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Screening for Suicide Risk in Primary Care: A Systematic Evidence Review for the U.S. Preventive Services Task Force

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Structured Abstract

Background: In the United States, the annual burden of suicide is substantial, accounting for almost 37,000 deaths and an estimated 1.4 million years of potential life lost in recent years.

Purpose: To systematically review evidence for the accuracy of suicide risk screening instruments, the efficacy and safety of screening for suicide risk, and the efficacy and safety of treatments to prevent suicide.

Methods: We searched MEDLINE, PsycINFO, the Cochrane Central Register of Controlled Trials, and the Cumulative Index for Nursing Allied Health to identify literature that was published between January 2002 and July 17, 2012. We also examined the references from the previous review and additional relevant reviews, searched Web sites of government agencies, professional organizations, and other organizations for grey literature, and monitored health news Web sites and journal tables of contents to identify potentially eligible trials. Two investigators independently reviewed identified abstracts and full-text articles against a set of a priori inclusion and quality criteria. One investigator abstracted data into an evidence table and a second investigator checked these data. We conducted random effects meta-analyses to estimate the effect size of suicide prevention interventions on suicide attempts, suicidal ideation, depression, and global functioning. We grouped trials into 11 intervention types among three categories (psychotherapy, medication, and enhanced usual care).

Results: We included 86 articles representing 56 unique studies. Very limited data showed no clear positive or negative immediate (1 to 14 days) effects of suicide risk screening. Limited data suggest that there are screening instruments with acceptable performance characteristics for adults and possibly older adults; however, positive predictive value was below 40 percent in all cases where sensitivity was 80 percent or higher. No effects of treatment were seen on suicide deaths, though reporting was sparse and trials were underpowered for this rare outcome. Psychotherapy reduced the risk of suicide attempts by 32 percent compared with usual care in adults, but did not show a benefit in adolescents, and four of 11 adolescent trials reporting on suicide attempts showed statistically nonsignificant increases in the risk of suicide attempt by 22 percent or more. Depression was improved in both adults (standardized mean difference [SMD], -0.37 [95% CI, -0.55 to -0.19]) and adolescents (SMD, -0.36 [95% CI, -0.63 to -0.08]), but there was little or no consistent effect on suicidal ideation. Other outcomes were sparsely reported. The single trial of lithium in adults was limited by high attrition. Practice-based interventions in primary care settings targeting older adults showed some benefits; however, a variety of other approaches to enhance usual care showed no consistent benefit.

Conclusions: Suicide screening is of high national importance. It is very difficult, however, to predict who will die from suicide, and there are many inherent difficulties in establishing the effectiveness of treatment to reduce suicide and suicide attempts. Limited evidence suggests that primary care-feasible screening instruments may be able to identify adults at increased risk of suicide, and psychotherapy targeting suicide prevention can be an effective treatment in adults. Evidence was more limited in older adults and adolescents; additional research is urgently needed.

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CHAPTER 1. INTRODUCTION

Condition Definition

Suicide is the act of intentionally inflicting one's own death. While suicide deaths are uncommon, suicide attempts and ideation (thought of killing oneself or wishing oneself dead) are less rare. Suicidal ideation is much more common than suicide attempts and is often a precursor of suicide and can be targeted by intervention. Self-harm is the broader term that encompasses suicide attempts and self-injurious behavior without the conscious or certain intent to cause one's own death. It can be difficult, however, to determine the intent of the patients who injure themselves. Among adults, for example, almost half with a lifetime history of a suicide attempt report that their attempt was a cry for help and they did not want to die.[1] While the current review is focused on suicide, suicide attempts, and suicidal ideation, studies examining self-harm rather than suicide attempts may be included in this review if the majority of cases are either suicide-related or are cases with unknown intent. While we use the term "suicide attempt" preferentially over "self-harm" when discussing primary research, we do use the terms the authors use in their description of the study. **Table 1** defines a number of suicide-related terms.

Prevalence

Suicide Deaths

Suicide was the tenth leading cause of death in the United States in 2009, accounting for 36,897 deaths, with an age-adjusted rate of 11.8 deaths per 100,000 individuals.[6,7] Suicide attempts and death rates vary by sex, age, and race (**Figures 1** and **2**). The suicide rates in the United States held relatively steady between 1990 and the early 2000s in most age-sex subgroups, other than a steady decline in Caucasian males age 65 years or older.[8,9] Overall suicide rates, however, have gradually increased over the last decade, particularly between 2005 and 2009, for both males and females.[9] The suicide rate in general primary care patients in the United States is unknown.

In 2009, men were four times more likely to die from suicide than women (age-adjusted suicide death rates per 100,000 of 19.2 and 4.9, respectively).[6] Men accounted for 79 percent of all reported suicides.[7] For women, suicide deaths are generally at the highest during early- to mid-adulthood and gradually decline in the later years. These peak ages, however, are earlier for American Indian/Alaskan Native and Asian/Pacific Islander women.

Males show marked differences in suicide risk by race. American Indian/Alaskan Native males have very high rates of suicide in the adolescent and early adult years, peaking at 42.2 per 100,000 in the ages of 19 to 24 years, and declining as age increases. In contrast, the suicide rate in nonHispanic white males increases steadily throughout their lifespan, peaking at 39.1 per 100,000 among men age 75 years and older. Black males have overall lower rates of suicide than nonHispanic white or American Indian/Alaskan Native males; these rates generally show bimodal distribution that peaks during the early 20s (13.8 per 100,000) and again at age 75 years

and older (12.2 per 100,000).[6]

Military personnel and veterans also appear to be at increased risk of suicide. In 2007, the Department of Veterans Affairs (VA) reported a suicide rate of 56.8 per 100,000 veterans among men ages 18 to 29 years,[10] a rate that represented a 26 percent increase since 2005.[11] Data prior to 2006 are conflicting on whether former military personnel were more likely to commit suicide than the general population,[12,13] but most recent data suggest that suicide rates are elevated in youngest male veterans (ages 17 to 24 years; Operation Enduring Freedom/Operation Iraqi Freedom era veterans), whose crude suicide rates were almost four times higher than nonveterans.[14]

Suicide Attempts

In the United States, lifetime prevalence of a suicide attempt in adults is 4.6 percent, with about 0.5 percent of adults reporting attempting suicide in the past year.[1,15] The 12-month prevalence for suicide attempts is higher at 1.2 percent in younger adults (ages 18 to 25 years).[16] Despite the fact that men are more likely to die from suicide, women have a greater lifetime prevalence of suicide attempts than men.[1] When asked to rate the seriousness of their attempt, however, men and women had similar rates of attempts during which they truly intended to die. The odds of inflicting self-harm without a true intent of dying was almost three times higher for women than men.[17] Suicide attempt risk is increased in sexual minorities; most analyses report at least an 80 percent increase in risk, and several report more than double that risk.[18] Interestingly, male veterans did not report higher rates of suicide attempts than civilians on the 2008 National Survey on Drug Use and Health.[19]

According to the 2011 Youth Behavior Risk Surveillance System (YRBSS), 7.8 percent of high school students reported attempting suicide at least once during the previous 12 months, and 2.4 percent of students made a suicide attempt that required treatment due to their self-injury.[20] As with adults, the prevalence of suicide attempts in high school students was higher among females (9.8%) than males (5.8%), and prevalence varied by age (younger grades had higher risk) and race and ethnicity, especially in females (13.5% in Hispanic females compared with 7.9% in white and 8.8% in black females).[20]

Rates of emergency department (ED) visits in the United States were 153 per 100,000 persons in 2010, almost doubling since 1993 to 1996 (from 84 per 100,000 persons).[9,21] Almost all subgroups had comparable increases, including males and females, blacks and whites, and three of the five age groups examined (15 to 19 years, 30 to 49 years, and ≥50 years). Most of this increase appeared to be driven by low-lethality self-harm, as the proportion of visits coded as urgent or emergent decreased from 95 (1993 to 1996) to 70 (2005 to 2008) per 100,000 persons.[21]

Suicidal Ideation

Among adults, 13.5 percent have seriously thought about committing suicide during their lifetime,[1] and 2.6 to 3.7 percent have seriously thought about committing suicide during the past

year.[15,22] These rates are higher in younger adults and females.[16] Rates of suicidal ideation in primary care are widely variable, but are most commonly in the 2.4 to 3.3 percent range in general primary care populations.[23] As with suicide attempts (and in contrast to suicide deaths), veterans are not more likely to report suicidal ideation than nonveterans.[19]

Sixteen percent of students (in 9th to 12th grades) seriously considered attempting suicide during the previous 12 months according to the YRBSS.[20] Again, this prevalence was higher among female students (19.3%) than male students (12.5%). Prevalence also varied by age and race and ethnicity (white and Hispanic females had higher prevalence than black females, and white and Hispanic males had higher prevalence than black males).[20] Nearly 13 percent of students have made a suicide plan during the past year.[20]

Burden

In addition to the individual devastation of thousands of families who are bereaved by suicide, the burden of suicide on the United States as a whole is substantial. In 2009, suicide accounted for over 1.4 million years of potential life lost (YPLL) before age 85 years, which is nearly 4 percent of the total YPLL in the United States.[24] In 2000, the total lifetime medical care cost of self-inflicted injuries, including suicide attempts and deaths, was $1 billion, which is in addition to over $32 billion for lost productivity.[25] The average medical care cost associated with a suicide death was $2,596, and the average medical care cost of a nonfatal self-inflicted injury (e.g., attempted suicide) that required hospitalization was $7,234.[25] A study estimating disability weights for suicidal ideation and suicide attempts found suicidal ideation to be comparable to alcohol or cocaine dependence and suicide attempts to be comparable to heroine dependence or early Parkinson's disease.[26]

Etiology and Natural History

Onset

While suicidal behavior can appear in very young children, suicide attempts and deaths are very rare before adolescence.[6] For some race-sex subgroups, late adolescence and early adulthood mark the greatest risk for suicide attempts and death.[6] This is also the most common period for first onset of suicidal ideation and suicide attempts.[1]

Progression From Ideation to Attempt (Contextual Questions 1 and 2)

For those with suicidal ideation, 15.6 percent will make an attempt within 12 months,[15] while 31.8 percent will progress to an attempt at some point in their lifetime.[27] That is, only about one third of those with suicidal ideation will ever attempt suicide. For those who do make an attempt, however, 60 percent will attempt suicide during the first year after the onset of suicidal ideation.[27] Developing a suicidal plan is a key step in this progression that roughly doubles the risk of an attempt to 31.9 percent within 12 months[15] and 54.4 percent over a lifetime.[27]

Eighty percent of those attempting suicide have a psychiatric illness at the time they attempt suicide. The actual risk of ideation and the formulation of a plan, however, depends largely on the particular disorder.[28] While depression is a better predictor of suicide ideation, for example, disorders characterized by severe anxiety or agitation (e.g., posttraumatic stress disorder [PTSD]) or poor impulse control (e.g., conduct disorder or substance use disorders) better predict which individuals go on to formulate a plan or attempt suicide.

Multiple Suicide Attempts

Among those who attempt suicide, an estimated 16 percent will make a second suicide attempt within the following year.[29] In a naturalistic study of adults in Australia who had made a suicide attempt, for example, the median time until first re-attempt was 241 days for middle-aged adults and 173 days for older adults.[30] An estimated 2 percent will die as a result of suicide in the subsequent year,[29] and suicide deaths continue to accumulate, with reports of 5 percent or more dying by suicide after 9 years and as many as 13 percent after 37 years.[31] Some studies, however, have reported lower rates of re-attempts and deaths.[30,32] One study of patients treated for self-harm in England in which patients used self-poisoning found that this method was associated with a lower risk of re-attempt than other methods of self-harm.[33] Among those who have made suicide attempts, the risk of another attempt varies somewhat by sex: repeat attempts in males are more likely to be associated with substance abuse, while in females, PTSD and high levels of depression are associated with repeat attempts.[34]

In a study of young adolescents (ages 12 to 15 years) with a psychiatric inpatient stay, 36.4 percent of those with previous suicide attempts made a suicide attempt within 18 months of discharge compared with 12.7 percent of those who had not made a previous attempt.[35] Most adolescents who self-reported a history of self-harm on a telephone interview did not report continued self-harm into young adulthood, however, particularly among boys.[36] This study did not report factors that were associated with continuation, such as treatment history.

