

# Screening for Suicide Risk in Adults: A Summary of the Evidence for the U.S. Preventive Services Task Force

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**Background:** Suicide is the 11th leading cause of death and the seventh leading cause of years of potential life lost in the United States. Although suicide is of great public health significance, its clinical management is complicated.

**Purpose:** The authors systematically reviewed the literature to determine whether screening for suicide risk in primary care settings decreases morbidity, mortality, or both.

**Data Sources:** MEDLINE (1966 to 17 October 2002), PsycINFO, Cochrane databases, hand-searched bibliographies, and experts.

**Study Selection:** For screening, only English-language studies performed in primary care settings were examined. For treatment, randomized, controlled trials and cohort studies were included if they were performed in any setting where suicide completions, suicide attempts, or suicidal ideation were reported.

**Data Extraction:** A primary reviewer abstracted data on key variables of study sample, design, and outcomes; a second reviewer checked information accuracy against the original articles.

**Data Synthesis:** No study directly addressed whether screening

for suicide in primary care reduces morbidity and mortality. The remainder of the review focused on the questions of reliable screening tests for suicide risk and the effectiveness of interventions to decrease depression, suicidal ideation, and suicide attempts or completion. One screening study provided limited evidence for the accuracy of suicide screening in a primary care setting. Intervention studies provided fair and mixed evidence that treating those at risk for suicide reduces the number of suicide attempts or completions. The evidence suggests mild to moderate improvement for interventions addressing intermediate outcomes such as suicidal ideation, decreased depressive severity, decreased hopelessness, or improved level of function.

**Conclusion:** Because of the complexity of studying the risk for suicide and the paucity of well-designed research studies, only limited evidence guides the primary care clinician's assessment and management of suicide risk.

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Suicide is a major public health problem in the United States. In 2001, suicide was the 11th leading cause of death ( $n = 30\,000$ ; age-adjusted rate, 10.7 per 100 000 persons) (1). Suicide accounts for 1.3% of total deaths, more than double the number due to HIV infection and AIDS (2). It is the seventh leading cause of years of potential life lost, surpassing diabetes, liver disease, and HIV infection (1). Annually, approximately 500 000 individuals require emergency department treatment in U.S. medical centers following attempted suicide (3). One of every 6 young adults describes having suicidal ideation at some point in their lives, and 5.5% report ever having attempted suicide (4). The public health significance of this problem was underscored by *The Surgeon General's Call to Action to Prevent Suicide* (3), which proposed completion of a National Strategy for Suicide Prevention (5).

Relevant demographic risk factors have been identified. Persons 65 years of age or older are at the highest risk for completed suicide, and white men older than 85 years of age have an especially high rate (59 per 100 000 persons) (5). Suicide also affects adolescents and young adults: It is the third leading cause of death among persons 15 to 24 years of age (10.3 per 100 000 persons), following unintentional injuries and homicide (1). Rates of suicide attempts and completions differ by sex. Men have a higher rate of suicide completion, whereas women have a higher rate of attempts (6). Finally, suicide behaviors vary widely by race and ethnicity. Nearly 75% of all completed suicides are by

white men (2), who have a 2-fold higher risk than black men (11.7 per 100 000 persons vs. 5.5 per 100 000 persons) (1).

Clinical risk factors have also been identified. Suicide is closely related to psychiatric illness. More than 90% of those who complete suicide have a diagnosable psychiatric illness at the time of death, usually depression, alcohol abuse, or both (7). Hopelessness, often present in those with severe depressive illness, and previous suicide attempts are particularly strong and independent prospective risk factors for suicide (8). Although previous suicide attempts are a key risk factor, two thirds of suicides occur on the first attempt (9), and suicide attempts remain substantially more common than completed suicides by a factor of 10 to 20 (7). Other identified risk factors for completed suicide include being widowed or divorced, living alone, having a recent adverse event (such as job loss or death of loved one), having severe anxiety, having a chronic medical illness (especially a central nervous system disorder), and having a family history of suicide attempts or completions (Hirschfield and Russell [7] and Mann [9] provide more detailed reviews).

Primary care physicians have a key role in identifying and managing suicidal tendency. Patients endorsing suicidal ideation, a key factor in the assessment of suicide risk, are not uncommon in primary care; between 2% and 3% of primary care patients report having had suicidal ideation in the previous month (10, 11). Furthermore, most patients completing suicide have recently visited their primary care

physician. Approximately one half to two thirds of individuals who commit suicide visit physicians within 1 month of taking their lives; 10% to 40% visit in the week before (12–15).

The clinical management of suicide risk is complicated. Suicide is a rare event. It has a low prevalence in the general population (0.01%) (16) and, despite a 10-fold increase in adults with depression, most depressed patients (99.9%) do not commit suicide (17). As a result, many clinical trials on the management of suicide risk have focused on high-risk patients, such as those with a history of deliberate self-harm.

Deliberate self-harm, understood as an intentionally initiated act of self-harm with nonfatal outcome (including self-poisoning and self-injury), encompasses terms such as *attempted suicide* and *parasuicide* (18). Deliberate self-harm is not synonymous with attempted suicide. Attempted suicide, understood as a self-initiated act with the intent of ending one's life, is only a single example of deliberate self-harm. Still, deliberate self-harm is a recurrent behavior with important long-term risks. Between 15% and 23% of patients who are seen for deliberate self-harm will be seen for treatment of a subsequent episode within 1 year (19) and are at high risk for repeated deliberate self-harm in the weeks after an episode (20). Of those with an episode of deliberate self-harm, 3% to 5% die by suicide within 5 to 10 years (21). Identification of deliberate self-harm is relevant to primary care practice, since two thirds of patients who deliberately harm themselves visit their general practitioner within 12 weeks of the episode (22). Patients with borderline personality disorder are at increased risk for deliberate self-harm, and groups from psychiatric and primary care settings have similar self-harm profiles (23).

Given *The Surgeon General's Call to Action*, clarification of the available evidence base guiding the clinical management of suicide risk is especially pertinent. As part of the U.S. Preventive Services Task Force (USPSTF)'s update of its 1996 recommendation (24), we examined the evidence addressing whether primary care identification and treatment of suicide risk improves outcomes in patients whose risk had previously been unidentified. Our full systematic evidence review set out to answer 8 key questions (**Appendix Figure**, available at [www.annals.org](http://www.annals.org)). In this article, we report on the 3 key questions for which we found data meeting our selection criteria:

- 1) Can a screening test reliably detect suicide risk in primary care populations?
- 2) For those at risk, does treatment result in decreased suicide attempts or completions?
- and 3) For those at risk, does treatment result in improved intermediate outcomes (for example, decreased suicidal ideation or depressive severity)?

## METHODS

Using USPSTF methods (25), we developed an analytic framework and 8 key questions to guide our literature

searches (**Appendix Tables 1 to 3** and **Appendix Figure**, available at [www.annals.org](http://www.annals.org)). Our population of interest was primary care patients with previously unidentified suicide risk.

