A Systematic Review of Suicide Prevention Programs for Military or Veterans

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Military personnel and veterans have important suicide risk factors. After a systematic review of the literature on suicide prevention, seven (five in the U.S.) studies of military personnel were identified containing interventions that may reduce the risk of suicide. The effectiveness of the individual components was not assessed, and problems in methodology or reporting of data were common. Overall, multifaceted interventions for active duty military personnel are supported by consistent evidence, although of very mixed quality, and in some cases during intervals of declines in suicide rates in the general population. There were insufficient studies of U.S. Veterans to reach conclusions.

U.S. military veterans are a large population with multiple and often significant risk factors for suicide. These include mood disorders, substance use disorders, pain, disabling chronic medical illness including traumatic brain injury, posttraumatic stress disorder (PTSD), and skill in using firearms, many which may have started while active military personnel. What is known about suicide risk factors and rates in the military and for veterans?

Recently published studies of U.S. military and veteran and non-veteran populations have identified a variety of risk factors and trends in suicide rates. Scoville, Gubata, Potter, White, and Pearse (2007) reported suicide rates for U.S. Armed Forces recruits in the interval 1980 to 2004. Age adjusted rates ranged from 2.0 per 100,000 (Navy) to 7.3 per 100,000 (Army); the composite rate for all services was 5.1 per 100,000. Similarly, Eaton, Messer, Garvey, Wilson, and Hoge (2006) compared the rate of suicide in the U.S. military with the rate in the U.S. population over the period 1990–2000 when adjusted for age, gender, and race, using both conservative and liberal treatment of uncertain cases. Both the conservative (8.31 per 100,000) and liberal (9.16 per 100,000) rates were lower than the US population rate (12.31 to 14.15 per 100,000). Eaton et al.'s data show a general trend of increase for the military from 1990 to 1995, and a decrease thereafter.

Zivin et al. (2007), in a study of over 800,000 depressed veterans in the interval 1999–2004, reported a suicide rate about seven times higher than the baseline risk in the general population. They also found elevated rates in groups known to be higher risk, including male, White, and having a substance abuse diagnosis. Their rate for younger veterans (age 18–44 years) was higher than for those older. Unexpectedly, a diagnosis of posttraumatic stress disorder (PTSD) was found to be protective, although only at older ages, perhaps because that diagnosis facilitated access to psychosocial treatments. Maynard and Boyko (2008) reported suicide
rates for U.S. veterans and nonveterans in Washington State for the years 2000–2006. For ages 18 to 44, they found widely fluctuating rates for veterans, but stable rates for nonveterans. For ages 45 to 64, they found increasing rates for both veterans and nonveterans. For ages 65 and older, the veterans’ rates were constant, but fell in the nonveterans. Overall, the veterans’ rates were higher than the nonveterans’ rates. They did note that Washington State has a significant veteran population and a high suicide rate relative to the national rate, so that their results may not be representative of national rates or trends.

A recent report (Milliken, Auchterlonie, & Hoge, 2007) on the prevalence of mental health disorders in soldiers returning from the current Iraq conflict found clinician-identified mental health problems in 20% of active duty personnel, and in over 40% of National Guard and reserve personnel. The authors found suicidal ideation in the range of 0.6% to 1.5%; they did not assess attempts or completions. Kang and Bullman (2008) reported suicide rates (as age, sex, race, and year of death adjusted standardized mortality rates) for U.S. veterans of the current Iraq and Afghanistan conflicts. They found statistically significant elevations for those who had formerly been on active duty (Standardized Mortality Ratio (SMR) 1.33, 95% CI: 1.03–1.69) and for those who were Veterans Administration (VA) patients with a mental disorder (SMR 1.77, 95% CI: 1.01–2.87). They also noted that suicide rates in the U.S. military are historically lower than rates for the overall U.S. population, and that their finding of many SMRs near 1.0 may actually represent an increase.