Risk Factors

Suicide risk in the United States varies according to age, sex, and race. The presence of a psychiatric disorder also increases the risk of suicide, particularly affective disorders (e.g., depression),[37-39] schizophrenia,[37] PTSD,[38,39] and substance use disorders.[37,38] As many as 87 percent of those who die as a result of suicide meet the criteria for a psychiatric disorder before their death.[40] Among U.S. adults, a lifetime history of depression more than doubles the odds of a suicide attempt. A history of a psychotic disorder, PTSD, and dysthymia all increase the odds of suicide by more than 50 percent.[39] Depression is likely present in 50 to 79 percent of youth suicide attempts, though the depression is not always recognized.[41] Other clinically-relevant variables can increase the risk of suicide attempt. For example, a prior suicide attempt is a major risk factor for future suicide attempts[42] and completed suicides.[43-46] Further, having a history of nonsuicidal self-harm is an independent risk factor for attempting suicide, as is borderline personality disorder (BPD).[47]

Other important risk factors for suicide include the presence of a serious adverse childhood

experience (e.g., family violence, physical or sexual abuse, incarcerated family members, or familial mental illness),[48,49] family history of suicide (especially parental),[50,51] sexual minority status,[18,52,53] and possibly history of being bullied,[54] sleep disturbance,[55,56] and chronic medical conditions such as epilepsy and chronic pain.[57] Among males, socioeconomic factors such as low income level, occupation, and being unemployed are also associated with suicide.[37]

Among older adults, social isolation, spousal bereavement, neuroticism, affective disorders (e.g., unipolar major depression), physical illness, and functional impairment are all associated with an increased risk of suicide attempt.[58] Several studies indicate that suicidal ideation is rare among seriously ill older adults without clinically significant mood disturbances.[58]

Risk factors among military veterans include prolonged combat injury (specifically traumatic brain injury), separation from service within the previous 12 months, PTSD, and other psychiatric illnesses (e.g., depression).[11,59]

Individual risk factors, however, have only limited ability to predict suicide in an individual at any particular time. A large portion of Americans have one of these enumerated risk factors for suicide; however, only a small proportion will attempt suicide, and even fewer will die by suicide. For example, among a sample of adult patients judged by physicians to be in need of treatment for depression, 90 percent were identified as having a low risk of self-harm, based on self-reported suicidal ideation.[60] In addition, focus on risk factors alone ignores the role of protective factors and the balance between them.[61] Concern for suicide increases with multiple risk factors and high levels of distress.[38,62]

Rationale for Screening

Data from the late 1980s and early 1990s indicates that 38 percent of adults of all ages in the United States visited their primary care providers within 1 month of committing suicide. This rate was even higher (50% to 70%) in older adults.[63] Further, nearly 90 percent of suicidal youth were seen for primary care visits during the previous 12 months compared with 70 to 80 percent of nonsuicidal youth.[64,65] If any of the available screenings tools were accurate and feasible for use in primary care, this could represent an important opportunity for identifying people at increased risk of suicide.

Screening Strategies

The previous U.S. Preventive Services Task Force (USPSTF) review[66] identified only one study of test characteristics for a suicide screening test.[67] Numerous instruments, however, have been developed that may have utility in primary care settings (**Appendix A**). We examined these instruments for the current review and reviewed approaches to screening in general and high-risk populations. The recommendations for suicide screening in clinical practice from other health organizations are available in **Table 2**. The American Academy of Pediatrics recommends broad-based screening for suicide risk in adolescents,[68] while other groups limit their recommendations for suicide risk screening to known high-risk patients.[69-71]

Treatment Approaches

Psychotherapy and pharmacotherapy are the primary interventions used in clinical settings. Given the high rate of mental health disorders among those who die by suicide, an underlying mental health condition (e.g., depression, PTSD) is often an important treatment target.[4] Studies seeking to improve physician treatment and management of depression have lowered suicide rates in several countries outside the United States.[75] Meta-analyses of randomized, controlled trials (RCTs) of antidepressants have generally not shown an impact on suicide attempts and deaths; however, effects on suicide attempts may be age-related. Antidepressants appear to reduce the risk of suicidal ideation and attempts in older adults, but some meta-analyses suggest a possible increase in suicidal ideation and attempts in teens and young adults (ages 18 to 29 years) taking antidepressants, particularly those with major depressive disorder and those taking paroxetine.[76,77] Other medications can be appropriate for other subgroups, including some antipsychotics (e.g., clozapine) for individuals with schizophrenia[78] and mood stabilizers (e.g., lithium) for individuals with bipolar disorder.[79]

A wide variety of psychotherapy interventions are used to reduce suicide risk. The National Registry of Evidence-Based Programs and Practices, maintained by the Substance Abuse and Mental Health Services Administration, includes 19 interventions that include suicidal ideation or behavior as an outcome.[80] These programs include interventions targeting adolescents, adults, and older adults. These interventions include both treatment and screening approaches in a variety of settings, although some programs primarily target depression or substance abuse. A recent review examined training manuals of empirically supported treatments for suicidality and identified several factors that were common to all the interventions they examined. These factors include having a clear treatment framework, having an agreed-upon strategy to manage suicidal crises, attention to affect (e.g., emphasizing the emotional experiences of the patient, especially those experiences that contribute to suicide risk, and facilitating tolerance of feelings, thoughts, opposing feelings/thoughts, and ambiguity), the therapist taking an active role in treatment, exploratory interventions, and a focus on change-oriented interventions.[81]

System- and Policy-Level Suicide Prevention Approaches

While many risk factors for suicide cannot be altered, some prevention targets particular steps in the progression from suicide ideation to suicide attempt, although this evidence base is limited. One example is education of physicians and "community gatekeepers," such as those in the military, who can then direct individuals to treatment.[75]

Restricting access to lethal means has also been found to prevent suicide.[75] Completed suicides have decreased following firearm control legislation (e.g., waiting periods and licensing requirements), pesticide restrictions, detoxification of domestic gas, restrictions on barbiturates, mandatory use of catalytic converters in automobiles, construction of barriers at jumping sites, use of lower toxicity antidepressants, introduction of "safe rooms" in prisons and hospitals, and reducing drug pack size for paracetamol and salicylate.[75,82] Such environmental restrictions are likely to be most effective when the proposed method is popular, highly lethal, widely available, and not easily substituted by a similar means.

A study of 21 developed nations (including the United States) demonstrated that the presence of a national policy to prevent suicide is associated with a lower rate of suicide, particularly in males.[83] In this study, suicide rates in males dropped by an estimated 1.4 per 100,000 person-years after the implementation of a national policy. In England and Wales, implementation of mental health service recommendations in regional health trusts was similarly associated with lower suicide rates.[84] Specific components associated with the greatest reductions in suicide rates included 24-hour crisis care, introduction of substance abuse policies for treatment of patients with dual diagnosis, and multidisciplinary review after suicide.

Role of Primary Care

Specific therapeutic approach aside, primary care providers may have an important role to play in identifying those in need of treatment and coordinating with specialty providers, as well as attending to the physical health needs of patients with a history of suicide attempts. A recent large-scale review by the National Institute of Clinical Excellence (NICE) on management of self-harm recommends the following for primary care providers in the United Kingdom.[85]

1. If a person presents in primary care with a history of self-harm and a risk of repetition, consider referring them to community mental health services for assessment. If they are younger than age 18 years, consider referring them to child and adolescent mental health specialists. Make referral a priority when: levels of distress are rising, high, or sustained; the risk of self-harm is increasing or unresponsive to attempts to help; the person requests further help from specialist services; and/or levels of distress in parents or caretakers of children and young people are rising, high, or sustained despite attempts to help.
2. If a person who self-harms is receiving treatment or care in primary care as well as secondary care, primary and secondary health and social care professionals should ensure they work cooperatively, routinely sharing up-to-date care and risk management plans. In these circumstances, primary health and social care professionals should attend care planning meetings.
3. Primary care professionals should monitor the physical health of people who self-harm. Pay attention to the physical consequences of self-harm as well as other physical health care needs.

Current Clinical Practice in the United States

In a study of U.S. primary care providers, suicide was discussed in only 11 percent of encounters with patients who had (unbeknownst to their providers) screened positive for suicidal ideation.[86] Similarly, only 36 percent of U.S. primary care physicians explored suicide in encounters with standardized patients portraying major depression, adjustment disorder, or those who sought out antidepressants.[87] Danish general practitioners participating in in-depth interviews about how they handled mental health issues felt that greater clinical experience led to an increased likelihood of discussing suicide risk with their patients.[88]

Less than one quarter of surveyed primary care pediatricians or family practice physicians in

Maryland reported that they frequently or always screened adolescents for suicide risk factors in a mailed survey, despite the fact that nearly 75 percent thought that physicians can be effective in preventing some teen suicides.[89] Only one third of the providers, however, thought they had enough time during well-child visits and sufficient training to screen for suicide.[89] Indeed, training of providers can increase screening rates. One trial found that 36 percent of providers screened their patients for suicide in low-income practices of mostly black youth before receiving an intervention designed to increase screening rates. These same providers screened 82 percent of patients after the training.[90] Similarly, providers in this study detected increased suicide risk in 0.8 percent of their patients before training, and in 3.6 percent of their patients after training.[90]

Patients appear to be reluctant to discuss suicidal feelings. Among patients who endorsed suicidal ideation on a screening questionnaire that their provider did not see, for example, only 7 percent had initiated a conversation about suicidal feelings.[86] A psychological autopsy study of 571 suicide cases whose last contact with a health care professional was within 28 days of their death found that suicide was only discussed in 22 percent of the visits. Likewise, suicide was only discussed during 21 percent of the visits occurring on the same day that the person committed suicide.[44]

Unfortunately, many people contemplating suicide do not seek or receive treatment for their distress. Only 26 percent of adolescents with suicidal ideation received mental health treatment or psychotropic medications during the previous year, and only 16 percent received care during the subsequent year.[64] Similarly, a survey conducted in 2002 and 2003 found that only 46 percent of U.S. adults who had suicidal ideation and had attempted suicide received any mental health care during the previous year.[91]

Current U.S. Initiatives

In 1999, the U.S. Surgeon General, in collaboration with multiple government agencies, issued a call to develop a national strategy to prevent suicide.[92] This strategy was a blueprint for addressing suicide prevention that included 15 key recommendations covering increasing awareness, enhancing services, and advancing the science of suicide prevention. This effort led to the development of the 2001 National Strategy for Suicide Prevention (NSSP), a comprehensive report that was developed with input from researchers, practitioners, federal agencies, nongovernmental organizations and groups, and consumers.[93] This report enumerated specific goals and objectives related to suicide prevention, four of which were directly related to primary care:

- NSSP 5.1: By 2005, increase the proportion of primary care clinicians, other health care providers, and health and safety officials who routinely assess the presence of lethal means (including firearms, drugs, and poisons) in the home and educate about actions to reduce associated risks.
- NSSP 7.2: By 2005, develop guidelines for assessment of suicidal risk among persons receiving care in primary health care services, EDs, and specialty mental health and substance abuse treatment centers, and implement these guidelines in a proportion of

these settings.

- NSSP 7.9: By 2005, incorporate screening for depression, substance abuse, and suicide risk as a minimum standard of care for assessment in primary care settings, hospice, and skilled nursing facilities for all federally-supported health care programs (e.g., Medicaid, TRICARE [formerly Civilian Health and Medical Program of Uniformed Services], Medicare, and State Health Insurance Assistant Program).
- NSSP 7.10: By 2005, include screening for depression, substance abuse, and suicide risk as measurable performance items in the Health Plan Employer Data and Information Set.

An updated NSSP report is due soon, so these objectives may soon change. The National Action Alliance for Suicide Prevention is a public-private partnership with the mission of advancing the NSSP. It has a number of task forces tackling difference aspects of the NSSP that fall into three broad categories: infrastructure (e.g., research prioritization, data, and surveillance), high-risk populations (e.g., Native Americans and Alaskan Natives; lesbian, gay, bisexual, and transgender persons; military/veterans), and interventions (e.g., clinical care and interventions, clinic workforce preparedness). In addition, Healthy People 2020 has published two goals related to suicide prevention:

- Mental Health Mood Disorder (MHMD)-1: Reduce suicide rate. Target 10.2 suicides per 100,000 (from baseline of 11.3 per 100,000 in 2007).[94]
- MHMD-2: Reduce suicide attempts by adolescents. Target 1.6 suicide attempts per 100 (from baseline of 1.9 suicide attempts per 100 in 2009).[94]

The Department of Defense and VA also promote research and policies to prevent suicide among military personnel and veterans.[95] The VA has established two centers that focus on suicide research and instituted a number of population-based initiatives, including public awareness campaigns for service members and veterans, a 24-hour suicide crisis hotline, a gun safety program, and a program to improve identification of suicidal veterans in VA and community EDs. This program provides suicidal veterans with a brief ED-based intervention, links them to services at the VA, and ensures appropriate followup care.[96] The U.S. Air Force has also implemented a comprehensive suicide prevention program that has reduced the suicide rate by 33 percent between 1987 and 1996 and 1997 through 2007.[97]

Previous USPSTF Recommendation

In 2004, the USPSTF concluded there was insufficient evidence to recommend for or against routine screening by primary care clinicians to detect suicide risk in the general population (I statement). The previous review found limited evidence that screening tests can reliably detect suicide risk in primary care populations. There was a fairly large body of evidence examining the effects of treatment on suicide attempts and suicide deaths in adolescents and/or adults (33 RCTs and two cohort studies). Few trials, however, showed benefit of treatment and many trials were underpowered for these rare outcomes. In addition, evidence showed that nonpharmacologic treatment could reduce depressive symptoms and suicidal ideation in high-risk older adolescents and adults. The USPSTF found no evidence on the harms of screening, and only two trials addressed harms of nonpharmacologic treatment, with contradictory results.