To identify relevant articles, we searched the MEDLINE database from 1966 to 17 October 2002, beginning with the terms *suicide* or *suicide, attempted*. We supplemented these sources by using the same search terms in PsycINFO; searching the Cochrane Collaboration Library; and hand searching the bibliographies of systematic reviews, relevant original articles, and the 1996 edition of the *Guide to Clinical Preventive Services* (24). We additionally reran searches using *deliberate self-harm* as a search term and identified no further articles. In this paper, we present our findings for studies involving adults.

We found 1 well-conducted, recent systematic review by Hawton and colleagues (18) that concerned treatment of deliberate self-harm and was relevant to reducing suicide attempts or completions, our primary outcome (18). We found another recent well-done systematic review relevant to intermediate outcomes (26). We checked our study results against the studies in these reviews, and we examined in detail only studies that had not been included in the systematic reviews.

Two of the authors independently reviewed all titles and abstracts. If either reviewer determined that a study met inclusion criteria, we retrieved the full paper for further evaluation. Two of the authors subsequently reviewed the studies to determine final inclusion, adjudicating disagreements by consensus discussion.

A primary reviewer abstracted relevant information into evidence tables. As part of this abstraction, the primary reviewer rated the internal and external validity for each article using criteria developed by the USPSTF Methods Work Group (25). A second reviewer checked the accuracy of the abstracted information against the original articles, while the first author reviewed all quality ratings to ensure consistency.

We required that screening studies be performed in a primary care setting, but treatment studies could be performed in either primary or specialty care settings. This strategy reflected our idea that screening must be performed in primary care but that a primary care physician could refer patients for subsequent treatment if suicide risk was identified.

For screening studies, inclusion required comparison with a gold standard. For treatment studies, inclusion required that trials report suicide completions, suicide attempts, or suicidal ideation as primary outcomes. We excluded clinical trials targeting patients with chronic psychotic illnesses because these patients would already be identified as having increased suicide risk; randomized, controlled trials (RCTs) that did not supply sufficient detail to allow direct comparison of outcomes between intervention and control groups; and cohort studies that did

not have either a similar clinical presentation for intervention and control groups or an independent control group.

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## DATA SYNTHESIS

### Can a Screening Test Reliably Detect Suicide Risk in Primary Care Populations?

Our evaluation identified 1 relevant article assessing an instrument's operating characteristics for identifying suicide risk in primary care (10). The Symptom-Driven Diagnostic System for Primary Care (28), a 62-item self-report instrument designed to help identify psychiatric illness in primary care settings, contains 3 items assessing suicide risk (all within the past month) (10). Data on suicidal thoughts, plans, and past attempts were systematically collected by using a nurse-administered, face-to-face structured interview conducted immediately before the medical visit. The individual operating characteristics of the 3 items were compared with a structured interview for identifying a plan to commit suicide (the gold standard).

"Thoughts of death" had 100% sensitivity, 81% specificity, and 5.9% positive predictive value for detecting patients with a plan to commit suicide. Endorsing "wishing you were dead" had 92% sensitivity, 93% specificity, and 14% positive predictive value; "feeling suicidal" had 83% sensitivity, 98% specificity, and 30% positive predictive value. Of those "feeling suicidal," 85% had a psychiatric disorder as determined by structured clinical interviews (29). Only major depression (odds ratio [OR], 33.1 [95% CI, 10.9 to 99.6]) and drug abuse or dependence (OR, 16.7 [CI, 3.9 to 71.4]) were independently associated with suicidal ideation. Of note, only 46% of those eligible for this study agreed to participate.

Given the rarity of suicide attempts in the primary care population, finding an accurate screening strategy for suicide risk in a primary care setting is a daunting challenge. This is illustrated by the following hypothetical situation. Consider a screening instrument (for example, endorsing "feeling suicidal") that identifies patients at high risk and has reasonable test characteristics (for example, a sensitivity of 80% and a specificity of 70%, figures similar to screening tools for depression) (30, 31). If this tool were applied to a sample of 10 000 in which 10 patients will attempt suicide (10-fold more than the 10 in 100 000 persons who will complete suicide), it would produce 8 true-positive results, 2 false-negative results, and 2997 false-positive results, a positive predictive value of 0.3%. This high proportion of false-positive results could generate a

substantial time and cost burden. Using the higher specificity result (98%) from the previously discussed produces substantially fewer false-positive results ( $n = 200$ ) but only a slightly improved positive predictive value (3.8%).

### Does Treatment Result in Decreased Suicide Attempts or Completions?

We report findings first from RCTs and then from cohort studies. Within each study design section, we provide the evidence stratified by age whenever possible.

#### Randomized, Controlled Trials

All 30 RCTs that met our inclusion criteria (27) involved high-risk groups as identified by a deliberate self-harm episode, a diagnosis of borderline personality disorder, or admission to a psychiatric unit. However, only Motto and Bostrom (32) and Rudd and colleagues (33) identified depressive illness as part of their eligibility criteria, and no studies focused primarily on depressed patients with suicidal ideation. Of the 2 studies directly involving primary care, one recruited some of its patients from a primary care setting (although the intervention occurred in a psychiatric outpatient setting) (34) and the other conducted its intervention in a primary care setting (35).

Trials focusing on adolescents or young adults and elderly adults, the 2 populations of greatest clinical concern, were limited. The included studies involved either adults only or adults and older adolescents but did not differentiate further by age in the analyses; we review them together.

We found no published intervention study for the elderly population. However, the Prevention of Suicide in Primary Care Elderly—Collaborative Trial (PROSPECT) is currently being conducted (36). This trial aims to determine whether a depression health specialist in primary care practices has a favorable impact on rates of depression, hopelessness, and suicidal ideation in elderly primary care patients with depressive illness. Initial outcomes for the 4- and 8-month follow-up periods were expected in 2003.

We organized our review of the 30 RCTs as follows. Because Hawton and colleagues (18) had systematically reviewed 21 of these trials (37–57), we first briefly summarize the results of their meta-analysis (Table 1). We then provide greater detail on the 9 additional RCTs of deliberate self-harm that our literature search identified (32–35, 58–63) (Table 2). Of note, 2 articles (58, 59) were from a single trial and are counted as 1 trial. Given the substantial heterogeneity of the populations enrolled, the interventions tested, the length of follow-up periods, and the outcomes measured, we concluded that integrating the new studies into the previous summary was not warranted.