The main problem confronting those working in suicide prevention is that while the absolute number of suicides in a population is cumulatively quite large, the risk of suicide to any given individual, even those with multiple risk factors, is by relative measures quite small. This problem is illustrated in an example in Gaynes et al. (2004), who showed that for reasonable assumptions of sensitivity and specificity, a screening test for suicide risk would have a positive predictive value of 0.3% and generate an overwhelming number of false positives. These same factors complicate any attempt at constructing randomized clinical trials of suicide prevention efforts. It is widely recognized that the problem of accurate suicide prediction at the clinical level is currently an intractable one (Paris, 2006).

In spite of the difficulties with prediction, structured approaches to suicide prevention have been developed. The multifactorial nature of the problem of suicide has required the adoption of a compound approach to intervention, combining population-based screening and education with more targeted efforts for those at above-baseline risk. Specific interventions include education and awareness programs (such as for primary care physicians, the general public, or defined populations), community or organizational gatekeepers, screening for individuals at high risk, specific psychiatric treatments (such pharmacotherapy, ECT, or psychotherapy), follow-up care for suicide attempts, restriction of access to lethal means, and media reporting guidelines for suicide (Mann et al., 2005). Many new programs, including some reviewed in this article, are multicomponent programs and draw on many or all of the individual elements just listed.

In this article we review the state of the evidence for suicide prevention for military and veteran populations. The review presented here is part of a larger evidence synthesis project conducted for the VAS Office of Research and Development to identify new or improved suicide prevention strategies (e.g., hotlines, outreach programs, peer counseling, treatment coordination programs, and new counseling approaches) that show promise for veterans, and report on the evidence that supports the most promising strategies (Bagley, Munjas, & Shekelle, 2008).

METHODS

We started the search using a recent systematic review of the literature on suicide
prevention covering the period from January
1966 to June 2005 (Mann et al., 2005) which
scored well on those aspects of the Oxman-
Guyatt Overview Quality Assessment Quest-
ionnaire (Oxman & Guyatt, 1991) and the
AMSTAR Systematic Review Checklist (Shea
et al., 2007) that dealt with the rigor of the
search and selection process. We searched
MEDLINE, the Cochrane Library, and
PsychINFO from July 2005 through May
2008 for articles published in English, using
the following search terms: Suicide/preven-
tion and control OR suicide, attempted/pre-
vention and control OR suicide AND (pre-
vent*[tiab] OR depression OR health
education OR health promotion OR public
opinion OR mass screening OR family
physicians OR medical education OR pri-
mary health care OR antidepressive agents
OR psychotherapy OR schools OR adoles-
cents OR methods OR firearms OR over-
dose OR poisoning OR gas poisoning OR
mass media NOT case report* OR edito-
rial* OR letter. We also performed refer-
ence mining of retrieved articles, refer-
ences of prior reviews, and solicited articles
from experts.

Data were abstracted by a psychiatrist
with prior experience in systematic reviews,
and spot checked by another author. The
studies included in this review were too het-
erogeneous to statistically pool, and we
therefore summarized these in a narrative
form. We assessed the overall quality of evi-
dence for outcomes using a method devel-
oped by the GRADE Working Group,
which classifies the grade of evidence across
outcomes (Atkins et al., 2004). This method
assigns “high” grade to randomized trials,
“low” to observational studies, and “very
low” to any other evidence; these grades are
then adjusted up for a strong evidence of as-
soiation, evidence of a dose-response rela-
tionship, and if all plausible confounders re-
duce (or would have reduced) the reported
effect. The grades are adjusted down for
limitations in study quality, inconsistencies,
uncertainty about directness, imprecise or
sparse data, or there being a high probability
of reporting bias.

RESULTS

In total, we examined 3,406 titles and
reviewed 261 articles. Details of the complete
search, including a flow diagram, along with
the search results outside the area of military
and veterans appear in our full report (Bagley
et al., 2008). Seven studies involving military
personnel were identified. The characteris-
tics, interventions, and outcomes of the mili-
tary studies are shown in Table 1.

