unable to obtain more detail to add to the report about work in progress. For our next update, we will be sure to seek out additional detail.* |
| 60 | 4 | page 22: You might want to note that Caring Letters is being used in conjunction with REACH-Vet; Dr. Sara Landes from Little Rock VA is leading an HSR&D study looking at the use of Caring Letters to facilitate the REACH-Vet process | *Thank you. Yes, we added this information per comment #41 above.* |
| 61 | 4 | Given HSRD's key focus right now on the 'transition period', would it be possible to have a paragraph devoted to this in the summary (maybe with a subheader)? It kind of gets minimal attention on page 30 - one paragraph that is actually just one long sentence. I note that it is mentioned throughout the report, but is there a way to bring more attention to that topic throughout the report? | *Yes – added new paragraphs – both with a subheading – both to the Executive Summary and the Discussion.* |
| 62 | 5 | An excellent review with rigorous methodology. I do not have anything to add to the current scope of the project. However, one often overlooked factor is that a large part of the suicide problem is not within the VA but without. 16 of the 20 suicides per day are by Veterans who have had no contact with the VA. That rate will not be reduced substantially until this problem is addressed. Once Veterans are seen within the VA, they by and large receive excellent care in the area of suicide prevention. I do agree with your point that the transition out of the military is a vulnerable time, especially if they do not engage with VA services. I think it is an important point to acknowledge the lack of contact with Veterans who do not receive care as a critical shortcoming in the fight against Veteran suicide. How can that be addressed? | *Agreed that this is an important issue worth addressing this report. We added a paragraph to the Discussion about this that focuses on the concept of community outreach, describing known gatekeeper training programs such as VA's S.A.V.E. and calling for more work in this area.* |
| 63 | 6 | Can a table of gaps and recommendations be included in the executive summary and in the summary/conclusion section? | *Yes, added.* |

| | | | |
|---|---|---|---|
| 64 | 6 | I wasn't quite sure what "adverse effects" meant in KQ1, KQ2? — Should adverse effects be replaced with "effectiveness"? | *We added clarification to our eligibility criteria that by adverse effects, we mean: "Any (eg, potential unintentional iatrogenic effects such as anxiety, distress, stigma), including direct adverse effects of an assessment or intervention or those of subsequent interventions"* |
| 65 | 6 | Given that the HSR&D suicide prevention roadmap and EO 13822 focus on "transitioning" veterans, can we include a brief summary upfront in the Executive Summary? Even though likely there may not be a lot in this area. | *Yes, added.* |
| 66 | 6 | on p. 9 the literature flow showed that some inconsistent numbers? Number of records after excluding duplicates is '3459' but later '3495' is the number presented that represents unique potentially relevant articles? | *This has been resolved.* |
| 67 | 6 | on pg. 30 (summary and discussion) can a table be developed to summarize what was found in the rapid brief? | *Summary table has been added to the summary and discussion.* |
| 68 | 6 | also on p. 32, (conclusion), I'm again not clear about what is meant by "adverse effects of suicide prevention efforts"? I think it might be good to replace "adverse effects with "effectiveness as the phrase implies that suicide prevention is not good as it has adverse effects. | *We added clarification in our eligibility criteria that by "adverse effects" we mean potential unintentional iatrogenic effects such as anxiety, distress, stigma, that could either be the direct effect of an assessment or intervention or those of subsequent interventions. This is not meant to imply that suicide prevention is not good, nor are we aware of conclusive evidence regarding potential iatrogenic effects. We are posing the question, though, in adherence to one of the guiding principles of comparative effective research – to evaluate the potential trade-offs of health care approaches, regardless of their likelihood.* |