CHAPTER 2. METHODS

Scope and Purpose

This systematic review provides updated evidence regarding the accuracy and reliability of instruments used to screen for increased suicide risk, benefits and harms of screening for increased suicide risk, and benefits and harms of treatment to prevent suicide. The USPSTF will use this review to update its 2004 recommendation for primary care practices. This review includes all trials from the previous review[98] that met current inclusion/exclusion criteria, as well as newly identified studies.

Key Questions and Analytic Framework

We developed an analytic framework (**Figure 3**) and Key Questions (KQs) using USPSTF methods to guide our literature search, in consultation with liaisons from the USPSTF. The KQs we examined were:

1. Do screening programs to detect suicide risk among adolescents, adults, and older adults in primary care settings result in improved health outcomes (decreased suicide attempts, decreased suicide deaths, improved functioning, improved quality of life, or improved health status) or intermediate outcomes (decreased suicidal ideation, depressive symptomatology, or hopelessness)? Does the effect of screening programs vary by population characteristics (i.e., sex, age, race/ethnicity, other)?
2. Do instruments to screen for increased risk of suicide accurately identify adolescents, adults, and older adults who are at increased risk in primary care populations? Does the accuracy of the screening instruments vary by population characteristics?
3. Are there harms associated with screening for suicide risk in primary care settings? Do the harms vary by population characteristics?
4. For those identified as being at increased risk of suicide, do interventions to reduce suicide risk (behaviorally-based, including home visits or counseling for environmental change, or pharmacologic) result in improved health outcomes (decreased suicide attempts, decreased suicide deaths, improved functioning, improved quality of life, or improved health status)? Does the effect of the interventions vary by population characteristics?
5. For those identified as being at increased risk of suicide, do interventions to reduce suicide risk (behaviorally-based, including home visits or counseling for environmental change, or pharmacologic) result in improved intermediate outcomes (suicidal ideation, decreased access to means of suicide, increased treatment of previously undiagnosed mental health conditions, decreases in depressive symptomatology or hopelessness)? Does the effect of screening programs vary by population characteristics?
6. For those identified as being at increased risk of suicide, what are the harms of behaviorally-based or pharmacologic treatment to reduce suicide risk? Do the harms vary by population characteristics?

Population characteristics include: sex; age; race/ethnicity; comorbid medical illness; history of previous suicide attempts; and social, mental health, or other psychological factors.

Data Sources and Searches

In addition to considering all studies from the previous review for inclusion in the current review, we searched MEDLINE, PsycINFO, Cumulative Index for Nursing and Allied Health Literature, and the Cochrane Collaboration Registry of Controlled Trials for studies published since January 2002 through July 17, 2012 (**Appendix B**) to bridge from the previous review (which searched through June 2002). As this review was intended as an update, we did not substantially change the scope of the previous review. Additionally, we did not conduct database searches for research published during the period covered by the previous review. For literature published prior to January 2002, however, we hand-searched reference lists and tables of included and excluded studies in the previous review and additional relevant reviews to ensure that all pertinent literature was identified. A medical librarian also conducted grey literature searches of government agencies (e.g., Agency for Healthcare Research and Quality [AHRQ], Institute of Medicine, VA, and NICE), professional organizations (e.g., American Psychiatric Association, American Psychological Association, American Academy of Child and Adolescent Psychiatry, and the American Association of Suicidology), and other organizations (e.g., Robert Wood Johnson Foundation, World Health Organization, British Medical Journal Clinical Evidence, and the Campbell Collaboration) that may sponsor or publish relevant research for synthesized evidence published outside of peer-reviewed journals. We also used news and table-of-contents alerts from Google, ScienceDirect, and HighWire Press to help us identify potentially eligible trials that were published between bridge searches.

Study Selection

Two investigators independently reviewed abstracts and articles against specified inclusion and exclusion criteria. Disagreements were resolved by consultation with the larger project team. **Appendix C** details our inclusion and exclusion criteria. Excluded studies and reasons for exclusion are listed in **Appendix D**.

This review had no restrictions on participants' ages, country in which the study took place, or minimum time to followup. We excluded trials that only included patients with chronic psychotic disorders or mental health conditions other than depression, substance misuse, PTSD, or BPD.

For KQs 1, 4, and 5 (benefits of screening or treatment), we required included trials to list reduction in suicide, suicide attempts, or suicidal ideation as a primary aim. As such, trials targeting detection or general management of disorders such as depression or substance misuse that reported suicide-related outcomes were not included unless it was clear that suicide prevention was a primary aim of the study. Trials of treatment in the ED or inpatient setting were excluded, as were intervention approaches that could not be replicated in health care settings (e.g., media campaigns and public policy interventions). However, we did include trials if participants were identified through an ED or inpatient service (including intake assessments and

randomization) as long as the intervention occurred after discharge. We excluded trials that compared two competing treatment approaches unless there was also a control condition. Control conditions for these trials included usual care or nonspecific supportive care.

For KQ 2 (test performance characteristics), screening instruments had to meet one of two requirements: 1) designed to identify suicidal thoughts or behaviors (i.e., we did not include studies that looked at the sensitivity of depression screeners to identify people who are experiencing suicidal thoughts) or 2) included a constellation of attitudes thought to be essentially synonymous with suicidality without expressly including the desire to kill oneself, such as the Geriatrics Depression Scale–Suicide Ideation (GDS-SI) subscale. The GDS-SI measures hopelessness, worthlessness, emptiness, absence of happiness, and lack of perception that it is wonderful to be alive. Included studies reported sensitivity, specificity, positive predictive value (PPV), or negative predictive value (NPV) relative to a valid reference standard administered within a short period of time of the screening test (preferably 24 hours), or provided the raw data to calculate one or more of these statistics.

The reference standard for included studies had to involve an interview that included more than one or two items and was administered by a mental health clinician or, if using a structured or semistructured interview, other trained staff. These interviews had to target current or very recent suicidal ideation and behavior (within the previous 2 weeks). We also considered a medical chart notation of suicidality to be a valid reference standard if the study confirmed that the chart notes were the result of an acceptable interview process, such as a psychological assessment in a mental health facility. We excluded trials whose reference standard was future suicidal behavior (i.e., behavior that occurred more than 3 months after the screening), as we were addressing accuracy of screening tools to identify persons who are currently suicidal for interventions, rather than distal prognostic value, especially with unknown treatment occurring in the interim. We also excluded trials if the reference standard was a prediction as to whether a person had recently made a suicide attempt or were admitted to an inpatient mental health facility.

All trials meeting inclusion criteria for KQs 1, 2, 4, or 5 were also examined for reported harms (KQs 3 and 6), including a paradoxical effect on suicidality. We also consulted experts in the field to identify harms that might not have been identified by the trials but were still serious enough to warrant caution in implementing suicide risk screening. We also inquired about harms that could be identified through observational study designs. Despite this effort, we identified no other harms that outweighed the benefit of avoiding a suicide death or attempt.

Quality Assessment and Data Abstraction

Two investigators independently assessed the methodological quality of each study using predefined, design-specific quality criteria based on methods developed by the USPSTF and supplemented by the Quality Assessment of Diagnostic Accuracy Studies tool for the quality assessment of diagnostic accuracy (screening) studies (**Appendix E Table 1**). Briefly, we assessed trials for randomization procedures, blinding (allocation, outcomes assessment, and, if appropriate, participants and interventionists), comparability between groups (in recruitment and assessment procedures, retention, and baseline characteristics), overall study retention, and

analysis methods (handling of missing data, appropriate use of statistical procedures, potential for selective reporting of outcomes). In general, good-quality trials blinded researchers who performed assessment or randomization tasks , had followup data on 90 percent or more of participants, reported group-specific followup with less than 10 percentage-point differences between the groups, and used validated instruments or otherwise acceptable measurement procedures. We rated trials as poor quality if attrition in the treatment and control groups differed by more than 20 percentage points, if overall attrition was higher than 40 percent, or if other important flaws were identified (e.g., groups clearly or very likely not comparable at baseline, assessment procedures differed between groups). We also rated trials as poor quality if we identified so many minor flaws or missing pieces of information that we had low confidence that the study's results were valid. We resolved disagreements in quality assessment through discussion and, if necessary, consultation with a third reviewer. We excluded studies rated as poor-quality from this review.

One investigator abstracted data from all included studies into a standard evidence table and a second investigator checked the data for accuracy. Data abstracted included details on study design, population, recruitment procedures, interventions, and outcomes. We also abstracted a set of treatment components identified by a recent review examining training manuals of empirically supported treatments for suicidality.[81] These researchers organized treatment components into 12 conceptually-defined treatment factors: multimodal treatment, clear treatment framework, suicidality as an explicit target behavior, agreed-upon strategy to manage suicidal crises, attention to affect, focus on treatment relationship, active therapist, interpretations, exploratory interventions, supportive interventions, change-oriented interventions, and support for therapists (see **Appendix F** for description of these categories).

Data Synthesis and Analysis

For all KQs, we created tables showing results along with important study characteristics, which we critically examined to identify the range of results and potential associations with effect size. We found few trials that addressed KQs 1, 2, and 3 (benefits and harms of screening). As a result, we synthesized these trials qualitatively only and provide ranges of results, separately for different age groups, where applicable. We identified a substantial body of evidence addressing the benefits of treatment (KQs 4 and 5). We examined these data qualitatively and quantitatively. We examined trials limited to adolescents separately from those that were either limited to adults or that included mixed samples of adults and adolescents.

For KQs 4 and 5, we conducted random effects meta-analyses to estimate the effect size of suicide prevention interventions on suicide attempts, suicidal ideation, depression (for subsets of homogeneous trials), hopelessness, and global functioning. We ran separate meta-analyses for the psychotherapy interventions and enhanced usual care interventions, grouped by specific intervention subgroup. We also ran analyses separately for adults and adolescents. We used Stata Version 11.2 (StataCorp LP, College Station, TX) for all statistical analysis.

Risk ratios were analyzed for suicide attempts, based on the raw numbers of events and numbers of participants with followup. We analyzed standardized mean differences (SMDs) in change

from baseline for the continuous outcomes (suicidal ideation, depression, and global functioning). We calculated standard deviations (SDs) of change from baseline using a standard formula, which requires estimating the correlation between baseline and followup scores for each outcome.

Correlations between baseline and followup were estimated as follows. For global functioning, one of the included trials reported both baseline and followup means and SDs as well as the means and SDs for change scores, which allowed us to calculate the correlation between baseline and followup (0.41 in the intervention group and 0.71 in the control group). We found no trials that provided enough information to allow us to calculate the correlation for depression or suicidal ideation. Because of this, we based our estimates on reports of test-retest reliability,[99-104] but assumed lower correlations than those reported in test-retest studies, since followup intervals were substantially longer in the included trials than in the test-retest studies. We also assumed that correlations would be slightly higher in the control groups than the intervention group (since the intervention may override the natural history). For depression, we estimated the correlation between baseline and followup to be 0.50 for the intervention group and 0.60 in the control group. We assumed the correlation to be 0.20 in the intervention group and 0.30 in the control group for suicidal ideation. We encountered discrepancies in statistical significance between our calculated results in the meta-analysis and results reported in the trials.[105-109] In most cases, this resulted from the fact that the trial ran a repeated measures analysis examining change over time, as opposed to the simple change from baseline to one followup point in our meta-analysis.[106-109]

One trial for which we found a discrepancy between published results and meta-analysis results, however, did not report analysis methods.[105] This trial also did not appear to have performed a repeated measures or adjusted analysis, which could explain the discrepancy. It is possible that the correlations between baseline and followup that we estimated were substantially lower than the true correlation in this study, resulting in the discrepancy in statistical significance. We ran a sensitivity analysis assuming higher correlations (a less conservative analysis) to see if this discrepancy in statistical significance was eliminated and found that the discrepancy remained even with very high correlations (0.80 to 0.90 for suicidal ideation). We felt these high correlations were unlikely to be generalizable to other included trials, so we kept our original estimates.