James and Kowalski (1996) described a
suicide prevention program for the U.S. Army
25th Infantry Division (Light) that was started
Psychological autopsy data from 1985 to 1993
identified various risk factors in this popula-
tion, including demographics (all male), men-
tal status (depression), substance abuse, and
relationship problems (all the suicides in-
volved marital or relationship discord or al-
leged infidelity). The intervention reported
was multifactorial and multidisciplinary. The
disciplines involved included the chaplain (to
provide individual counseling and division-
wide education), the psychologist (to coor-
dinate training and assist in identifying high-
risk soldiers), and the social worker (to provide
a liaison for the soldier, their family, and the
soldier's commander). Specific components
of the intervention as reported included: lec-
tures by chaplains, lectures at training pro-
grams (for division commanders and enlisted
soldiers), pocket-sized cards with warning
signs and contact information for emergency
services, crisis-intervention command con-
sultations (special meetings with the soldier,
his commanders, and the division mental
health officer), a high-risk book (once identi-
ified as high risk, the soldier's commander
would provide bimonthly written assessments
on the soldier's progress), outpatient follow-
up care with mental health services, and
mental health services for the soldier and
their family, along with a substance abuse
prevention program. The size of the study
population was not reported. The program
was not formally evaluated, but in a post-
script the authors noted, “the suicide rate has
decreased to three in the past 2 years.” Un-
<table>
<thead>
<tr>
<th>Author, Year</th>
<th>Population</th>
<th>N</th>
<th>Intervention</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>(James &amp; Kowalski, 1996)</td>
<td>U.S. Army, 25th Infantry Division</td>
<td>NR</td>
<td>Lectures, warning cards, tracking of high-risk soldiers, mental health services.</td>
<td>&quot;The suicide rate has decreased to three in the past 2 years.&quot;</td>
</tr>
<tr>
<td>McDaniels et al., 1990</td>
<td>A U.S. Navy training command</td>
<td>NR</td>
<td>Instructors were educated about risk factors and treatment.</td>
<td>Correlation between number of instructors trained and monthly suicide rate was -0.65.</td>
</tr>
<tr>
<td>(Knox et al., 2003)</td>
<td>U.S. Air Force</td>
<td>5,260,262 personnel</td>
<td>Eleven components, listed in text.</td>
<td>Pre-intervention rate: 13.5 per 100,000; Post-intervention rate: 9.2 per 100,000 (33% relative risk reduction).</td>
</tr>
<tr>
<td>(Jones et al., 2001)</td>
<td>U.S. Navy and Marine Corps</td>
<td>NR</td>
<td>Suicide awareness training video added to required annual training.</td>
<td>U.S. Navy post-intervention rate: 9.2 per 100,000 &quot;the lowest rate in 10 years&quot; U.S. Marine Corps: 15.6 per 100,000.</td>
</tr>
<tr>
<td>(Kennedy et al., 2005)</td>
<td>U.S. naval base, Okinawa, personnel referred into gambling treatment program</td>
<td>35</td>
<td>Weekly Gamblers Anonymous meetings, individual counseling as needed, for 12 weeks of treatment.</td>
<td>Three suicide attempts before referral into program. No attempts once in treatment.</td>
</tr>
<tr>
<td>(Gordana &amp; Mili-voje, 2007)</td>
<td>Army of Serbia and Montenegro</td>
<td>NR</td>
<td>Based on USAF program. Includes education, mental health services.</td>
<td>Pre-intervention rate: 13 per 100,000; post-intervention rate: 5 per 100,000.</td>
</tr>
<tr>
<td>(Rozanov et al., 2002)</td>
<td>Ukrainian army unit</td>
<td>10,000 soldiers</td>
<td>Education of soldiers and gatekeepers, mental health services.</td>
<td>Pre-intervention rate: 32.6 per 100,000; post-intervention rate: 0 (2000), 16.7 (2001).</td>
</tr>
</tbody>
</table>

NR = not reported

Fortunately, the baseline comparison rate was not clearly reported, so we cannot reach any conclusions about effectiveness.