# REFERENCES


1. Hartl TL, Rosen C, Drescher K, Lee TT, Gusman F. Predicting high-risk behaviors in veterans with posttraumatic stress disorder. *J Nerv Ment Dis.* Jul 2005;193(7):464-472.
2. Nock MK, Millner AJ, Joiner TE, et al. Risk factors for the transition from suicide ideation to suicide attempt: Results from the Army study to assess risk and resilience in servicemembers (Army STARRS). *J Abnorm Psychol.* Feb 2018;127(2):139-149.
3. Kessler RC, Stein MB, Petukhova MV, et al. Predicting suicides after outpatient mental health visits in the Army study to assess risk and resilience in servicemembers (Army STARRS). *Mol Psychiatry.* Apr 2017;22(4):544-551.
4. Rosellini AJ, Stein MB, Benedek DM, et al. Using self-report surveys at the beginning of service to develop multi-outcome risk models for new soldiers in the U.S. Army. *Psychol Med.* Oct 2017;47(13):2275-2287.
5. Kessler RC, Warner CH, Ivany C, et al. Predicting suicides after psychiatric hospitalization in us army soldiers: The army study to assess risk and resilience in servicemembers (Army STARRS). *JAMA Psychiatry.* 2015;72(1):49-57.
6. 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.* Sep 2015;105(9):1935-1942.
7. Breshears RE, Brenner LA, Harwood JE, Gutierrez PM. Predicting suicidal behavior in veterans with traumatic brain injury: The utility of the personality assessment inventory. *J Pers Assess.* Jul 2010;92(4):349-355.
8. Hendin H, Al Jurdi RK, Houck PR, Hughes S, Turner JB. Role of intense affects in predicting short-term risk for suicidal behavior: A prospective study. *J Nerv Ment Dis.* Mar 2010;198(3):220-225.
9. Tiet QQ, Ilgen MA, Byrnes HF, Moos RH. Suicide attempts among substance use disorder patients: An initial step toward a decision tree for suicide management. *Alcohol Clin Exp Res.* Jun 2006;30(6):998-1005.
10. Bryan CJ, Mintz J, Clemans TA, et al. Effect of crisis response planning vs. Contracts for safety on suicide risk in U.S. Army soldiers: A randomized clinical trial. *J Affect Disord.* Apr 1 2017;212:64-72.
11. Goodman M, Banthin D, Blair NJ, et al. A randomized trial of dialectical behavior therapy in high-risk suicidal veterans. *J Clin Psychiatry.* Dec 2016;77(12):e1591-e1600.
12. Jobes DA, Comtois KA, Gutierrez PM, et al. A randomized controlled trial of the collaborative assessment and management of suicidality versus enhanced care as usual with suicidal soldiers. *Psychiatry (New York).* 2017;80(4):339-356.
13. Rudd M, Bryan CJ, Wertenberger EG, et al. Brief cognitive-behavioral therapy effects on post-treatment suicide attempts in a military sample: Results of a randomized clinical trial with 2-year follow-up. *The American Journal of Psychiatry.* May 2015;172(5):441-449.
14. Smith-Osborne A, Maleku A, Morgan S. Impact of applied suicide intervention skills training on resilience and suicide risk in army reserve units. *Traumatology.* Mar 2017;23(1):49-55.
15. Watts BV, Shiner B, Young-Xu Y, Mills PD. Sustained effectiveness of the mental health environment of care checklist to decrease inpatient suicide. *Psychiatric Services.* Apr 2017;68(4):405-407.
16. Knox KL, Pflanz S, Talcott GW, et al. The US air force suicide prevention program: Implications for public health policy. *Am J Public Health.* Dec 2010;100(12):2457-2463.

**17.** Warner CH, Appenzeller GN, Parker JR, Warner C, Diebold CJ, Grieger T. Suicide prevention in a deployed military unit. *Psychiatry.* Summer 2011;74(2):127-141.
**18.** Heisel MJ, Flett GL. Psychological resilience to suicide ideation among older adults. *Clinical Gerontologist: The Journal of Aging and Mental Health.* 2008;31(4):51-70.
**19.** Kleiman EM, Adams LM, Kashdan TB, Riskind JH. Gratitude and grit indirectly reduce risk of suicidal ideations by enhancing meaning in life: Evidence for a mediated moderation model. *Journal of Research in Personality.* 2013;47(5):539-546.
**20.** Kleiman EM, Beaver JK. A meaningful life is worth living: Meaning in life as a suicide resiliency factor. *Psychiatry Res.* 2013;210(3):934-939.
**21.** Tsai AC, Lucas M, Sania A, Kim D, Kawachi I. Social integration and suicide mortality among men: 24-year cohort study of U.S. Health professionals. *Ann. Intern. Med.* 2014;161(2):85-95.
**22.** Tsai AC, Lucas M, Kawachi I. Association between social integration and suicide among women in the United States. *JAMA Psychiatry.* 2015.
**23.** Luxton D, National Center for Telehealth and Technology, Department of Defense, U. S. Army Medical Research and Materiel Command. Caring letters for military suicide prevention. *ClinicalTrials.gov* https://ClinicalTrials.gov/show/NCT01473771. Accessed July 17, 2018.
**24.** Kerbrat AH, Comtois K, DeCou CR. Caring contacts via text message: Results of a randomized controlled trial with active duty military personnel. Presented at: Ammerican Association for Suicidology Annual Conference. 2018; Washington, DC.