We assessed the presence of statistical heterogeneity among the studies using standard chi-square tests and we estimated the magnitude of heterogeneity using the I^2 statistic.[110] We applied the Cochrane Collaboration's rules of thumb for interpreting I^2: less than 40 percent likely represents unimportant heterogeneity, 30 to 65 percent represents moderate heterogeneity, and 50 to 90 percent represents substantial heterogeneity; above 75 percent indicates considerable heterogeneity among the studies.[111] We also included prediction intervals in forest plots, which provide an estimate of where 95 percent of newly conducted trials would fall, assuming the between-study variability in the included trials held for new trials.[112] The prediction intervals are shown with pooled estimates on forest plots by the horizontal lines, which go out from the diamond showing the 95 percent confidence interval (CI) of the pooled effect. We interpreted effect sizes according to Cohen's rules of thumb, in which SMDs of 0.2 to less than 0.5 are considered small, 0.5 to less than 0.8 are medium, and 0.8 and above are large.[113]

The meta-analysis adjusted for the cluster randomization of two trials[114,115] by dividing the sample sizes in these studies by a design effect, which is based on average cluster size and the estimated intraclass correlation (ICC).[111] We estimated the ICC to be 0.05 since the cluster randomized trials in these trials randomized at the level of medical clinic, which we believed would have a low ICC. We performed tests of publication bias that examine whether the distribution of the effect sizes was symmetric with respect to effect precision (which is related to study n) using funnel plots and Egger's linear regression method. We conducted these analyses only for the three outcomes that included at least 10 trials: suicide attempts (psychotherapy and enhanced usual care trials analyzed separately), suicidal ideation (psychotherapy trials only), and depression (psychotherapy trials only).[116]

We used meta-regressions to explore heterogeneity in effect sizes among the KQ 4 and 5 trials for suicide attempts, suicidal ideation, and depression when at least 10 trials reported the outcome and the predictor of interest. Continuous variables were left as continuous variables, and categorical variables were converted to dummy variables. Since other work[77] and our initial qualitative analysis suggested that suicidality effects may be different between adolescents and adults, we included an indicator variable set to "1" if the trial was limited to adolescents and "0" if it was all or predominantly adults in all regression models. For all trials combined we examined the following study characteristics: whether the trial was limited to participants with a recent suicide attempt, the proportion of participants with suicide attempts prior to the index attempt that qualified them for the included trial (or the proportion with any suicide attempt, if none was required for inclusion in the trial), and whether the trial was conducted in the United States, all controlling for population age and time to followup. Additional components were examined for the psychotherapy trials: number of sessions, duration of the intervention (in months), number of sessions per week during the acute treatment phase, and the 12 treatment components described by Weinberg and colleagues (**Appendix F**).

USPSTF Involvement

This research was funded by AHRQ under a contract to support the work of the USPSTF. We worked with four USPSTF liaisons at key points in the review, particularly in the development of the KQs, analytic framework (**Figure 3**), and the inclusion and exclusion criteria (**Appendix C**), as well as finalizing the evidence synthesis. AHRQ had no role in the study selection, quality assessment, or evidence synthesis, and an AHRQ Medical Officer only provided oversight of the project, reviewed the draft report, and assisted in the external review of the report.

CHAPTER 3. RESULTS

Literature Search

We identified 56 eligible studies for inclusion in this review, reported in 86 publications, from our review of 3,925 abstracts and 303 articles (**Figure 4**). We identified seven trials addressing screening (KQs 1, 2, and 3): one examined short-term benefits of screening,[117] four examined performance characteristics of screening instruments,[67,118-120] and three examined adverse effects of screening.[117,121,122] Forty-nine trials addressed benefits of treatment (KQs 4 and 5), 36 of which were conducted in adults or mixed adolescent and adult populations[105-107,109,114,115,123-152] and 13 in adolescents.[108,153-164] The identified trials reported health outcomes, intermediate outcomes, or both. A subset of these trials (k=12) also reported adverse events of treatment, including paradoxical worsening of outcomes, which are discussed under KQ 6.[106,115,123,126,133,137-139,147,153,156,157]

Key Question 1: Do Screening Programs to Detect Suicide Risk Among Adolescents, Adults, and Older Adults in Primary Care Settings Result in Improved Health Outcomes or Intermediate Outcomes? Does the Effect of the Screening Programs Vary by Population Characteristics?

We identified one short-term, fair-quality trial (n=443) that addressed KQ 1. This trial found no clear short-term benefit of screening (i.e., within 2 weeks of screening).[117] This trial included adult primary care patients who screened positive for depression (ages 18 to 92 years; mean age, 48 years) identified from four practices in the United Kingdom. Patients were randomized to suicide screening or to answer health and lifestyle questions, with the primary aim of determining whether suicide screening increased the likelihood of suicidal ideation. Intervention-group participants screening positive for suicide risk were given information about helplines and other sources of help and were encouraged to use those resources. When followed up 2 weeks later, there were no statistically significant differences between groups in the proportion feeling that life was not worth living (28% in the intervention group vs. 24% in the control group), wishing they were dead (23% in both groups), or reporting thoughts of taking their own life (15% in the intervention group vs. 11% in the control group). At followup, one control group participant had attempted suicide; there were no suicide attempts in the intervention group. We cannot conclude, however, that screening prevents suicide attempts with only a single attempt in the whole trial, particularly since the direction of effect for other outcomes (e.g., suicidal ideation) did not trend toward benefit in the intervention group. Retention in this trial was only 81 percent at the 2-week followup and the authors did not report allocation concealment.

Key Question 2: Do Instruments to Screen for Increased Risk of Suicide Accurately Identify Adolescents, Adults, and Older Adults Who Are at Increased Risk in Primary Care Populations? Does the Accuracy of the Screening Instruments Vary by Population Characteristics?

We included four studies that reported on the accuracy of screening instruments for identifying individuals at increased risk of suicide (i.e., experiencing current or recent suicidal ideation, with or without recent suicidal behavior).[67,118-120] Two trials reported instrument accuracy in adolescent samples (combined n=799). One trial was conducted in an outpatient mental health setting among youth with a diagnosis of depression. This trial used a three-point clinicians' summary assessment that was based on a two-item screener.[118] The second trial used the Suicide Risk Screen (SRS), a 20-item screener embedded in a broader self-report questionnaire administered in schools by research staff to youth at risk of dropping out of high school.[119] A third study examined the clinical utility of three suicide-related items in primary care patients age 18 years and older with prescheduled appointments for any reason (n=1,001),[67] and the final study examined a suicide ideation subscale of the GDS-SI in general primary care patients age 65 years and older (n=626) (**Table 3**).[120]

We rated all of these trials as fair quality for a number of reasons. On the positive side, all trials applied the same reference standard to all screened participants and all pulled their sample from a single identified population (rather than pulling from separate high-risk and low-risk populations). The studies generally provided adequate information about the screening and reference tests. The one study in older adults, however, examined three possible cut-points for its scale, without a set-aside validation sample.[120] As a result, the performance characteristics associated with the optimal threshold they identified may overestimate the true performance of this screener. The index test was clearly interpreted without knowledge of the reference test in both trials in adults[67,120] and the trial of potential high school dropouts;[119] however, this information was not reported in the trial of depressed adolescents.[118] Only one study specifically reported that the reference test was independent of the screening test,[120] and in one study the results of the screening test were definitely used in the reference test.[119] The major source of concern with these studies was the time lag between the screening and reference tests. Only one of the trials applied the screening and reference tests within 24 hours for all participants.[67] The other studies either did not report the time lag,[120] reported a median lag of 6 days (range, 0 to 35 days; unclear if the reference test was always administered after the screener),[118] or reported a lag of 7 to 10 days (reference test always followed the screener).[119]

Although the two studies in adolescents used different approaches to assembling their samples, both represented high-risk groups that had 22 to 27 percent prevalence of suicidal ideation or behavior according to the reference standards. An even higher proportion screened positive (25% to 50%) (**Table 3**).[118,119] One of these studies compared the accuracy of mental health clinicians' three-level assessment (nonsuicidal, suicidal ideation, and suicide attempt) based on asking two questions about participants' behavior during the previous 2 weeks ("Have you thought of killing yourself?" and "Have you attempted suicide?") with the suicide items on the Kiddie Schedule for

Affective Disorders and Schizophrenia administered by trained raters.[118] This study sample was 82 percent female, with an average age of 16 years. The sensitivity was fairly low (52%) for this instrument, although the specificity was relatively high (85%) and PPV was 58 percent. These results may have low applicability to a general primary care setting, however, given that the screeners were mental health clinicians and the sample was limited to youth who had already screened positive for depression. The other study conducted in adolescents (mean age, 16 years; 42% female) compared a self-administered screening questionnaire (SRS, number of items not reported) with a computer-assisted clinician interview for identifying youth at high risk of suicide. This study reported sensitivity of 87 percent and specificity of 60 percent for the SRS, and fairly low PPV (38%).[119] Study authors did not describe the age and sex distribution of their sample. Likewise, they did not describe the timeframe of the suicide-related questions. Additionally, this study used the screening test's results as part of the reference test, which could inflate agreement between the screening and reference tests.

Another study conducted in adult primary care patients ages 18 to 70 years (66% between the ages of 26 and 55 years) administered a three-item questionnaire in the waiting room before a primary care visit. Each of the items for this instrument related to suicidal ideation during the past month. The items had sensitivities of 83 percent or higher and specificities of 81 percent or higher relative to a nurse-administered structured interview on the same day. The one item asking about "thoughts of death" had the highest sensitivity (100%), while the item about "feeling suicidal" had the greatest specificity (98%).[67] The PPVs were quite low for these items, ranging from 6 to 30 percent. The screening and references tests' independence in this study was unknown.

In older adults, a score of 1 or more on the five items of the GDS-SI yielded both sensitivity and specificity of 80 percent for suicidal ideation during the previous 2 weeks compared with suicide-related items on a structured interview.[120] The PPV was fairly low (33%) at a cut-off of 1. The GDS-SI does not ask directly about suicidality or death, but rather asks about feelings of emptiness, worthlessness, and hopelessness, and has two items assessing happiness (or unhappiness). This may have led to poorer sensitivity on the GDS-SI than the three single items explored in the other study in adults.[67] Alternatively, other differences in study or population characteristics (e.g., age, prevalence of suicidal ideation), including study quality, may explain possible between-study differences in test performance. The study of the GDS-SI maintained independence between the screening test and reference standard,[120] while the other study in adults did not report whether the screening test results could be viewed by the nurses who were administering the reference test.[67]

Only one study reported test performance characteristics for demographic or clinical subgroups.[120] This study reported that test performance characteristics did not differ across sex on the GDS-SI among older adults.

Key Question 3: Are There Harms Associated With Screening for Suicide Risk in Primary Care Settings? Do the Harms Vary by Population Characteristics?

Three trials reported on potential adverse effects of screening, including the trial of depressed adults in four primary care practices in the United Kingdom that was included in KQ 1 (n=443).[117] The two other trials were conducted in high school settings (total randomized, n=2,650).[121,122] The trial conducted in depressed adults found no statistically significant increases in suicide attempts or ideation at 2-weeks followup.[117] This trial had limited power and the results could be biased by differential ascertainment, since a higher proportion of those who were screened withdrew consent for followup (6.6% of screened vs. 2.2% of unscreened). While the authors did not report this result's statistical significance, these results do suggest that a subgroup of patients may have been disturbed by the screening. Overall, attrition in this fair-quality study was also somewhat high for such short followup (23% of the screened participants and 19% of the unscreened participants dropped out overall). The impact of increased withdrawal of consent and greater loss to followup in the screened group on results is unclear, but could bias against detecting short-term increases in suicidality after screening.

Both high school-based trials randomly assigned students to be screened for suicide risk on one of two occasions, 1 to 2 days apart.[121,122] The suicide screening items were embedded in screening instruments addressing broader mental health issues and current mood state, which were divided into two separate questionnaires that were administered over the course of two separate occasions. The experimental groups in both studies were asked these suicide screening questions on the first day, while the control group answered the suicide screening items during the second day. The larger trial (n=2,342) was conducted in 181 classes in six high schools in New York, which were randomized at the classroom level.[122] This study reported no immediate increase in percent reporting suicidal ideation (4.8% in those who had been screened for suicide risk 2 days ago vs. 3.9% in the unscreened group) or mean suicidal ideation scores (mean, 6.5 [SD, 11.5] in the screened group vs. 6.6 [SD, 10.5] in the unscreened group on the Suicidal Ideation Questionnaire-Junior [SIQ-JR]) in response to screening. This trial had no major quality concerns and was rated as good quality. The treatment groups were comparable in terms of age, sex, and race/ethnicity, and there were no differences in attrition between groups overall (6% in the intervention group vs. 7% in the control group) or as a function of depression, substance use, or suicide attempt history.

The other smaller trial (n=308), rated fair quality, was conducted in Australia, and found no differences in anger, confusion, depression, fatigue, or tension based on the Profile of Mood States (POMS) questionnaire between the two groups immediately after being screened for suicide risk or completing other mental health-related items.[121] It did find that those who were screened reported higher levels of vigor, although it seems unlikely that suicide screening would be related to increased vigor. During the study's second session, after students in both groups had answered the suicide risk screening items, only 8.9 percent of the students rated the suicide-related items as moderately or very distressing. A fairly large proportion (31.5%), however, found the items "a little distressing." Almost three fourths of students found the screening for suicidal ideation and self-harm to be moderately or very "worthwhile." Those who screened positive reported higher levels of distress and found the screening less worthwhile than those who did not screen positive. While this trial did not report group-specific followup, it did have high attrition overall for one of the forms (POMS) from the first to the second day (33% attrition overall).

While none of available trials in adolescents or adults were definitive, short-term harms due to suicide screening cannot be dismissed based on this evidence. None of the studies examined screening-related risk among demographic subgroups.

Key Question 4: For Those Identified as Being at Increased Risk of Suicide, Do Behaviorally-Based or Pharmacologic Interventions to Reduce Suicide Risk Result in Improved Health Outcomes? Does the Effect of the Interventions Vary by Population Characteristics?

Key Question 5: For Those Identified as Being at Increased Risk of Suicide, Do Behaviorally-Based or Pharmacologic Interventions to Reduce Suicide Risk Result in Improved Intermediate Outcomes? Does the Effect of the Interventions Vary by Population Characteristics?