#### Previous Review of RCTs for Deliberate Self-Harm

Of the 21 studies of adults receiving treatments for deliberate self-harm (Table 1) (37–57), 12 included older adolescents (37–44, 46, 47, 52, 54). Although some trends

Table 1. Randomized, Controlled Trials of Interventions To Decrease Deliberate Self-Harm in Adults and Older Adolescents\*

Study, Year (Reference)	Sample	Age Range	Intervention and Control Groups	Follow-up Period (after Enrollment)	Participants with DSH during Follow-up	Odds Ratio (95% CI)
		y		mo	n/n (%)	
<b>Problem-solving therapy vs. standard follow-up care</b>						
Gibbons et al., 1978 (37)	Self-poisoning patients in Southampton, UK, with no immediate suicide risk and no formal psychiatric diagnosis	>17	Intervention group: Home-based crisis-oriented problem-solving therapy by social workers over 3 mo Control group: Standard aftercare	12	Intervention group: 27/200 (13.5) Control group: 29/200 (14.5)	0.92 (0.52–1.62)
Hawton et al., 1987 (38)	Deliberate self-poisoning patients in Oxford, UK, who were not in psychiatric care, did not require treatment for alcohol or drug addiction, and did not need inpatient psychiatric care	>16	Intervention group: Outpatient therapy by nonmedical clinicians for ≤8 sessions Control group: Standard aftercare	12	Intervention group: 3/41 (7.3) Control group: 6/39 (15.4)	0.43 (0.10–1.87)
Salkovskis et al., 1990 (39)	Nonpsychotic patients in Leeds, UK, referred by psychiatrist after admission to an emergency department after antidepressant self-poisoning; ≥4 on Buglass and Hawton Risk of Repetition Scale or ≥2 previous attempts	16–65	Intervention group: Home-based therapy by community psychiatric nurse for 5 sessions Control group: Standard aftercare	12	Intervention group: 3/12 (25.0) Control group: 4/8 (50.0)	0.33 (0.05–2.24)
McLeavey et al., 1994 (40)	Nonpsychotic, nonsuicidal patients in Cork, Ireland, without cognitive impairment and not needing psychiatric inpatient care who were admitted to an emergency department for self-poisoning	15–45	Intervention group: Interpersonal problem-solving skills training by trained therapists for approximately 5 sessions Control group: Brief problem-solving therapy	12	Intervention group: 2/19 (10.5) Control group: 5/20 (25.0)	0.35 (0.06–2.09)
Evans et al., 1999 (41)	Patients in London, UK, with self-harm episode in previous 12 mo and a personality disturbance but no alcohol or drug dependence or schizophrenia who were admitted to Paddington or Chelsea, Westminster, emergency department	16–50	Intervention group: Manual-assisted cognitive-behavior therapy by trained therapists for 2–6 sessions Control group: Standard psychiatric treatment	6	Intervention group: 10/18 (55.6) Control group: 10/14 (71.4)	Not calculated
Overall						0.70 (0.45–1.11)
<b>Intensive care plus outreach vs. standard care</b>						
Chowdhury et al., 1973 (42)	Patients in Edinburgh, UK, with a previous DSH episode admitted for DSH to a general hospital; included patients with psychiatric disturbance, alcohol dependence, and drug addiction	>16	Intervention group: Enhanced aftercare with aggressive outreach and follow-up Control group: Standard aftercare	6	Intervention group: 17/71 (23.9) Control group: 19/84 (22.6)	1.08 (0.51–2.27)
Welu, 1977 (43)	Patients in Pittsburgh, PA, admitted to an emergency department for DSH	≥16	Intervention group: Special outreach program with weekly or biweekly contact with trained mental health professionals for 4 mo Control group: Standard aftercare	4	Intervention group: 3/62 (4.8) Control group: 9/57 (15.8)	0.27 (0.07–1.06)
Hawton et al., 1981 (44)	Patients in Oxford, UK, not receiving current psychiatric care or treatment for alcohol or drug addiction who were admitted to a general hospital after DSH	≥15	Intervention group: Home-based therapy as often as therapist felt necessary for ≤3 mo by mental health professionals Control group: Weekly outpatient therapy	12	Intervention group: 5/48 (10.4) Control group: 7/48 (14.6)	0.68 (0.20–2.32)
Allard et al., 1992 (45)	Nonsociopathic patients in Montreal, Canada, with a recent suicide attempt who presented to the hospital for another suicide attempt	NR	Intervention group: Enhanced aftercare with aggressive outreach and follow-up by mental health professionals for 12 mo Control group: Standard aftercare	12	Intervention group: 22/63 (34.9) Control group: 19/63 (30.2)	1.24 (0.59–2.62)
Van Heeringen et al., 1995 (46)	Patients in Gent, Belgium, treated in an emergency department after a suicide attempt	≥15	Intervention group: Enhanced aftercare with aggressive outreach and follow-up by mental health professionals for unspecified period Control group: Standard aftercare	12	Intervention group: 21/196 (10.7) Control group: 34/195 (17.4)	0.57 (0.32–1.02)
van der Sande et al., 1997 (47)	Patients in Utrecht, the Netherlands, without drug or alcohol addiction and obvious psychiatric comorbidity who were admitted to the hospital after a suicide attempt	≥16	Intervention group: Brief psychiatric admission with outpatient therapy by mental health professionals and 24-h hospital access for unspecified period Control group: Standard aftercare	12	Intervention group: 24/140 (17.1) Control group: 20/134 (14.9)	1.18 (0.62–2.25)
Overall						0.83 (0.61–1.14)
<b>Emergency care vs. standard aftercare</b>						
Morgan et al., 1993 (48)	Patients in Bristol, UK, who were admitted to the hospital after a first DSH episode	30†	Intervention group: Standard care plus card indicating 24-h access to mental health professional for 12 mo	12	Intervention group: 5/101 (5.0)	0.43 (0.15–1.27)