McDaniel, Rock, and Grigg (1990) reported on a suicide prevention program at a U.S. Navy training command that was implemented after a cluster of suicides in 1986. The target of the intervention was the petty officers and chief petty officers who were the instructors at the command. They were educated to recognize risk factors likely to be common in the students of the training command (recent interpersonal losses, substance abuse, social isolation, and personality disorders and psychiatric illnesses), and about the goals of fostering group cohesiveness and en-
suring treatment compliance for those referred for treatment. The size of the study population was not reported. The main outcome assessed was suicide attempts at the training command in comparison with that reported at a similarly sized operational command nearby. They reported a statistically significant negative correlation between the number of instructors trained and the number of suicide attempts. They concluded that the program reduced the number of suicide attempts at the training command. However, there were a number of complicating factors, including seasonal factors stemming from start dates for cohorts of students at the training command and limited of hours of operation when potentially suicidal students were referred to the operational command for evaluation (thus inflating the number of suicide attempts reported at the latter facility).

Knox, Litts, Talcott, Feig, and Caine (2003) described a multifactorial suicide prevention program implemented in the U.S. Air Force (USAF), comprising over 5,000,000 active duty personnel. The intervention was designed to reduce stigma and risk factors, and strengthen protective factors in a population-based approach. The program had 11 components. There was training for squadron commanders, addition of suicide prevention into required training, use of guidelines for mental health referral, addition of staff to support community-based preventive services at mental health centers, and required training for nonprofessionals in suicide risks and referral procedures. The program also assessed for suicide risk those under investigation for legal problems, established teams to respond to traumatic events including suicides, integrated the delivery system for human services prevention activities, established patient privilege in psychotherapy, conducted a behavior health survey, and established a suicide event surveillance system for tracking risk factors. To evaluate the program, the USAF population from 1990–1996 was the control cohort, and the 1997–2002 population was the treatment cohort. No differences in demographic characteristics, changes in which would be expected to modify suicide rates, or in rates for mental health disability were found between the two groups. There was a statistically significant trend for decline in suicide rate over time, with a 33% reduction of risk for completed suicide compared to the baseline rate. The average rate in the pre-intervention period was 13.5 per 100,000, and 9.2 in the post-intervention period.

Jones, Kennedy, Hawkes, Hourani, Long, and Robbins (2001) described a U.S. Navy and Marine Corps initiative to reduce suicide using “best practice strategies.” The authors identified existing resources relevant to suicide prevention, which included awareness (education about suicide prevention for all personnel and in leadership schools), life skills training (for substance abuse, stress and anger management, conflict resolution), post-suicide attempt interventions (family support, critical event stress debriefing), and data collection (suicide incident reports with explicit monitoring and tracking of data). A training video on suicide prevention was developed for all personnel; it highlighted positive role models and early identification by coworkers of those at risk, and was included as part of the required annual general military training (GMT) starting in the summer of 2000. The size of the study population was not reported. The authors reported that “the introduction of annual suicide prevention GMT requirement coincided with a drop in Navy suicide rate for FY-01 to 9.2/100K. This is the lowest rate in 10 years.” The Marine Corps rate for the same year was 15.6/100,000, but no baseline rate or comparison was provided.

Kennedy, Cook, Poole, Brunson, and Jones (2005) described an overseas gambling treatment program for the U.S. Navy. Pathological gambling was recognized to have significant psychiatric comorbidity, including substance abuse, mood disorders, and suicidality. The program focused on overseas gambling because of the relative lack of restriction on slot machines in military clubs overseas, and the lack of overseas treatment options for pathological gambling. The services were provided at a naval base in Okinawa, Japan, within the context of a substance abuse rehabilitation program, and included psychologi-
ual evaluation, individual and group counseling, patient and family education, Gambler's Anonymous, and access to gambling crisis counseling around the clock. The program was evaluated for a year (roughly, the calendar year 2004) during which 35 individuals were referred. Twenty percent of those reported suicidal ideation, and three had made gambling-related suicide attempts before referral. During the treatment period, there were no attempted suicides and no suicidal ideation recurred.