We discuss health and intermediate outcomes together for all 49 trials that were included for either KQ 4 or KQ 5 to avoid excessive redundancy. **Table 4** (for adult trials) and **Table 5** (for adolescent trials) list all included trials and outcomes reported by each trial.

While some treatment trials used the term "suicide attempt," others used "self-harm" or "deliberate self-harm" (DSH). The use of these terms appeared to be primarily due to differences in terminology between countries, rather than differences in the study populations. Almost all trials in the United Kingdom, Australia, New Zealand, and the Netherlands used the terms "self-harm" or "DSH." Studies conducted in other countries, including the United States, usually used the term "suicide attempt." Three trials limited to people with BPD or BPD symptoms used the term "parasuicide" (defined as any intentional, acute self-injurious behavior with or without suicidal intent, including both suicide attempts and self-mutilative behaviors). Most trials did not characterize the "seriousness" or lethality of the suicide attempts or self-harm, and presumably included a range of intent to die. These populations, however, likely differed on the proportion of participants with frequent low-lethality suicide attempts. Unfortunately, we were unable to capture this dimension fully due to inconsistent reporting. We use the term "suicide attempt" when referring to this outcome generically. We use the terminology used in the trial when referring to a specific trial's results. **Table 6** (for adult trials) and **Table 7** (for adolescent trials) list the information on previous suicide attempts or self-harm that was provided, as well as demographic information and other population characteristics, such as reporting of substance abuse and depressive disorders. We used the high-lethality results for our outcome when researchers reported on suicide attempts with high lethality or intent to die separately from low-lethality suicide attempts. The relative differences between groups were similar for the different outcomes when multiple suicide or self-harm outcomes were reported in this way (data not shown).

We organized treatment trials into three broad intervention groups of psychotherapy, medication, and enhanced usual care. Among the psychotherapy trials, 11 were limited to adolescents.[108,153-161,163,164] The remaining trials were limited to adults or included both adolescents and adults. Thus, we discuss the results for psychotherapy trials separately for trials limited to adolescents and those that included adults. Subgroups of intervention types within the psychotherapy and enhanced usual care groups were also defined, but these trials did not explain between-study differences after studies were stratified by age group. Thus, we briefly report on the intervention subgroups, but emphasize overall broad intervention categories for summarizing results. **Table 8** (for adult trials) and **Table 9** (for adolescent trials) describe intervention characteristics and the control groups in all included trials.

Psychotherapy Interventions

Thirty trials investigated the use of a specific psychotherapeutic treatment approach, usually compared with usual care. Nineteen of these trials were conducted in adults[105-107,109,124,126,128,131,134,135,137,138,140-142,144-146,148] and 11 were conducted in adolescents.[108,153-161,163,164] Twenty-one of these trials (combining adult and adolescent trials) used cognitive behavioral treatment (CBT) or an approach that included substantial CBT elements. We describe these interventions broadly as "CBT and related" or "CBT-related." While this is a heterogeneous group of trials, there were important commonalities among the CBT-related trials in their attention to the connection between thoughts, feelings, and behavior, and all included some type of specific skills development, such as problem solving, managing affect, and communication. We further divided the CBT-related trials into four subgroups: CBT,[105,126,134,137,142,144-146,153,156,163] dialectical behavior therapy (DBT) (developed for patients with BPD),[128,140,141,148] problem-solving therapy,[106,107,109] and developmental group therapy (in adolescents only).[155,157,160] Other nonCBT approaches included psychodynamic or interpersonal approaches[108,124,135,159,164] and other approaches that could not be categorized elsewhere. We separated these "other" trials into studies involving direct therapeutic contact[131,154,161] and studies not involving direct therapeutic contact in our tables and forest plots.[138,158]

Summary of Psychotherapy Study Results.

Adults. **Table 10** provides a brief summary of results of all outcomes. Only six of the 19 trials of psychotherapy in adults reported suicide deaths, and we could not determine whether psychotherapy reduced the likelihood of suicide death due to relatively low event rates and small sample sizes. The proportion of adults with a suicide attempt or DSH was reduced by an average of 32 percent in those receiving the intervention compared with usual care (relative risk [RR], 0.68 [95% CI, 0.56 to 0.83]; k=11; n=1,583; I^2=16.1%) (**Figure 5**).

Additionally, there was a small beneficial effect on depression (SMD, -0.37 [95% CI, -0.55 to -0.19]; k=12; n=1,653; I^2=60.5%) (**Figure 6**).

In general, reductions in depression were reported in both groups, but greater reductions were seen in intervention participants. Psychotherapy did not show greater improvement than usual care for suicidal ideation (SMD, -0.10 [95% CI, -0.27 to 0.06]; k=8; n=964; I^2=26.3%) (**Figure 7**); most trials reported improvements in both intervention and control groups. Other health

outcomes and hopelessness were sparsely reported and had mixed results.

Adolescents. **Table 11** shows a brief summary of results of adolescents. The effects of suicide prevention treatment on deaths could not be determined, as there was only one death in any of the three trials reporting this outcome (**Table 11**). Suicide attempts were not reduced in adolescents with psychotherapy at 6 to 18 months (RR, 0.99 [95% CI, 0.75 to 1.31]; k=9; n=1,331; I^2=49.1%) (**Figure 8**).

The CI of the pooled effect was wide, however, and ranged from a 25 percent reduction in risk to a 31 percent increase in risk of suicide attempts. Four of the nine trials reporting this outcome reported a 22 percent or more increase in the risk of a suicide attempt. We cannot rule out the possibility of harm (or benefit) using the existing evidence even though there was a small beneficial effect on depression (SMD, -0.36,[95% CI, -0.63 to -0.08]; k=6; n=631; I^2=53.6) (**Figure 9**).

Although statistical heterogeneity was high, all effects were in the direction of the intervention's benefit on depression (but most were not statistically significant). In general, reductions in depression were reported in both groups, but greater gains were seen in intervention participants.

No beneficial effect was found for suicidal ideation (SMD, -0.22 [95% CI, -0.46 to 0.02]; k=6; n=629; I^2=41.2%) (**Figure 10**), for which both groups generally showed substantial improvement.

Other health outcomes were sparsely reported and rarely showed beneficial effects for the interventions, although results for feelings of hopelessness were mixed.

Predictors of effect size. Across the body of psychotherapy studies, we found no clear predictors of effect size other than target age (adults vs. adolescents), despite examining a large number of potential factors that could influence effect size for three different outcomes (suicide attempts, suicidal ideation, and depression). While the effect of age was only present for suicide attempts and not suicidal ideation or depression, we present all outcomes by population age group for consistency. Among adolescent trials, interventions that targeted parents as well as youth appeared to be more beneficial.

Detailed Description of Included Psychotherapy Studies in Adults. A total of 19 psychotherapy trials (n=2,460) were included, covering CBT and CBT-related therapies (k=15; n=2,144), psychodynamic therapy (k=2; n=163), and other therapies that could not be clearly categorized based on the information provided (k=2; n=153).

Population Characteristics of Psychotherapy Studies in Adults.

Risk at enrollment. Most of the psychotherapy trials enrolled participants with a recent suicide attempt or episode of DSH in the recent (up to 8 weeks) past[107,126,131,134,135,137,140-142,145,146] or within the past year.[109,128] Three trials identified participants at increased risk of suicide through screening: one trial of CBT as part of a population-based epidemiologic study in Sri Lanka[105] and two conducted in university settings.[106,138] One of the trials included adults evaluated in an

ED setting after a suicide attempt or period of acute risk who were judged to be safe for discharge with no mental health care for 2 weeks.[131]

Age and sex. The average age of trial participants was generally in the mid-20s to mid-30s, when these data were presented. Three American trials focused on young adults or were conducted in university settings, and participants in these trials had average ages ranging from 19 to 23 years.[106,138,144] Older adults were underrepresented in these trials. While one trial in Sri Lanka included participants as old as age 74 years,[142] the remaining included participants up to their early- or mid-60s,[105,124,126,128,131,135,148,165] early- or mid-50s,[109,134] age 45 years,[140,141] or age 35 years.[145] Other than the DBT trials, most trials included populations that were one half to two thirds female. The DBT trials were all limited to females with BPD.

Location and ethnicity. Included trials took place in the United States,[106,126,131,138,140,141,144] the United Kingdom,[124,134,135,137,146] Australia,[128] New Zealand,[107] the Netherlands,[145,148] Ireland,[109] and Sri Lanka.[105,142] Few U.S.- or European-based trials reported substantial minority representation. Two of the CBT trials conducted in the United States reported samples that were 65 percent nonwhite (60% African American)[126] and 26 percent African American.[144] In addition, two of the problem-solving trials (in the United States and New Zealand) reported that 25 to 39 percent of their samples were racial or ethnic minorities, with the largest groups being Asian/Pacific Islanders (15% in the U.S. trial) and Maori (16% in the New Zealand trial).[106,107] Finally, one of the "other" category trials included 14 percent African American participants, 10 percent of mixed racial background or "other," and 11 percent of the remaining participants were evenly divided among Latino, Asian/Pacific Islander, and "unknown" ethnicity.[131]

Previous history of suicide attempts. Of the 19 psychotherapy trials, most provided some information about suicide attempts or episodes of DSH prior to those that initiated their inclusion in the trial. All (or almost all) participants in seven of the trials had a previous history of DSH,[109,128,134,140,141,146,148] with the average number of previous episodes ranging from two[109] to 26 attempts or episodes[128] (where reported). Prior attempts or DSH were an inclusion requirement in five of these trials.[109,128,140,141,146] Four of the psychotherapy trials did not report the proportion of participants with previous suicide attempts or DSH.[105,106,124,142] In the remaining trials, 18 to 72 percent had a previous suicide attempt or DSH.

Mental health issues. Trials were inconsistent in their reporting of mental health diagnoses, and samples were heterogeneous in those that did report them. **Table 6** lists information provided by the trials on substance and depressive disorders. All trials of DBT were limited to females with BPD.

Intervention Characteristics of Psychotherapy Studies in Adults. Details of the intervention and control groups for all trials are provided in **Table 8** and **Appendix G**.

CBT trials. The nine trials examining the effects of CBT in adults used a wide variety of approaches, although all attempted to help participants understand the connection between thoughts, feelings, and behavior, and provided some direct skills development in areas such as problem-solving and communication. Four of the CBT trials involved eight sessions or fewer,[105,134,137,146] while the remaining five involved 10 or more sessions, generally lasting 2.5 to 6

months. One trial examined the use of a 2-week intensive outpatient program of daily 9-hour hospital-based care; this was the only trial that used group-based treatment.[144] The remaining trials used individual treatment, either with or without sessions with family members. The control groups in these trials received usual care. One trial put control group participants on a waiting list for CBT, but this also group only received usual care.[142]

DBT trials. The four DBT trials all referenced treatment manuals developed by the author of the U.S.-based trials.[128,140,141,148] These interventions were very intensive and involved more than an estimated 100 sessions over a 1-year period. These trials included weekly individual psychotherapy, telephone contacts between sessions, a weekly 2.5-hour skills training group, and weekly support and/or supervision meetings for therapists. Primary targets for DBT are skills-building (e.g., emotional regulation, interpersonal skills), increasing motivation for skillful behavior, ensuring generalization of newly acquired skills to the natural environment, and enhancing therapists' capabilities and motivation to treat patients effectively. While three of the trials compared DBT with community treatment as the usual care (with or without being on the waitlist for DBT),[128,140,148] one trial enlisted therapists judged to be "experts" in the other approaches for the comparison group.[141]

Problem-solving therapy trials. Three trials focused on teaching participants problem-solving techniques, which is an important component of CBT.[106,107,109] The two problem-solving trials in patients with recent self-harm involved four to nine individual or group sessions over a 2- to 3-month period.[107,109] These trials compared this approach with usual care, which involved standard individual therapy in outpatient or day hospitals in one trial[109] and possible referral to a range of services in the other trial, including multidisciplinary teams, mental health crisis teams, and alcohol or drug treatment centers.[107] The third trial was conducted in a university setting and involved a one-time, 40-minute didactic video describing the problem-solving process. The control group in this study viewed a video covering general health topics such as diet, exercise, and sleep habits.[106]

Psychodynamic/interpersonal therapy trials. Psychodynamic treatment focuses on identifying how unconscious beliefs and unresolved conflicts affect behavior, particularly in interpersonal interactions. The treatment generally involves interpretation of client's behavior and interpersonal interactions as reflecting underlying beliefs, of which the client is largely unaware. The two trials conducted in adults were very heterogeneous in intensity and ranged from four weekly sessions of manual-based interpersonal therapy[135] to long-term outpatient partial hospitalization for an average of 17 months.[124]

Other trials. Two trials were categorized as "other," and one involved direct therapeutic contact[131] while the other did not.[138] The intervention that involved direct therapeutic contact engaged the participant in a collaborative assessment and treatment approach.[131] This trial did not dictate specific session-by-session content or the exact number of sessions expected, but rather specified the use of a collaborative approach that was suicide-focused. This approach required providers to begin each session by completing the Suicide Status Form with the patient and ending the session with the development of a treatment plan, which always included a crisis response plan. The other trial had participants write about difficult times four times over the course of 2 weeks, with or without instruction to re-interpret the difficult times, compared with

writing about a neutral topic.[138]

Quality Assessment of Psychotherapy Studies in Adults. Quality assessment results are summarized in **Appendix E Table 2**. We rated all adult psychotherapy trials as fair quality. The three best-quality psychotherapy trials either definitely or likely used valid random assignment, allocation concealment, blinding of outcomes assessment, and randomized at least 100 participants.[107,135,141] The only quality concerns with these trials were relatively low retention at followup for one or more outcomes. Although one of these trials had high (99%) followup for medical records-based outcomes, followup was only 75 percent for self-report outcomes.[107] Overall retention in the other two trials was about 80 percent. One of these trials had substantially higher retention in the intervention group (88.5%) than in the control group (71.4%).[141] Another trial reported high retention (90% for the main outcomes) and generally good procedures, but failed to report blinding of outcomes assessment.[146]

Although several more of the trials reported retention of 90 percent or more at one or more followups,[105,109,124,134,137,138,142] all of these had multiple other flaws, which were primarily failure to report valid random assignment procedures,[124,134,137,138,142] failure to report allocation concealment,[105,124,137,142] and/or failure to report or definite lack of complete blinding of outcomes assessment.[109,124,137,138] Two of the trials that reported high followup rates were also very small and only randomized between 10 to 20 participants, which makes ensuring comparability between groups difficult.[105,109]

Detailed Results of Psychotherapy Studies in Adults.