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Table 1—Continued

Study, Year (Reference)	Sample	Age Range	Intervention and Control Groups	Follow-up Period (after Enrollment)	Participants with DSH during Follow-up	Odds Ratio (95% CI)
		y		mo	n/n (%)	
			Control group: Standard aftercare		Control group: 12/111 (10.8)	
<b>Dialectical behavior therapy vs. standard aftercare</b>						
Linehan et al., 1991 (49)	Women in Seattle, WA, with borderline personality disorder and ≥2 suicide attempts in past 5 y, current suicide attempt within past 8 wk	18–45	Intervention group: Dialectical behavioral therapy (individual and group) with mental health professional for 1 y Control group: Standard aftercare	12	Intervention group: 5/19 (26.3) Control group: 12/20 (60.0)	0.24 (0.06–0.93)
<b>Inpatient behavior therapy vs. inpatient insight-oriented therapy</b>						
Lieberman and Eckman, 1981 (50)	Patients in Los Angeles, CA, with ≥1 suicide attempt who were not psychotic or addicted to drugs or alcohol and were referred by a psychiatrist after admission to emergency department for DSH	18–47	Intervention group: Inpatient psychiatric treatment with behavior therapy for 10 d Control group: Inpatient psychiatric treatment with insight-oriented therapy for 10 d	12	Intervention group: 2/12 (16.7) Control group: 3/12 (25.0)	0.60 (0.08–4.45)
<b>Same therapist (continuity of care) vs. different therapist (change of care)</b>						
Torhorst et al., 1987 (51)	Nonpsychotic patients in Munich, Germany, hospitalized after a self-poisoning suicide attempt	NR	Intervention group: Outpatient appointment with same therapist as seen in hospital for 3-mo treatment Control group: Outpatient appointment with different therapist than seen in hospital for 3-mo treatment	12	Intervention group: 12/68 (17.6) Control group: 4/73 (5.5)	3.70 (1.13–12.09)
<b>General hospital admission vs. discharge</b>						
Waterhouse and Platt, 1990 (52)	Patients in York, UK, without current medical or psychiatric treatment needs who were admitted to an emergency department for DSH	≥16	Intervention group: General hospital admission for about 1 d Control group: Discharge from hospital	4	Intervention group: 3/38 (7.9) Control group: 4/39 (10.3)	0.75 (0.16–3.60)
<b>Flupenthixol (antipsychotic) vs. placebo</b>						
Montgomery et al., 1979 (53)	Patients in Maidstone, UK, with ≥2 DSH episodes without overt depression or schizophrenia who were admitted to a general hospital after a suicide attempt	18–68	Intervention group: Monthly intramuscular administration for 6 mo Control group: Monthly placebo administration	6	Intervention group: 3/14 (21.4) Control group: 12/16 (75.0)	0.09 (0.02–0.50)
<b>Antidepressants vs. placebo</b>						
Hirsch et al., 1982 (54)	Patients in London, UK, with a GHQ score ≥20 who were not taking an antidepressant or antipsychotic medication and were admitted to a hospital after deliberate self-poisoning	16–65	Intervention group: Mianserin or nomifensine therapy for 6 wk Control group: Placebo	3	Intervention group: 16/76 (21.1) Control group: 5/38 (13.2)	1.76 (0.59–5.24)
Montgomery et al., 1983 (55)	Patients in London, UK, with personality disorder and no depression or schizophrenia with previous DSH, admitted after DSH	35.7†	Intervention group: Mianserin therapy for 6 mo Control group: Placebo	6	Intervention group: 8/17 (47.1) Control group: 12/21 (57.1)	0.67 (0.18–2.41)
Verkes et al., 1998 (56)	Patients in Leiden, Rotterdam, the Netherlands, with repeated DSH and no current diagnosis of major depression who were admitted to emergency departments of university hospitals	≥18	Intervention group: Paroxetine therapy plus psychotherapy (therapy and therapist not described) for 12 mo Control group: Placebo plus psychotherapy	12	Intervention group: 15/46 (32.6) Control group: 21/45 (46.7)	0.70 (no CI, P = 0.12)
Overall						0.83 (0.47–1.48)
<b>Long-term therapy vs. short-term therapy</b>						
Torhorst et al., 1988 (57)	Patients in Munich, Germany, with repeated DSH without psychosis, current psychiatric treatment, or drug addiction who were admitted for a deliberate self-poisoning episode	NR	Intervention group: 1 session per month by a mental health professional for 12 mo Control group: 12 weekly therapy sessions by a mental health professional over 3 mo	12	Intervention group: 9/40 (22.5) Control group: 9/40 (22.5)	1.0 (0.35–2.86)

\* Adapted from Hawton et al., 2001 (18). CA = California; DSH = deliberate self-harm; GHQ = Generalized Health Questionnaire; NR = not reported; PA = Pennsylvania; UK = United Kingdom; WA = Washington.  
† Mean value.

Table 2. Additional Randomized, Controlled Trials of Interventions To Reduce Deliberate Self-Harm in Adults and Older Adolescents\*

Study, Year (Reference)	Sample	Age Range, y	Intervention and Control Groups	Follow-up Period (after Enrollment)	Participants with DSH during Follow-up, n/n (%)	OR or Reported Statistic
<b>Interpersonal psychotherapy vs. standard aftercare</b>						
Guthrie et al., 2001 (60)	Patients presenting to an emergency department with deliberate self-poisoning but not requiring inpatient psychiatric treatment	18–65	Intervention group: Weekly sessions of home-based interpersonal psychotherapy by nurse therapists for 1 mo Control group: Standard aftercare	6 mo	Intervention group: 5/58 (8.6) Control group: 17/61 (27.9)	No OR given; between-group difference, 19.3% (95% CI, 8.6%–30.0%); $P < 0.001$
<b>Psychoanalytically oriented partial hospitalization vs. standard aftercare</b>						
Bateman and Fonagy, 1999, (58), 2001 (59)†	Patients with borderline personality disorder who did not have bipolar or psychotic disorder, substance abuse, mental impairment, or organic brain disorder and were attending a psychiatric clinic	16–65	Intervention group: Partial hospitalization on psychiatric unit for 18 mo Control group: Standard aftercare for 18 mo	36 mo	Intervention group: 4/22 (18.2) Control group: 12/19 (63.2)	No OR given; $P < 0.004$ (Fisher exact test)
<b>Emergency care vs. standard aftercare</b>						
Evans et al., 1999 (62)	Patients in Bristol, UK, who were referred from several general hospitals for psychiatric evaluation after DSH and who were not considered dangerous to self or others	Adults	Intervention group: Card offering 24-h phone crisis consultation with psychiatrist for 6 mo Control group: Standard aftercare	6 mo	Intervention group: 70/417 (16.8) Control group: 59/410 (14.4) OR for previous DSH: 1.85 (CI, 1.14–3.03)	Overall OR: 1.20 (CI, 0.82–1.75)  OR for no previous DSH: 0.64 (0.34–1.22)
<b>Brief contact by letter vs. standard aftercare</b>						
Motto and Bostrom, 2001 (32)	Persons admitted for depressive or suicidal illnesses to 9 psychiatric inpatient facilities in San Francisco, CA, who continued with therapy for $\geq 30$ days postdischarge	34.4†	Intervention group: Brief contact using letters sent over varying time periods for 5 y Control group: No further contact	$\leq 15$ y	Intervention group: 15/389 (3.9) Control group: 21/454 (4.6)	OR not reported; patients with suicide as cause of death 5 y postintervention were 3.9% (intervention group) and 4.6% (control group)
<b>Outpatient day hospitalization vs. usual care</b>						
Rudd et al., 1996 (33)	Patients referred from 2 mental health clinics, 1 emergency department, and 1 inpatient psychiatric unit who had a suicide attempt, mood disorder and suicide ideation, or substance abuse and suicide ideation without psychosis or personality disorder	22 $\pm$ 2.3†	Intervention group: Outpatient intensive structured group treatment by mental health professionals for 2 wk Control group: Standard aftercare	1 y	Several measures of suicidal ideation and behavior (including Modified Scale for Suicidal Ideation and the Suicide Probability Scale) analyzed; no difference between intervention and control groups	
<b>Fluoxetine (antidepressant) vs. placebo</b>						
Montgomery et al., 1994 (61)	Patients without current major depression with a history of $\geq 2$ suicide attempts, identified from a psychiatric clinic	NR	Intervention group: Fluoxetine twice per week in psychiatric clinic for 6 mo Control group: Placebo twice per week for 6 mo	6 mo	Intervention group: 18/54 (33.3) Control group: 18/53 (34.0)	Not available
<b>Fluphenazine (antipsychotic) vs. placebo</b>						
Battaglia et al., 1999 (63)	Nonpsychotic patients with a suicide attempt in the previous 30 d who had $\geq 2$ previous suicide attempts, recruited from a psychiatric emergency department	18–65	Intervention group: Low-dose intramuscular injection monthly for 6 mo Control group: Ultra-low-dose intramuscular injection monthly for 6 mo	6 mo	Intervention group: Change of $-0.16$ in rate of serious self-harm behaviors per mo over 6 m Control group: Change of $-0.06$ in rate of serious self-harm behaviors per mo over 6 m	$P = 0.146$ (Mann-Whitney test)
<b>Dialectical behavioral therapy vs. usual care</b>						
Koons et al., 2001 (34)†	Female veterans with borderline personality disorder without schizophrenia, bipolar disorder, substance abuse, or antisocial personality disorder	21–46	Intervention group: Dialectical behavioral therapy by mental health professional for 6 mo Control group: Enhanced standard aftercare	6 mo	Intervention group: 1/10 (10) Control group: 2/10 (20)	Not available