Two military-based suicide prevention programs outside the United States have been reported. Rozanov, Mokhovikov, and Stiliha (2002) described a program implemented in a 10,000 soldier military unit in the Ukrainian Army. The program set up training seminars about suicide, risk factors, and prevention for commanders, officers, and basic soldiers. Training booklets were also distributed. The suicide rates in the years 1988–1999 (pre-implementation) were compared to the rates in 2000 and 2001. The total suicide rate over all military personnel in the pre-implementation period was 32.6 per 100,000. The rate for 2000 was 0 and 16.7 for 2001. Gordana and Milivoje (2007) reported on a suicide prevention program in the Army of Serbia and Montenegro, influenced by the USAF program of Knox et al. (2003), above. The program components included selection (to remove recruits with serious mental problems), education about suicide risk factors, and motivation for military duty. Training was provided to soldiers about maladjustment and substance abuse. Unit and central command physicians, psychologists, and officers were also involved. The program was fully implemented in December 2003. The size of the study population was not reported. The annual suicide rate for the Army of Serbia and Montenegro for the years 1999 to 2003 was 13 per 100,000, declining in the post-implementation period to 5 per 100,000 in 2004.

In summary, multicomponent interventions in military personnel probably reduce the risk of suicide. We assigned a GRADE quality of evidence of "low," meaning further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate. This was based on these studies being observational. The weaknesses in study design or reporting were balanced by the consistency of the effect found.

Three heterogeneous reports involving U.S. veterans were identified. Koons, Robins, Tweed, and Lynch (2001) reported a pilot Randomized Controlled Trial (RCT) of dialectical behavior therapy for female veterans with borderline personality disorder. Patients with the appropriate diagnosis were recruited through clinics at the Durham VA and other VA clinics in North Carolina. The treatment group received dialectical behavior therapy, a kind of psychotherapy explicitly designed to treat patients with chronic suicidality or self-injurious behaviors. It includes both individual and group therapy, and separate consultation sessions for the therapists, all conducted weekly. The treatment lasted 6 months. The control group received weekly individual therapy. The assessed outcome was intentional self-harm (including suicide attempts) in the preceding 3 months. In the treatment group this decreased from 50% to 10% (at 6 months), and in the control group decreased from 30% to 20%. This decrease was not statistically significant, possibly due to the small sample size (10 patients completed in each group).

Ilgen, Jain, Lucas, and Moos (2007) studied U.S. veterans entering substance abuse treatment programs (either residential or outpatient), and compared the suicide attempt rate in the previous 12 months at program entry, during treatment, and in the 12-month follow-up interval. The median treatment duration was 12 months. A total of 3,733 patients were followed. In predicting suicide attempts during treatment, residential treatment was associated with a lower rate than outpatient treatment, even when baseline suicidality was controlled for. In predicting suicide attempts after treatment, treatment setting (residential vs. outpatient), availability
of psychiatric services, and use of psychiatric services were not statistically significant, although longer treatment episode was.

Gibbons, Brown, Hur, Marcus, Bhaumik, and Mann (2007) examined the hypothesized association between treatment with antidepressants and the development of suicidal ideation and behavior; earlier studies had led to a Food and Drug Administration's (FDA) black box warning for children, adolescents, and young adults for these medications. The authors studied administrative and pharmacy data from the Veteran Health Administration with data on over 226,000 patients to identify those patients with new depressive disorders (no history in the prior 2 years). The outcome variable was suicide attempts treated at VA facilities. Cause of death information was not available for completed suicides. When compared to those depressed patients not receiving an antidepressant, there were reductions in the suicide rate for each class (SSRI monotherapy, non-SSRI monotherapy, and tricyclic monotherapy) studies. When suicide attempt rates were compared within in each class of treatment, the relative risk (in treatment vs. before treatment) was reduced with treatment.