Suicide deaths (KQ 4). There were a total of 10 suicide deaths in six psychotherapy trials reporting this outcome, among the 970 participants with followup in these trials (**Appendix H Table 1**).[106,135,137,141,145,146] Three suicide deaths occurred among participants in the intervention groups (0.62% of intervention participants across all studies) and seven among those in control groups (1.44% of control group participants across all studies). As such, we have insufficient power to detect effects on such a rare outcome, although available data appeared to exclude a paradoxical harm (i.e., increase in suicide deaths) with psychotherapy.

Suicide attempts (KQ 4). The overall pooled effect for all adult psychotherapy trials reporting suicide attempts demonstrated a 32 percent reduction in suicide attempts (RR, 0.68 [95% CI, 0.56 to 0.83]; k=11; n=1,583; I^2=16.1%) (**Figure 5**). All effects were in the direction of a benefit, ranging from a 14 to 71 percent reduction in risk, although the effect was statistically significant for only five of the trials (**Table 6**). The upper bound of the prediction interval was also less than 1.0, suggesting that this result would likely remain statistically significant if future trials were to be added. Two trials that were not included in the meta-analysis reported average number of suicide attempts per person and both reported fewer attempts in intervention participants than control participants.[124,145]

Ten of the 15 CBT-related trials reported the proportion of participants with a suicide attempt or self-harm. Overall, CBT-related trials showed a pooled 26 percent reduction in the proportion of participants reporting suicide attempts among those that could be pooled (RR, 0.74 [95% CI, 0.61 to 0.88]; k=8; n=1,406; I^2=9.7%) (data not shown). The prediction interval in this analysis

was bounded by 1.0 on the upper end, also suggesting a fairly robust effect. Results support a beneficial effect in adults for both DBT (limited to females with BPD) and CBT (**Appendix H Table 2**).

Three of the four remaining trials of psychodynamic and other treatment approaches in adults reported suicide attempts. These trials found reductions ranging from 38 to 69 percent at 6 to 12 months. These reductions, however, were statistically significant in only the two psychodynamic trials (only one of these was statistically significant in the meta-analysis).

Other health outcomes (KQ 4). Other health outcomes were sparsely reported. DBT generally reduced inpatient psychiatric use in female BPD patients at 12 to 18 months, including median inpatient psychiatric days (17 days in the DBT group vs. 51 days in the usual care group),[140] and percent with a psychiatric admission (16.6% in the DBT group vs. 48.9% with treatment by community experts) (**Appendix H Table 3**).[141] The other DBT trial, however, found a smaller difference in percent with a psychiatric admission (18.4% in the DBT group vs. 20.0% in the usual care group) and no differences in a number of other measures of inpatient use.[128] The very-intensive psychodynamic partial hospitalization intervention in the United Kingdom in adults reported a reduction in average length of stay at 18 months (average of 4 days in the intervention group vs. 22 days in the control group) and 36 months (1.7 days in the intervention group vs. 15.8 days in the control group).[124] Similarly, one of the CBT trials found reductions in percent of participants with psychiatric inpatient stays between 6 and 9 months postbaseline (2% in the intervention group vs. 21% in the control group), but no statistically significant differences at other followups.[145] In addition, a U.S. trial that engaged participants in a collaborative assessment and treatment approach found comparable declines in inpatient and ED or urgent care use in both groups, although these data were not analyzed statistically.[131]

Six of the adult psychotherapy trials reported functioning or quality of life outcomes (**Appendix H Table 4**).[124,128,131,134,137,146] Only one of these six trials showed a benefit of treatment. The intervention in this trial was an intensive psychodynamically-oriented partial hospitalization.[124] One of the DBT trials also reported a number of other functioning and quality of life outcomes.[128] This trial found a benefit of treatment on days in bed and the psychological domain of quality of life, but no group differences in days out of role or the physical, environmental, or social domains of quality of life (data not shown).

Suicidal ideation (KQ 5). Psychotherapy trials generally did not demonstrate a benefit for suicidal ideation (SMD, -0.10 [95% CI, -0.27 to 0.06]; k=8; n=964; I^2=26.3%), where most trials reported improvement in both the intervention and control groups (**Appendix H Table 5**). While half of the trials reporting this outcome did show statistically significant group differences, these effects were small.[105-107,131,135,142] The trial of brief interpersonal therapy conducted in the United Kingdom had a relatively large and statistically significant effect on suicidal ideation. Scores on the 38-point Scale for Suicide Ideation (SSI) dropped by 8 points in the intervention group and only 1.5 points in the usual care group, for a SMD of 0.46.[135]

Depression (KQ 5). Fifteen of the 19 psychotherapy trials reported depression (**Appendix H Table 6**). More than half of these trials reported greater improvement in intervention than usual care groups at one or more followups.[106,107,109,124,126,134,135,142,145] The pooled effect demonstrated

a small beneficial effect (SMD, -0.37 [95% CI, -0.55 to -0.19]; k=12; n=1,653; I^2=60.5%) (**Figure 6**). CBT-related interventions improved depression (SMD, -0.32 [95% CI, -0.50 to -0.13]; k=9; n=1,471; I^2=60.1%) (data not shown), particularly problem-solving therapy and CBT. Benefits were not seen for DBT in female patients with BPD, however. Both of the psychodynamic approaches reported at least medium effect sizes.[124,135] The trial of four individual interpersonal treatment sessions in the United Kingdom, for example, reported a reduction of 11.4 points on the Beck Depression Inventory (BDI) (range, 0 to 63) after 6 months compared with a reduction of 4.8 points with usual care (SMD, -0.55). Both of these groups' average scores were in the "severe" depression range at baseline. At 6-month followup, the intervention group's average score was in the "mild" range, while the usual care group's average score was in the "moderate" range.[135]

Hopelessness (KQ 5). Hopelessness was sparsely reported, and results were mixed in those trials that did report on this outcome (**Appendix H Table 7**). The greatest benefit was seen in the problem-solving trials, which all reported hopelessness. The pooled effect in these studies showed a small benefit (SMD, -0.47 [95% CI, -0.91 to -0.04]; k=3; n=511; I^2=61.5%) (data not shown). The largest of these three trials, which included four to nine sessions of manual-based individual problem-solving therapy, found a three-point greater improvement on the Beck Hopelessness Scale. For this trial, both the intervention and usual care groups began in the "moderate" hopelessness range and had average ratings in the "mild" hopelessness range at 12-month followup.

Detailed Description of Included Psychotherapy Studies in Adolescents. Twelve trials examined the effects of psychotherapy on suicide risk in adolescents, including three CBT trials[153,156,163] (n=365), three developmental group therapy trials[155,157,160] (n=501), three psychodynamically-oriented interventions[108,159,164] (n=225), and three that could not be clearly categorized into one of these groups (n=1,301).[154,158,161] Two of these provided assessment and direct contact with a counselor or therapist, without describing specific components or approaches,[154,161] and the other recruited youth-nominated adults to act as support persons.[158]

Population Characteristics of Psychotherapy Studies in Adolescents. Three very similar trials examined the effects of developmental group therapy (**Tables 4, 7,** and **9**) in adolescents with recent DSH in the United Kingdom[155,160] and Australia.[157] Two of these trials additionally required at least two episodes of DSH in the past year.[155,157] Samples in the developmental group therapy trials were 78 to 90 percent female with high rates of depression (57% to 83%). Racial and ethnic minorities were minimally represented in the one trial reporting on minority status.[155]

Of the remaining nine trials, four identified youth at increased risk of suicide through screening.[108,154,159,161] One of these trials, which examined interpersonal therapy in the United States, involved screening during primary care or ED visits.[108] The others screened high school students in the United States[154,161] (one only among youth identified as being at risk of dropping out of high school)[154] and Taiwan.[159] The remaining three trials included youth with recent suicide attempts or DSH[153,156,158] or youth with at least two symptom of BPD identified through mental health referrals.[164]

Most trials included youth age 12 years to ages 16 to 19 years, but three were limited to older

teens (ages 14 or 15 to 19 years).[154,161] Samples in six of the trials (including all three developmental group therapy trials) comprised more than three fourths females,[108,153,155,157,160,164] and the remaining trials comprised between one half and two thirds females.

Trials were conducted in the United States,[108,153,154,154,158,161] Australia,[157,164] the United Kingdom,[155,160] Canada,[156] and Taiwan.[159] Only four of these trials reported more than minimal racial or ethnic minority representation. A majority (74%) of the participants in the trial of interpersonal therapy that was based in the United States were African American.[153] The two U.S. high school-based trials categorized as "other" with direct therapeutic treatment included 57 and 34 percent nonwhite participants.[154,161] The largest racial groups reported in these studies were biracial (32% to 14%).[154,161] One of these also reported 12 to 13 percent each African American and Asian/Pacific Islander, with the remainder categorizing themselves as Hispanic/Latino (7%), other (3%), Alaskan Native/Native American (2%), or unknown (9%).[154] Twenty-nine percent of the youth in the Canadian CBT trial reported that they were something other than Caucasian, most describing themselves as "other" and small proportions describing themselves as African American (6%) and Hispanic (4%).[156]

There was a fairly wide range of depressive disorders at baseline among the trials other than developmental group therapy, ranging from 15 to 100 percent with a diagnosis of major depressive disorder. One trial was limited to youth with at least two symptoms of BPD.[164] Substance misuse was measured inconsistently and varied widely, from excluding participants with substance abuse diagnoses,[159] to about half of the sample reporting both alcohol abuse and illegal drug use,[156] to requiring substance abuse in all participants.[163]

Intervention Characteristics of Psychotherapy Studies in Adolescents.

CBT trials. Three trials conducted in adolescents examined CBT in the United States[153,163] and Canada.[156] The most intensive was a U.S.-based trial in participants with co-occurring suicidality and substance abuse. It involved 34 or more individual sessions along with slightly fewer sessions for parents covering CBT concepts and parenting and family sessions as needed with a different therapist. The other trial conducted in the United States used a 12- to 16-session skills-based approach that focused on problem-solving and affect management and included parents in the treatment.[153] This trial was the only adolescent psychotherapy trial to use an attention-matched control group, which involved unstructured sessions addressing symptoms and problems, on the same treatment schedule as the active intervention group. The other CBT trial was a Canadian study that was conducted in adolescents and involved a phone followup after an ED visit for a suicide attempt. This call involved a detailed assessment of the suicide attempt and the youth's support system, followed by an intervention of unknown intensity to reframe misconceptions and address maladaptive behavior and communication patterns.[156]

Developmental group therapy trials. The developmental group therapy interventions (which all referenced the same treatment manual) involved six weekly group sessions plus optional weekly sessions after completion of the main course.[155,157,160] The main course covered relationship issues and communication with peers and family, anger management, and information and discussion about depression, hopelessness, and suicide. In all cases the comparison was usual care.

Psychodynamic/interpersonal therapy trials. The psychodynamic trials used highly heterogeneous intervention approaches, including an 18-session manualized individual interpersonal therapy,[159] attachment-based family therapy,[108] and cognitive analytic therapy.[164] Cognitive analytic therapy was a 6-month, 24-session individual treatment compared with a manualized "usual care" designed to represent good clinical care that could be received in the community. The attachment-based family therapy intervention primarily addressed the core issue of problems with attachment between parent and child.[108] The attachment-based family trial had the greatest applicability to U.S. primary care, since adolescents were identified through primary care and ED screening in the United States.[108] This trial did not report the total number of sessions or intensity of treatment, but did report that it was of 3 months duration. This was compared with a facilitated referral process and ongoing clinical monitoring. The other trial, of interpersonal therapy, used psychoeducation and irregular supportive counseling with a teacher who had been taught basic counseling skills as the control group.[159]

Other trials. Finally, three trials were categorized as "other," two with direct therapeutic contact[154,161] and one without.[158] The trials with direct therapeutic contact recruited youth from American high schools through screening. One of these two trials limited the screening to youth identified as being at increased risk of dropping out of high school and screening positive for increased suicide risk.[154] Both trials included an intervention condition that involved a single session including 1) a 2-hour computer-assisted suicide assessment, 2) brief motivational counseling offering encouragement, empathy, and reinforcement of coping skills, and 3) a facilitated link to an adult at the school who could act as a support person, help the youth access community support, and facilitate communication between the school, parents, and youth. One of them had additional treatment groups evaluating the use of a two-session intervention with parents and the use of both parent and youth components.[161] Both trials compared the active treatment group(s) with the usual school protocol for addressing suicidality in students.