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Table 2—Continued

Study, Year (Reference)	Sample	Age Range, y	Intervention and Control Groups	Follow-up Period (after Enrollment)	Participants with DSH during Follow-up, n/n (%)	OR or Reported Statistic
Bennewith et al., 2002 (35)§	Patients without substance abuse or DSH secondary to psychosis with a new episode of DSH; identified from a DSH case register on the basis of weekly reports from local hospitals' accident and emergency departments	16–95	Intervention group: One-time education and consultation letter on DSH management provided to primary care physicians whose patients had recent DSH episode Control group: Standard aftercare	12 mo	Intervention group: 211/964 (21.9)  Control group: 189/968 (19.5)	Overall OR: 1.17 (CI, 0.94–1.47)
	Subgroup analysis dichotomized by history of DSH					OR for previous DSH: 0.57 (CI, 0.33–0.98) OR for no previous DSH: 1.32 (CI, 1.02–1.70)

\* Not included in the review by Hawton et al. (18). CA = California; DSH = deliberate self-harm; NR = not reported; OR = odds ratio; UK = United Kingdom.

† Inclusion criteria required diagnosis of borderline personality disorder; all others required DSH.

‡ Mean value. Value with a plus/minus sign is the mean ± SD.

§ Primary care treatment setting; all other studies conducted in specialty care settings.

suggested incremental benefit from certain interventions compared with usual care, interventions for which more than one study was performed produced no statistically significant effects by meta-analysis. The most promising intervention was problem-solving therapy, a short-term, cognitively oriented method of psychotherapy. In 5 studies comparing this intervention with standard aftercare, the summary OR showed a trend toward decreasing deliberate self-harm (OR, 0.70 [CI, 0.45 to 1.11]) (37–41). Of note, both the form and duration of treatment varied considerably within these 5 studies.

Intensive care plus outreach versus standard aftercare (6 studies) (42–47) produced a summary OR of 0.83 (CI, 0.61 to 1.14). Again, the form and duration of treatment varied substantially among the studies. One large trial comparing provision of both physician contact and crisis intervention assistance showed a trend toward a decreased likelihood of repeating deliberate self-harm in favor of the intervention (OR, 0.43 [CI, 0.15 to 1.27]) compared with standard care (48).

Two interventions, each supported by a single study involving a maximum of 20 patients in each group, reported statistically significant reduced repetition of deliberate self-harm. Dialectical behavior therapy (DBT), a comprehensive treatment program developed to treat severely dysfunctional persons with borderline personality disorders by improving emotional and behavioral management skills, significantly reduced repetition of deliberate self-harm for patients with borderline personality disorder and recent deliberate self-harm compared with standard care (OR, 0.24 [CI, 0.06 to 0.93]) (49). Administration of the antipsychotic agent flupenthixol significantly reduced the proportion of repeated deliberate self-harm for those with at least 2 previous suicide attempts compared with placebo (OR, 0.09 [CI, 0.02 to 0.50]) (53).

#### Additional RCTs of Deliberate Self-Harm

Of the 9 additional studies on repetition of deliberate self-harm identified in our literature search (Table 2) (32–35, 58–63), 2 showed benefit. Guthrie and colleagues (60) found significant benefit from interpersonal psychotherapy, a time-limited method that focuses on resolving current interpersonal problems to improve symptoms, compared with standard care. Patients who presented to an emergency department with deliberate self-harm but did not require medical or psychiatric hospitalization were enrolled. Participants were randomly assigned to either four 50-minute sessions of interpersonal psychotherapy delivered by nurse therapists in the patient's home, or usual care. Of those eligible ( $n = 119$ ), 51% participated; those who declined were at greater risk for suicide according to clinical measures. In an intention-to-treat analysis, those in the interpersonal psychotherapy group were less likely to have a repeated episode of deliberate self-harm in the subsequent 6-month period (8.6% vs. 27.9%;  $P < 0.001$ ).

Bateman and Fonagy (58, 59) compared psychoanalytically oriented partial hospitalization with standard psychiatric outpatient aftercare for patients with borderline personality disorder. Treatment lasted for a maximum of 18 months. Twenty-two patients were initially randomly assigned to each group; analysis was not intention-to-treat. After 18 months of treatment, the percentage of those who attempted suicide within the previous 6 months was significantly lower in the treatment group than in the control group (53% for the intervention group; no rate was given for the control group, but a graph suggested approximately 40% [ $P < 0.001$ ]). At 36-month follow-up, a significantly smaller proportion of the partial hospitalization group attempted suicide compared with the usual care group (18.2% vs. 63.2%; OR was not calculated [ $P < 0.004$ ]).

The remaining 7 studies identified no benefit from

**Table 3. Cohort Studies To Decrease Suicidal Behavior in At-Risk Patients\***

Study, Year (Reference)	Study Type	Sample	Age Range, y	Study Design	Follow-up (after Enrollment)	Participants with DSH during Follow-up, n/n (%)	Reported Statistic
<b>Lithium use in week preceding suicide or suicide attempt vs. no lithium use</b>							
Coryell et al., 2001 (64)	Nested case-control	Patients treated for major affective disorders identified from 5 academic medical centers. Two case groups: suicide completers and suicide attempters. Controls were matched with cases on sex, polarity at intake, history of substance abuse, and extent of treatment	≥17	Two case groups (suicide completers and attempters) and 2 matched control groups to evaluate medication use at time of suicidal behavior	Unclear period of time (≥14 y)	Lithium use: Completors: (40.0) Controls of completors: (53.3) Attempters: (22.0) Controls of attempters: (19.5)	McNemar chi-square: 0.667 McNemar chi-square: 0.067
<b>Cognitive behavioral counseling vs. usual care</b>							
Raj et al., 2001 (65)	Cohort	Patients who attempted suicide for the first or second time by overdosing on drugs or pesticides and also had anxiety or depression. Patients were excluded if they had psychosis, dysthymia, bipolar affective disorder, substance abuse, eating disorder, or personality disorder	16–50	Sequential allocation to treatment. Intervention group: 10 sessions of cognitive behavioral therapy with mental health professional plus outreach for 3 mo Control group: Standard aftercare	2–3 mo	Intervention group: 0/20 (0)  Control group: 1/20 (5)	Not available

\* DSH = deliberate self-harm.

interventions (Table 2). In 6 studies in which treatment was provided in the primary care setting, interventions included an emergency information card (62), a letter (32), outpatient day hospitalization (33), antidepressant medication (61), antipsychotic medication (63), and DBT (34). All interventions were compared with usual care or placebo (for the 2 medication studies). Of interest, a subgroup analysis in the study by Evans and colleagues (62), which examined the effectiveness of emergency information cards, suggested a need to examine the data by whether previous deliberate self-harm had occurred. For those with a history of deliberate self-harm, the intervention increased the likelihood of repeated deliberate self-harm (62).