In summary, three studies of veterans were found, but these were insufficient to draw conclusions. We assigned a GRADE quality of evidence of "very low," meaning any estimate of effect is uncertain. This was based on these studies being observational, covering rather disparate populations, and including results not reaching statistical significance.

CONCLUSIONS

Seven studies of suicide prevention for military personnel were identified. Most used a conceptual model of risk factor identification, based on review of suicides in the population under study, augmented with factors previously identified by others, followed by educational and organizational changes to reduce those factors or increase education and awareness about them. All but one were multifaceted programs, and all reported declines in suicides or suicide attempts. However, the reporting of sufficient data to make proper comparison was incomplete, and the quality of the analysis that was reported was generally poor. The largest studies were deployed for the U.S. Navy and Marine Corps and for the USAF. The methodologically strongest study was that of Knox et al. (2003) for the USAF. Its strengths include: very large study population, explicit description of 11 component initiatives in prevention program, use of linear time-trend analysis, and formal consideration of potential confounds from changes in the demographic makeup of the population over time. As noted, Eaton et al. (2006) reported a rising trend in suicide rates in the U.S. military up to 1995, followed by a general declining trend. Hu, Wilcox, Wissow, and Baker (2008) reported an increase in the overall U.S. suicide rate, starting in 1999. Such trends complicate the assessment of the effectiveness of the program reported, but full assessment would require adjustment for demographic characteristics in all of these studies, which has not been performed. Less is known about the trends in the military overall and population in the Eastern European countries whose militaries were surveyed here.

Three studies involving U.S. veterans were identified. One RCT found a trend not reaching statistical significance for the use of dialectical behavior therapy for female veterans with borderline personality disorder. One reported mixed results looking at associations between residential treatment of substance abuse and suicide attempts. One reported reduction in suicide rates associated with treatment with antidepressants. Because of the study designs, it was not possible to infer causality from the reported associations, and the heterogeneity of these studies limits any generalization.

As with all systematic reviews, certain caveats apply. While our literature search was extensive, it is not possible to exclude the possibility of publication bias. Also, as noted
in the descriptions of the individual studies, many had significant limitations in their design or reporting. We did not use formal criteria to reject studies based solely on quality, but we did note severe weaknesses in either study design or reporting in some of the studies. It was not possible to do sensitivity analysis based on quality because of the small number of studies involved. Heterogeneity of study populations for the studies involving veterans limited our ability to draw strong conclusions in that area. We also note that the military often use internal systems for publication and dissemination of program developments and research results; such studies would fall outside the peer-reviewed literature identified for this review.

In summary, multicomponent interventions in military personnel are consistent in reporting reductions in suicide, but these declines have occurred during some intervals of similar reductions in the general population rates. The largest and best described such study is by Knox et al., and it provides the most convincing evidence of effectiveness. The report of success of a program in Yugoslavia modeled after the Knox program increases our confidence that the effect is real. In addition, two studies reporting results of multicomponent national suicide prevention programs, one for Australia and one for England, both showing declines during the intervention period, add to the evidence of the benefits of multicomponent programs (National Institute for Mental Health in England, 2007; Robinson et al., 2006). However, there are still numerous questions about the relative merit of inclusion of each individual component or the possible increase in effectiveness of adding other components, and optimizing the effectiveness of each additional component.

There are no direct results pertaining to the effect of these multicomponent programs for veterans, although veterans would seem to be sufficiently close to a military population that some transferability of results could be assumed. None of the studies included veterans from the current conflicts in Afghanistan and Iraq. There is an urgent need for continued research in this area, using the large populations treated in the Department of Defense and the VA, to guide the implementation, refinement, and monitoring of effective suicide reduction programs.

REFERENCES


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