The final trial had the youth identify adult support persons who were then trained to provide the youth with support and maintain regular (at least weekly) contact for 3 months following hospital discharge.[158] This was compared with usual care.

Quality Assessment of Psychotherapy Studies in Adolescents. Appendix E Table 3 summarizes our quality assessment results. We rated all three developmental group therapy trials as good quality. Retention was excellent in all three of these trials (≥92% in all treatment groups). All three reported blinding of allocation and outcomes assessment, and although two did not explicitly report randomization procedures, randomization was likely valid since they appeared to involve a statistician. Two of the trials were fairly small (n=63 to 72 randomized).[157,160] One trial was approximately five times larger than the other two (n=366), yet still had very high followup.[155]

All of the remaining trials were rated fair quality. Three trials reported valid randomization procedures, allocation concealment, and blinded outcomes assessment and generally good study and analysis procedures; however, retention was below 80 percent in two of these,[158,164] and the other was a small CBT trial (n=40) with retention below 90 percent at 6-month followup.[163] In addition, the control group appeared to have higher levels of psychopathology than the intervention group, though differences were not statistically significant (e.g., medication use was

88% in the control group vs. 68% in the treatment group, 59% of control participants had a disruptive behavior disorder vs. 42% of the control group, the control group had 40% to 45% more participants with alcohol and cannabis use disorders than the intervention group). All of the remaining trials failed to report at least two of valid random assignments, allocation concealment, or blinding of outcomes assessment or had retention below 90 percent.[108,153,154,156,159]

Detailed Results of Psychotherapy Studies in Adolescents.

Suicide deaths (KQ 4). We found insufficient evidence to judge psychotherapy's impact on suicide deaths. There was only one suicide death in all three trials of adolescent psychotherapy reporting this outcome (**Appendix H Table 8**).[155,156,158]

Suicide attempts (KQ 4). All but one of the 12 psychotherapy trials in adolescents reported suicide attempts or DSH (**Appendix H Table 9**). The pooled effect for adolescents showed no reduction in suicide attempts in the trials that could be pooled (RR, 0.99 [95% CI, 0.75 to 1.31]; k=9; n=1,331; I^2=49.1%) (**Figure 8**). Four of the trials showed statistically nonsignificant increases in risk of 22 to 113 percent, which suggests the possibility of harm.[153,156,157,164] The trial that found the largest increase in risk, however, had very few events,[153] and another of these four did not see an increase in absolute risk at either 6- or 24-month followup. As such, the results for these trial should be interpreted with caution. Two trials could not be included in the meta-analysis; one of these reported no group differences in attempts with no further detail[161] and the other reported no differences in the number of suicide attempts at 2.5 months postbaseline (average of 0.10 attempts in the intervention group vs. 0.11 attempts in the control group).[154]

While one small, good-quality trial of developmental psychotherapy did report a large positive effect,[160] the two good-quality studies attempting to replicate this result failed to show a benefit of treatment. Another trial of CBT showed a comparable effect size, with an 85 percent reduction in suicide attempts;[163] however, this was a very small study with only seven suicide attempts total, so findings should be considered preliminary until they can be replicated by a larger trial.

Other health outcomes (KQ 4). The small CBT trial with the very large beneficial effect also showed a 70 percent reduction in percent of participants with an inpatient psychiatric hospitalization and a 73 percent reduction in participants with an ED visit.[163] The risk of hospitalization was reduced by 59 percent in the Canadian CBT trial that showed a 33 percent increase in risk of a suicide attempt at 6 months (18% in the intervention group with inpatient stays vs. 43% in the control group; p<0.001).[156] There were no differences reported in ED use in this trial, however. There were also no differences in inpatient use in trials of developmental group therapy[155,157] or the trial of youth-nominated support persons at any followup, up to 12 months (**Appendix H Table 10**).[158]

Developmental group therapy also did not demonstrate a beneficial effect on global functioning (**Appendix H Table 11**) in any of the trials, according to a World Health Organization instrument designed for children and adolescents (HoNOSCA). However, the pooled effect showed a small but statistically significant benefit (SMD, -0.28 [95% CI, -0.46 to -0.09]; k=3;

n=463; I^2=0%) (**Figure 11**). The weighted mean difference in change on the HoNOSCA between groups was 1.6 points on a 52-point scale. The trial of cognitive analytic therapy also showed no group differences in functioning.[164]

Suicidal ideation (KQ 5). Eleven of the 12 trials of psychotherapy in adolescents reported suicidal ideation; psychotherapy did not demonstrate a consistent benefit (**Appendix H Table 12**). The pooled effect was small and not statistically significant (SMD, -0.22 [95% CI, -0.46 to 0.02]; k=6; n=629; I^2=41.2%) (**Figure 10**), but five of the trials could not be included in the meta-analysis. Results in the five trials excluded from the meta-analysis were mixed: three reported no group differences in rate of change[154,163] or change from baseline at either 2 or 6 months (-1.4 in the intervention group vs. -1.5 in the control group on the Spectrum of Suicidal Behavior Scale at 6 months),[156] one reported group differences in change over time only for the treatment group that included both youth and parent components,[161] and one found greater improvement in the intervention group on the SIQ-JR at 1.5 months but not 3 months.[158] Overall, five of the 11 trials reported a statistically significant effect at one or more followups.[108,154,158,159,161] One of these trials had good applicability to primary care in the United States and examined interpersonal therapy in U.S. adolescents identified through screening in the ED or primary care.[108] This trial reported a 3.8-point reduction on a 38-point scale in the intervention group over 6 months compared with a 3.6-point increase in the usual care group. This was the largest effect size (SMD, -0.19) for the trials included in the meta-analysis,[108] other than the Taiwanese trial.[159] The Taiwanese trial used a control group that was likely less effective than usual care in the United States, involving psychoeducation and irregular supportive counseling with a teacher who had received basic instruction in counseling techniques, compared with 18 sessions of individual interpersonal therapy in Taiwanese adolescents.[159]

Depression (KQ 5). All but two of the adolescent trials reported depression (**Appendix H Table 13**), and the pooled effect showed a small benefit (SMD, -0.36 [95% CI, -0.63 to -0.08]; k=6; n=631; I^2=53.6%) (**Figure 9**), and again several trials could not be included in the meta-analysis.[154,158,161,163] Results in those excluded from the meta-analysis were mixed, and only three trials altogether reported statistically significant group differences.[154,159,161] The trial with the largest effect had a control group that was likely less effective than usual care in the United States.[159] A typical effect was a four-point difference in improvement on a 63-point scale and both groups ending the trial in the "mild" depression range, such as that seen in the trial of U.S. adolescents identified through primary care and ED screening.[108]

Hopelessness (KQ 5). Hopelessness was only reported in four of the adolescent psychotherapy trials,[154,158,159,161] and the largest benefit was seen in the Taiwanese trial of interpersonal psychotherapy involving a control group that may not be comparable to U.S. usual care (**Appendix H Table 14**).[159] Two other trials reported statistically significant group differences, one showed a benefit only at the 1-month followup,[161] and the other had a very small effect of questionable clinical importance: the intervention group showed a 0.5-point greater improvement on a two-item scale with unknown range.[154]

Predictors of Treatment Effect for Psychotherapy Trials. Intervention approaches were very heterogeneous. We attempted to capture both treatment intensity (number of sessions, duration of treatment, and sessions per week during the acute phase) and some specific intervention

components (as described in the Methods section) to examine characteristics using both meta-regression and qualitative approaches that were associated with beneficial effects. We also examined some additional study characteristics, including: whether the study was conducted in the United States, time to followup, percent of participants in the sample with suicide attempts prior to the index attempt (or a history of multiple attempts, if there was no index attempt), and whether the participant was recruited into the study in the immediate aftermath of a suicide attempt. All meta-regressions were controlled for age of the sample (adolescents vs. adults). We were unable to fully characterize all trials due to inconsistent reporting. These results should be considered exploratory and hypothesis-generating rather than definitive due to the challenges in accurately identifying the characteristics and the large number of characteristics explored.

For suicide attempts, trials of adolescents were less likely to show a benefit than trials that were predominantly or entirely adults. Only four (33%) of the psychotherapy trials in adolescents reported a 20 percent or greater reduction in risk of suicide attempts compared with 82 percent of the adult psychotherapy trials. Similarly, all but one (86%) of the psychotherapy trials conducted in the United States reported at least a 20 percent reduction in the risk of a suicide attempt; 55 percent of the trials conducted elsewhere reported reductions of that magnitude. A number of other factors were at least qualitatively associated with beneficial effects, such as time to followup, number of treatment sessions, treatment intensity during the acute treatment phase, and using a multimodal treatment approach. Trials with followup longer than 6 months, that included more than six treatment sessions, with more than one session per week during the acute treatment phase, and that used multimodal treatment were more likely to report at least a 20 percent reduction in risk of suicide attempts. The trials in adolescents were generally not evenly distributed over these characteristics, however. After controlling for the target age (adolescents vs. adults) in the meta-regression, none of these factors were statistically significant. Thus, disentangling the effects of these components from the effects of the age of the sample was impossible.

Although the meta-regression did not reveal a relationship between the proportion of patients with previous suicide attempts and effect size, one trial directly examined whether those with previous self-harm showed the same level of benefit as those who had only a single episode (for which they were recruited into the study).[107] The problem-solving treatment was beneficial in patients with a history of self-harm (RR, 0.39 [95% CI, 0.07 to 0.60]; p=0.03) but not for those who had no prior episodes of self-harm. It was unclear if this was an a priori hypothesis or an exploratory analysis.

Within the group of adolescent psychotherapy trials, interventions that targeted parents as well as youth appeared to be more likely to be beneficial. The two trials that included full participation of parents had two of the three largest effect sizes for suicide attempts.[108,163] In addition, one trial compared three different intervention arms with usual care: a youth-targeted intervention, a parent-targeted intervention, and both the youth and parent interventions combined.[161] This trial found that only the combined youth and parent intervention was effective in improving suicidal ideation, depression, and hopelessness.

The age of the individuals in the sample did not appear to be related to effect size for suicidal ideation in a slightly different subset of studies. Further, studies that were conducted in the

United States generally had smaller effects (in contrast to the results for suicide attempts). In addition, trials with shorter followup tended to show greater effects on suicidal ideation. The three trials with the largest effects, however, all had less than 6 months of followup and were all conducted outside of the United States.[105,109,159] These were conducted in Taiwan, Sri Lanka, and Ireland. These were all small trials (n randomized ranged from 10 to 73) and at least one used a control group that would likely be less effective than usual care treatment in the United States.[159] Thus, while it may make intuitive sense that shorter followup would be associated with greater effect sizes for suicidal ideation, the effects of followup time and country cannot be disentangled from each other in this sample. None of these three trials reported suicide attempts.

No clear or consistent relationships emerged between treatment or study characteristics and effect size for depression.

Medication Interventions

Study Characteristics of the Medication Trial. We included one fair-quality, placebo-controlled trial of a medication to prevent suicide (**Table 4**), which examined the effectiveness of lithium plus usual care in preventing suicide in patients with depression-spectrum disorders and a recent suicide attempt (n=167 randomized).[139] This trial was conducted in Germany and did not report participants' racial and ethnic background (**Table 6**). Fifty-seven percent of the sample was female, and the average age was 39 years (age range not reported). Many of these participants (76%) also had a major depressive disorder diagnosis. This trial suffered from low retention, as only 31 percent of participants were retained at final 13-month followup. Thirteen of the 17 suicide attempts documented by the study and all three of the suicide deaths, however, occurred during the first 3 months, when retention was acceptable.

Results of the Medication Trial. This trial reported three suicide deaths. All three of these deaths occurred among participants taking placebo medications (p=0.05 for difference in incidence rate) (**Table 10**). This study did not describe how suicide deaths were assessed or the number of participants contributing to this analysis. At both 2- and 3-month followup, there were fewer suicide attempts in the intervention group than in the control group among those with followup data, but statistical significance was not reported (3.6% with suicide attempt in those taking lithium vs. 7.2% in those taking placebo at 2 months, 6.0% in the lithium group vs. 9.1% in the placebo group at 3 months). These groups did not differ in cumulative survival without a suicide attempt over the entire 13 months of followup (hazard ratio, 0.517; p=0.21, adjusted for age, sex, and prior suicide attempts). Suicide attempts were based on self-report and did not appear to be corroborated by medical records or in any other way. Those taking lithium did not differ from those taking placebo in suicidal ideation at followup.