In the only study that tested an intervention for suicide risk in the primary care setting, Bennewith and colleagues (35) compared a three-part, one-time intervention with usual care. The intervention provided general practitioners with a letter informing them of a patient's deliberate self-harm episode, a letter the physicians could forward to the patient inviting him or her to make an appointment, and guidelines on assessing and managing deliberate self-harm in general practice. In an intention-to-treat analysis at a 12-month follow-up, the groups did not differ significantly in the proportion of patients who attempted suicide (21.9% vs. 19.5%). Adherence to this low-intensity intervention was poor; only 58% of the intervention-group physicians sent letters to the patients.

Of note, the investigators reported a subgroup analysis with results opposite those of Evans and colleagues (62). For patients with previous deliberate self-harm, this primary care intervention significantly decreased the likeli-

hood of repeated deliberate self-harm, whereas for those with no previous deliberate self-harm before the qualifying episode, the intervention increased the likelihood of repetition (Table 2). The variability of adherence in the study by Bennewith and colleagues and the differences in the 2 trials' study samples may partially explain the contradictory results.

### Cohort Studies

Two cohort studies, each using depression as a criterion for selecting participants, met our inclusion criteria (64, 65). Neither study produced statistically significant differences involving repeated suicidal behavior (Table 3).

Using a nested case-control design, Coryell and colleagues (64) evaluated suicide risk in a long-term cohort of patients with major affective disorders. In this small study, case-patients were compared with controls for use of lithium in the week before suicide completion (15 case-patients vs. 15 matched controls) or suicide attempt (41 case-patients vs. 41 matched controls). All patients were receiving some type of treatment at the time of the episode. The investigators found no relationship between lithium use and suicide or suicide attempts.

Raj and colleagues (65) compared the use of 10 weekly sessions of cognitive-behavioral counseling with routine medical treatment for patients admitted to the intensive care unit of a general hospital after their first or second suicide attempt. Upon intensive care unit admission, the 40 enrolled patients were sequentially assigned to either the counseling intervention or routine medical care with the

**Table 4. Previous Review of Randomized, Controlled Trials Comparing Problem-Solving Therapy with Standard Aftercare for Intermediate Outcomes\***

Study, Year (Reference)	Intervention and Treatment Duration	Follow-up (after Enrollment), mo	Standardized Mean Difference for Depression Score (95% CI)	Weighted Mean Difference for Hopelessness Score (95% CI)	OR for Improvement in Problems (95% CI)
Gibbons et al., 1978 (37)	Mean number of 9 sessions over 12 wk	4	-0.18 (-0.52 to 0.15)	NR	2.74 (1.40 to 5.36)
Hawton et al., 1987 (38)	≤8 sessions over 8 wk	9	-0.31 (-0.80 to 0.18)	NR	1.38 (0.43 to 4.47)
Salkovskis et al., 1990 (39)	5 sessions over 4 wk	12	-1.24 (-2.24 to -0.25)	-3.25 (-5.31 to -1.19)	NR
McLeavey et al., 1994 (40)	5 sessions over 5 wk	7-8	NR	0.50 (-4.51 to 5.5)	NR
Evans et al., 1999 (41)	2-6 sessions over unclear period	6	-0.86 (-1.60 to -0.13)	NR	NR
Patsiokas and Clum, 1985 (67)	10 sessions over 3 wk	About 1	NR	-6.60 (-13.73 to 0.53)	NR
Meta-analytic summary statistic			-0.36 (-0.61 to -0.11)	-2.97 (-4.81 to -1.13)	2.31 (1.29 to 4.13)

\* Data are from Townsend et al., 2001 (26). Sample and age range for each study are already described in Table 1 except for Patsiokas and Clum, which was conducted in "adult" patients who had deliberate self-harm episodes and were recruited from a U.S. inpatient psychiatric ward. NR = not reported; OR = odds ratio.

option to attend therapy sessions. No patients in the intervention group had repeated a suicide attempt at 2 to 3 months of follow-up; 1 patient in the control group made a repeated suicide attempt.

### Does Treatment Result in Improved Intermediate Outcomes?

We identified 1 systematic review (26) and 4 additional articles (34, 60, 65, 66) that studied intermediate outcomes in patients at high risk for suicide. Again, study heterogeneity (interventions tested, treatment duration, follow-up length, and outcomes used) precluded integration of the new studies into the previous review.

#### Previous Review of RCTs Involving Intermediate Outcomes

Townsend and colleagues (26) conducted a systematic review of 6 RCTs (37-41, 67) involving brief problem-solving therapy in patients with deliberate self-harm. The outcomes included depressive severity, hopelessness, and improvement in problems (Table 4). Treatment duration and length of follow-up varied substantially across studies, and the analyses were not stratified according to age. The 4 studies that evaluated depressive outcomes (37-39, 41) used 2 different scales for depression, requiring the authors to calculate a standardized mean difference (the mean difference divided by the pooled sample SD) to evaluate depressive symptoms. The summary standardized mean difference indicated a significantly lower depression score—approximately one third of an SD—for patients offered problem-solving therapy compared with those receiving usual care (-0.36 [CI, -0.61 to -0.11]). Three trials measured hopelessness, which is strongly correlated with suicidal ideation (39, 40, 67) on the Beck Hopelessness Scale (68), and the authors calculated a weighted mean difference. Those receiving problem-solving therapy averaged approximately 3 points less on hopelessness scores at follow-up than did those receiving standard care (-2.97 points [CI, -4.81 to -1.13]). Two trials measured whether problems had improved (a dichotomous measure rated by assessors blinded to treatment) (37, 38). Problems were more likely to improve in those receiving problem-solving

therapy than in those receiving usual care (OR, 2.31 [CI, 1.29 to 4.13]) (Table 4).

#### Additional RCTs Involving Intermediate Outcomes

As shown in Table 5, Guthrie and colleagues (60) measured suicidal ideation in an RCT comparing interpersonal psychotherapy with usual care. Suicidal ideation, as measured by the Scale for Suicidal Ideation (69) at 6-month follow-up, was significantly lower for the psychotherapy group (mean difference, -4.9 [CI, -8.2 to -1.6];  $P < 0.001$ ). A priori, the authors had identified a difference of 5 points as being clinically significant.

Koons and colleagues (34) measured suicidal ideation and depressive severity in their 6-month RCT of female veterans with borderline personality disorder. For those who completed treatment, DBT was superior to usual care in decreasing suicidal ideation as measured by the Scale for Suicidal Ideation (69) (10-point decrease vs. 4-point decrease;  $P < 0.05$ ). As measured by the self-report Beck Depression Inventory (70), DBT produced a significantly greater decrease in depressive symptoms than usual care (2-way analysis of variance,  $P < 0.05$ ). This is inconsistent with the authors' findings using the Hamilton Depressive Rating Scale (71), which showed no significantly greater decrease for DBT versus usual care.

Montgomery and colleagues (66) performed a 4-week cohort study examining the antidepressants mianserin, amitriptyline, and maprotiline. Mianserin decreased suicidal ideation, as measured by the Montgomery-Asberg Depression Rating Scale, significantly more than maprotiline ( $P < 0.01$ ); a trend favoring mianserin over amitriptyline was also observed ( $P < 0.10$ ). The 3 study drugs showed no differences for the analogous "suicidal thoughts" on the Hamilton Depressive Rating Scale, and the overall quality of the study was poor.

Raj and colleagues (65) also measured the effect of a cognitive-behavioral intervention on suicide ideation. Assessing the difference in Scale for Suicidal Ideation scores between baseline and 2 to 3 months postdischarge for the 2 groups, they found that those who received counseling had

Table 5. Additional Studies Involving Intermediate Outcomes\*

Study, Year (Reference)	Study Type	Intervention and Treatment Duration	Follow-up (after Enrollment), mo	Age Range, y	Outcome	Intervention Group	Control Group	Reported Statistic
<b>Interpersonal psychotherapy vs. standard aftercare</b>								
Guthrie et al., 2001 (60)	RCT	4 sessions over 1 mo	6 mo	18–65	Scale for SI score (69)	7.9	12.8	Mean difference, –4.9 (95% CI, –8.2 to –1.6); $P < 0.001$
<b>Dialectical behavioral therapy vs. usual care</b>								
Koons et al., 2001 (34)	RCT	Weekly sessions over 6 mo	6 mo	21–46	Scale for SI (69) Depressive severity	10-point decrease BDI: 9.4-point decrease HAM-D: 12.6-point decrease	4-point decrease BDI: 5.4-point decrease HAM-D: 8.3-point decrease	$P < 0.05$ by 2-way repeated-measures analysis of variance $P < 0.05$ by 2-way repeated-measures analysis of variance NS
<b>Mianserin vs. amitriptyline vs. maprotiline (all antidepressants)</b>								
Montgomery et al., 1978 (66)	Cohort	1 mo	1 mo	NR	Suicidal thoughts	By HAM-D: Mianserin group: NA Amitriptyline group: NA Maprotiline group: NA By MADRS: Mianserin group: ~11 Amitriptyline group: ~5 Maprotiline group: ~6	NR NR	No difference among 3 drugs Greater SI decrease only with mianserin vs. maprotiline ( $P < 0.01$ )
<b>Cognitive-behavioral counseling vs. usual care</b>								
Raj et al., 2001 (65)	Cohort	2–3 mo	3 mo	16–50	Scale for SI	15-point mean decrease	2.75-point mean decrease	$P < 0.001$

\* BDI = Beck Depression Inventory (self-report); HAM-D = Hamilton Depressive Rating Scale; MADRS = Montgomery–Asberg Depression Rating Scale; NA = not available; NR = not reported; NS = not significant; RCT = randomized, controlled trial; SI = suicidal ideation.

a substantially greater reduction in suicidal ideation than the usual care group (mean decrease, 15 vs. 2.75;  $P < 0.001$ ).

## DISCUSSION

Evidence for or against the value of screening for suicide risk in primary care settings must be considered within a complex practice and epidemiologic context. Suicide is a rare outcome, even among high-risk groups, and this alone creates methodologic challenges. Randomized, controlled trials, the gold standard for showing efficacy in evidence reviews, ethically cannot include a true placebo arm. Consequently, all interventions are being compared with treatment arms that in fact may or may not be effective. Finally, patterns of suicide behaviors are very complex. Although a previous suicide attempt is a strong risk factor for completed suicide, sociodemographic characteristics and behaviors clearly differ across groups of those who attempt suicide, practice repetitive deliberate self-harm, and successfully complete suicide. Focusing exclusively on completed suicide reveals dramatic differences in rates and methods across the life span, between men and women, and between different race and ethnicity groups. Current research, in large part, does not address this complexity.

Within this context, we have reviewed literature published since 1966 with the goal of better defining the clinician's role in screening for suicide risk in primary care settings.

Despite the public health import of suicide and the Surgeon General's call to action, evidence to guide the primary care clinician's assessment and management of suicide risk is extremely limited. No studies address the overarching question of whether screening for suicide risk in primary care patients improves outcome. Consequently, we must approach this issue by analyzing studies examining the intervening linkage questions.

Very little is known about use of screening instruments for suicide risk in primary care populations. One prospective study identified reasonable test characteristics for persons reporting that they were "feeling suicidal" compared with responses indicating the presence of a plan. This study has not been replicated, nor has the specific question identified ("feeling suicidal") been tested independently of the longer instrument.

Regarding whether interventions for those at risk reduce suicide attempts or completions, the poor generalizability of the studies makes the overall strength of evidence fair, at best, while the results are mixed (25). Although some trends suggest incremental benefit from several interventions, no consistent statistically significant effects have emerged for interventions for which more than 1 study has been done. Of the interventions for which only 1 study has

been done, DBT for borderline personality disorder (49) and interpersonal psychotherapy for deliberate self-harm (60) seemed promising. These interventions, however, require further confirmation.

We should emphasize that our review did not include all of the available clinical trial literature involving suicide attempts or completions. Some literature has examined the effectiveness of medications, such as lithium, in the prevention of suicide among psychiatric patients with major mood disorders, as reflected in a recent meta-analysis by Tondo and colleagues (72). We excluded these studies because they did not meet our inclusion criteria of controlled trials with adequate comparison groups.

Several studies showed improvement for intermediate outcomes, primarily for persons at high risk for deliberate self-harm. Specifically, meta-analyses of RCTs using problem-solving therapy have shown benefit, as indicated by improved mood, decreased hopelessness, and improvement in problems (26). In addition, 1 RCT involving interpersonal psychotherapy (60) and 1 RCT involving DBT (34) documented decreased suicidal ideation. Finally, 1 cohort study of cognitive-behavioral therapy showed decreased suicidal ideation (65).

Our review highlights several important issues involving research on assessing and managing suicide risk. First, the challenge of studying interventions for a rare event is underscored by the fact that, even in a population with a relatively high risk for deliberate self-harm, documenting incremental benefit relative to standard care has been difficult. This difficulty is attributable at least in part to the fact that most studies are underpowered to detect significant differences, thereby increasing the risk for falsely concluding that an effective intervention does not produce a statistically significant benefit. Studies that have larger sample sizes typically provide the least intense (and, arguably, likely less efficacious) interventions (35). Future research must consider the feasibility of large, multisite studies that have sufficient power to identify the benefit of interventions for a substantial but relatively rare health problem.

Second, the generalizability of the available evidence to a primary care population with unidentified suicide risk is poor. The great majority of research has been conducted in psychiatric samples with an already identified risk for suicide rather than among unidentified patients in primary care, who as a group are at lower risk. The existing literature includes only 1 screening study conducted in a primary care setting (10). Only 1 intervention study involved patients recruited from primary care practices (34), and all of the intervention studies involved patients already identified as being at high risk for harming themselves (and, consequently, likely to be in treatment with a mental health professional). Only 1 study conducted the intervention in a primary care setting (35). High priorities for future research include examining the test characteristics of instruments used to determine suicide risk in primary care settings, recruiting patients for intervention studies from

primary care settings, and testing interventions in primary care settings.

Third, the available studies focused on those with relatively moderate risk for suicide and, for ethical and clinical reasons, excluded patients at the highest risk. Most identified high-risk patients are probably admitted to a psychiatric unit for safety, which may or may not in itself be an effective intervention. Subsequent research should consider how to stratify at-risk primary care patients and target interventions to risk severity.

Fourth, the lack of evidence for incremental benefit from a particular intervention compared with standard care is not equivalent to saying that nothing works. Standard care in many instances may be a successful intervention; it may be “good enough.” However, the components of standard care are poorly described in the existing literature and probably vary across studies, making the comparison to the experimental intervention difficult to evaluate. Subsequent research could address this shortcoming by more carefully monitoring and defining standard care.

Fifth, making meaningful conclusions specific to any particular age group is difficult. Available studies were not stratified by age, and as a result, drawing conclusions specific to young adults or elderly adults is a challenge. In addition, despite the concern about increased risk for suicide in the elderly, there is a dearth of information to guide evidence-based assessment and management strategies in primary care. Results from PROSPECT will begin to fill this void (36). Subsequent research should involve samples with more clearly defined age groups and analyses stratified by age to allow more meaningful interpretation for specific high-risk age groups.

Sixth, dramatic differences in suicide behaviors among men and women and among different racial and ethnic groups have drawn little attention. A better understanding of these variations may have direct implications for screening and treatment strategies, and they warrant further research.

Seventh, our review is relevant only to persons who access clinical care, which means that a large portion of the population may be ignored. Community-based research can presumably address this question.

Finally, we did not find studies that met our inclusion criteria and addressed whether more adequate treatment of depressed patients or substance-abusing patients will decrease the risk for suicide. We think such a clinically guided approach is key for the primary care physician to balance effectively the public health import of suicide with the real challenge of improving the outcome of a rare event. Approximately 90% of patients who complete suicide have a diagnosable psychiatric illness, and the great preponderance have depression or substance abuse. A more feasible means of decreasing suicide may be to focus on the high-risk groups, such as depressed primary care patients for whom routine screening is already recommended (73), and to focus efforts to decrease risk on improving the ad-

equate management of depression (74). Improving depression management may both improve depressive outcomes and decrease suicide risk. This strategy is reasonable and practical from a clinical perspective and testable from a research perspective. It is also necessary. Assessing suicidal ideation is the standard of care in the evaluation for depression, and routine depression screening will probably identify more patients with suicidal ideation, for which primary care clinicians will need evidence-based management strategies. Retrospective analyses have suggested that educating general practitioners on better identification and treatment of depression may be an effective method of suicide prevention (75). Subsequent prospective clinical trials focusing on primary care are needed to develop this evidence base.

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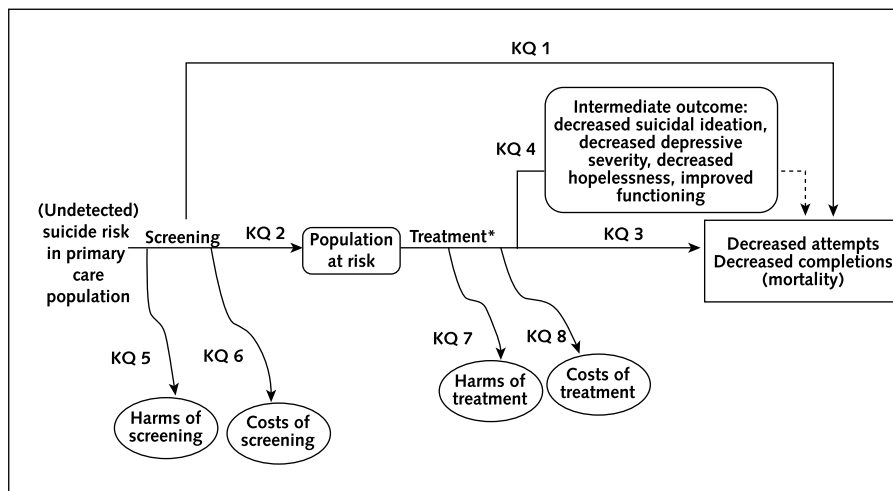
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**Appendix Table 1. Key Questions for Screening for Suicide Risk**

Number	Question
1	Does screening for suicide risk in primary care settings result in decreased attempts and/or decreased mortality?
2	Can a screening test reliably detect suicide risk in primary care populations?
3	Main outcome: For those identified as being at risk, does treatment result in decreased suicide attempts and/or decreased mortality from suicide?
4	Intermediate outcome: For those identified as being at risk, does treatment result in decreased suicidal ideation, decreased depressive severity, decreased hopelessness, or improved level of functioning?
5	What are the harms of screening?
6	What are the costs of screening?
7	What are the harms of treatment?
8	What are the costs of treatment?

**Appendix Figure. Key questions (KQs).**



\*Treatments were categorized by intervention type after the literature search.

Appendix Table 2. Inclusion and Exclusion Criteria

Element	Inclusion Criteria	Exclusion Criteria
Databases	MEDLINE, PsycINFO	Other databases
Languages	English only	Other languages
Samples	Humans only	Animal studies
Study design	Randomized, controlled trials; cross-sectional studies; cohort studies; systematic reviews; and meta-analyses	Case-control studies, letters, editorials, and nonsystematic reviews
Study sample	Screening: primary care Treatment: primary or specialty care	Screening: community settings and psychiatric settings Treatment: community settings

Appendix Table 3. Literature Search Results\*

Category and Step	Search Strategy	Articles, <i>n</i>	
		MEDLINE	PsycINFO
<b>Screening</b>			
1	Explode suicide/or explode suicide, attempted	24 512	17 269
2	Explode mass screening	51 454	15 074
3	1 and 2	83	456
4	Total unduplicated records from both databases Met inclusion criteria		250 1†
<b>Randomized, controlled trials of suicide treatments</b>			
1	Explode (suicide/or explode suicide, attempted) and (explode randomized controlled trial/explode single-blind or double-blind method/explode random allocation)	72	0
2	Explode suicide/or explode suicide, attempted	26 541	17 269
3	Limit 2 to randomized, controlled trial	123	0
4	1 or 3	215	0
5	Randomized controlled trial	110 121	727
6	1 and 2 and 5	215	7
7	Limiting to human and English language, total unduplicated records from both databases Met inclusion criteria		222 33
<b>Cohort studies of treatment</b>			
1	Explode suicide/or explode suicide, attempted	26 780	17 269
2	Limit 1 to (human and English language)	19 492	NA
3	Explode therapeutics/or treatment.mp	2 561 983	226 733
4	2 and 3	2249	NA
5	Explode cohort studies	438 625	6861
6	4 and 5	522	109
7	Total unduplicated records from both databases Met inclusion criteria		507 4
<b>Primary care reviews and meta-analyses</b>			
1	Primary care reviews or meta-analyses	54	47
2	Total unduplicated records from both databases Met inclusion criteria		54 2

\* NA = not applicable.

† One additional article abstracted; see text.