Enhanced Usual Care

Seventeen trials attempted to enhance usual care through a variety of approaches; all attempted to improve either the quality or format of recommended treatment (in either primary or specialty care) or improve patient adherence to usual care, with little to no direct therapeutic counseling or specific prescription for a psychotherapeutic approach that should be used (**Table 4**). One of these trials was limited to adolescents and young adults (ages 15 to 24 years),[162] two to older

adult primary care patients,[114,152] and the remaining included wide age ranges covering primarily adults. Population characteristics for all trials in the group can be found in **Table 6** (adults and older adults) and **Table** 7 (adolescents).

Both trials in older adults were highly relevant to primary care populations. One, the Prevention of Suicide in Primary Care Elderly: Collaborative Trial (PROSPECT), addressed only depressed older adults (ages 60 to 94 years) and was the only trial that used primary care-based (depression) screening in the United States to identify eligible study participants.[114] The other trial of older adults was a large cluster-randomized trial (randomized at the provider level) that included all patients older than age 60 years on the panels of participating providers, so it was not limited to patients who screened positive for suicidal ideation or had known risk factors for suicide, but was representative of a general Australian primary care population.[152]

One of the included trials was a nonrandomized, population-based, practice-based intervention trial that compared an intervention and a control region in the county with the highest suicide rate in Hungary and reported suicide rates per 100,000 persons as its outcome, rather than following an identified sample of individuals.[151] This study is described separately from the other adult-focused trials.

All of the remaining trials targeted participants who had an ED visit or inpatient stay related to a suicide attempt or self-harm, and were either limited to adults across a wide age range or primarily addressed adults but included some adolescents (**Table 6**). We divided the trials into three subgroups: practice-based interventions,[115,130] interventions to improve treatment adherence with direct person-to-person contact,[123,129,132,133,147,149,150] and interventions to improve treatment adherence without person-to-person contact.[125,127,136,143] We group the three subcategories together when discussing results, however, since treatment approach did not appear to have an impact on treatment results.

Summary of Results for Enhanced Usual Care Trials. Seven of the 17 enhanced usual care trials reported deaths, including PROSPECT in older adults. PROSPECT reported only a single suicide death, found no group differences in suicide attempts, and found a reduction in all-cause mortality after 5 years.[114] Depression and suicidal ideation were also reduced in the intervention group through 8 months (for suicidal ideation) and 24 months (for depression). The Hungarian population-based trial found no reduction in suicide deaths from a 5-year provider-education intervention that also offered free consultation and a depression clinic for referral.[151] After 5 years, the suicide rate was 40.7 per 100,000 in the intervention region and 47.1 per 100,000 in the control region. The trial in adolescents did not report deaths.[162]

Among the remaining trials, the largest trial reported a 49 percent reduction in suicide deaths at 2-year followup (1.8% in the intervention group vs. 3.5% in the control group; one-tailed p=0.04).[143] There were very few deaths across all trials, however, and this outcome was too sparsely reported to conclude that suicide deaths were reduced. Combining data from six trials (excluding the population-based trial[151]), there were 27 suicide deaths in the intervention groups (2.0% of participants with followup) and 32 in control groups (2.3%). Summary of results can be found in **Table 10** (adults), **Table 11** (adolescents), and **Table 12** (older adults).

Thirteen of the 17 enhanced usual care trials (including PROSPECT[114] and the adolescent trial[162]) reported on suicide attempts, and all but one[136] found no differences in suicide attempts between 4 and 24 months (RR, 0.91 [95% CI, 0.80 to 1.02]; k=13; n=6,592; I^2=0.0%) (**Figure 12**).

While these findings were generally consistent, they should not be considered precise. These results are consistent with a small to moderate decrease in suicide attempts or no effect. Other health and intermediate outcomes were very sparsely reported.

Detailed Study Characteristics of Enhanced Usual Care Trials.

Trials in older adults. Both of the trials in older adults were practice-based interventions;[114,152] that is, they involved education with or without other supports to primary care providers in treating patients at increased risk of suicide. The U.S.-based PROSPECT included older adults who screened positive for depression in primary care.[114] This trial's primary aim was reducing suicidal ideation as well as depression. It was one of only two trials limited to older adults (ages 60 to 94 years; 31% age 75 years or older) and the only enhanced usual care trial that identified patients through primary care screening. The PROSPECT intervention involved giving primary care providers treatment guidelines and assigning a care manager to monitor the patient, inform the provider if the patient was suicidal, advise the primary care provider on treatment, and provide psychotherapy if needed. Seventy-two percent of the participants were female and 28 percent were nonCaucasian. PROSPECT was rated fair quality (**Appendix E Table 2**). It had fairly low retention (69% in each group) and also did not blind outcomes assessors, although it did have high standards for interrater reliability for outcomes assessment (**Table 12**).[114]

The other trial in older adults was conducted in an Australian primary care population.[152] All patients who were age 60 years and older in participating general practitioners' practices were eligible for the study (age range, 60 to 101 years; average age, 72 years). This study provided an educational intervention on assessment and treatment of depression and self-harm for clinicians and provided personalized direct feedback on assessment and handling of 20 consecutive patients. This trial was also rated fair quality because it did not provide adequate detail on the method of outcomes data collection, including blinding of outcomes assessors and mode of assessment (mailed questionnaire, phone interview, in-person interview, etc.).[152]

Population-based trial. The population-based trial compared intervention and control regions in the county with the highest suicide rate in Hungary.[151] The intervention and control regions were noncontiguous in the same county, and comparable in proportion of female (52%) and older residents (22% age 60 years or older), and both were predominantly rural. The intervention involved four main training sessions on depression and suicide over 5 years for general practitioners and nurses, plus three additional lectures on suicide and depression-related topics per year, a free consultation service to all providers, and a referral specialty depression management clinic.[151] This trial was rated fair quality (**Appendix E Table 2**); it was not an RCT, and reported only population-based outcomes (e.g., rate of suicide death per 100,000 persons). The trial did not describe how it obtained data on the population size. In addition, it was unclear if police and coroners were aware of the intervention; if not, it is possible that reporting of suicides could have been affected by the intervention.

Trial in adolescents. The Australian trial in adolescents was limited to adolescents and young adults (ages 15 to 24 years) with a history of suicide threats, ideation, or attempts, but who did not meet entry criteria for service in the mental health facility associated with the study because they were either receiving treatment elsewhere or were not unwell enough to qualify for services.[162] Sixty-four percent of participants were female and ethnicity was not reported in this trial. Two thirds met criteria for a mood disorder and 68 percent had a lifetime history of DSH. It was unclear whether participants were recruited upon presentation to the facility, or if researchers searched records and recruited participants who had failed to qualify for services, or if some other recruitment method was used. All participants received 12 monthly hand-written postcards that inquired about their well-being, reminded them of sources of help they had identified in the baseline phone interview with the study coordinator, and promoted one of six self-help strategies (e.g., physical activity, early morning light exposure, Web sites or self-help books based on CBT). This trial was rated fair quality (**Appendix E Table 3**). Retention was fairly low and somewhat differential at 12 months (74% in the intervention group and 63% in control group), and was unacceptably high at 18 months. In addition, groups were not entirely comparable at baseline; intervention group participants were more likely to have history of DSH (64% vs. 53% in past year), higher incidence of substance abuse (31% vs. 19%), and lower incidence of anxiety disorders (51% vs. 75%).

Study Characteristics of Other Enhanced Usual Care Trials. All of the remaining enhanced usual care trials were limited to people with a recent ED visit or inpatient stay for a suicide attempt or self-harm (**Table 6**). Average ages were generally mid-20s to mid-30s. The trial with the youngest average age (24 years) included participants as young as age 12 years,[136] but most trials reporting age requirements were limited to those ages 16 or 18 years and older. Almost all trials were between one half and two thirds female. One trial was limited to patients screening positive for alcohol misuse or whose ED visit was due to alcohol use.[132] Another trial with a mailed letter-based intervention was limited to people who had refused further treatment 1 month after an inpatient stay for a suicide attempt.[143]

Only one trial reported racial/ethnic minority representation: 36 percent of participants were African American, 13 percent were Hispanic, and less than 1 percent were Native American in this trial. Evidence of substance misuse and depressive disorders were inconsistently reported and varied substantially between studies.[133] Trials were conducted in nine different countries, primarily in developed countries in North America, Europe, and Oceania. One trial was conducted in Iran[136] and three were conducted in the United States.[133,143,150]

We rated all but one[127] of the other 13 adult enhanced usual care trials as fair quality (**Appendix E Table 2**). These ratings stem from a variety of quality-related concerns. Several trials reported all three of valid random assignment, allocation concealment, and blinding of outcomes assessment along with 100 percent for medical records-based outcomes[115,125,127,147] (including the good-quality trial[127]), but most were rated fair because they either had lower followup for self-reported outcomes or included only medical records-based outcomes, which can underestimate suicide attempts. Several additional trials reported both valid random assignment and allocation concealment along with high followup of medical records-based outcomes, but outcomes blinding was either not reported[130,132] or not present.[136] In the trial without outcomes assessment blinding, assessment of suicidal ideation was based on only a single item, but assessment of DSH

was based on both self-report and medical records, rather than relying solely on medical records. One trial based in the United States had very long (15 years) and complete followup, but was rated as fair quality because authors did not report randomization methods, allocation concealment, or blinding of outcomes assessors, and only minimal information was provided about outcomes measurement methods.[143]

Intervention Descriptions of Enhanced Usual Care Trials. Intervention characteristics are shown in **Table 8** and **Appendix G**.

Practice-based intervention trials. In addition to the two trials in older adults[114,152] and the population-based trial,[151] two other trials examined practice-based interventions. One of these trials examined intensive case management, which included a comprehensive needs assessment, development of a treatment plan, and ongoing monitoring of treatment and the patient's health status.[130] The other U.K.-based trial notified general practitioners when their patient came to the Accident and Emergency Service for DSH, sent them practice guidelines for assessment and treatment, and gave the provider a letter to send to the patient encouraging them to come in for a visit.[115]

Trials improving adherence to usual care with direct person-to-person contact. These seven trials used a wide variety of intervention approaches that all involved contact with patients identified in an ED to better manage or improve adherence to recommended treatments, rather than providing additional treatment, such as psychotherapy. Most of these seven trials involved only one or two contacts, usually limited to assessment and referral or encouragement to follow up with an already provided referral.[129,132,133,147,149] One of these trials made special efforts to contact the patient very soon after discharge from the ED (within 48 hours), using a mobile crisis team to meet at the place of the patient's choosing.[133] Another trial that was limited to patients who misuse alcohol included provision of a referral to an alcohol assessment and counseling session, from which a referral for more extensive treatment could be made.[132] Another was more extensive and akin to case management, involving phone contact immediately after ED discharge, a home visit for assessment and development of a treatment plan, and continued treatment monitoring.[150] The final trial dictated a specific schedule of visits and procedures for outreach in case of missed appointments, but the content of the treatment was left to the discretion of the provider.[123] Control groups all involved treatment or referrals as usual.

Trials improving adherence to usual care without direct person-to-person contact. Similar to the trial in adolescents, four interventions were limited to a series of mailed cards or letters that expressed concern, wished the patient well, and invited them to contact their provider or a research staff member. This study included six[125] to nine[136] contacts conducted over the course of 12 months to 24 letters over 5 years.[143] The comparison was with usual care in all cases. The Iranian trial reported that usual care was minimal in Iran,[136] so was likely not as effective as usual care in the United States.

Detailed Results of Enhanced Usual Care Trials.

Suicide deaths (KQ 4). PROSPECT found only one suicide death total (in the intervention group) (**Appendix H Table 1**).[114] The population-based trial in Hungary reported suicide rates per

100,000 persons for each of the five intervention years, and found no differences between groups; at 5 years, the suicide death rates were 40.7 in the intervention group and 47.1 in the control group.[151] The trial in adolescents did not report suicide deaths.[162]

There were 59 deaths across all remaining enhanced usual care trials between 1- and 5-years followup. Twenty-seven of these deaths (2.0% of participants with followup) occurred in the intervention groups and 32 deaths (2.3% of participants with followup) occurred in the control groups. A trial based in the United States that sent 24 letters over 5 years found reductions in suicide deaths at 2 years (1.8% in the intervention group vs. 3.5% in the control group; one-tailed p=0.043), but survival curves began to converge after that and the groups no longer differed at 5 years (3.9% in the intervention group vs. 4.6% in control group) or at any point thereafter.[143] This trial also examined nonsuicidal deaths and found no differences at either 5 or 15 years, but did not report nonsuicidal mortality at 2-years followup.

Suicide attempts (KQ 4). Thirteen of the 17 enhanced usual care trials reported suicide attempts, including PROSPECT and the trial in adolescents (**Appendix H Table 2**). The pooled effect (including PROSPECT[114] and the adolescent trial[162]) showed no benefit of treatment (RR, 0.91 [95% CI, 0.80 to 1.02]; k=13; n=6,592; I^2=0.0%) (**Figure 12**). Results were almost identical when PROSPECT[114] and the adolescent trial[162] were dropped from the analysis (RR, 0.90 [95% CI, 0.80 to 1.02]; k=11; n=6,075; I^2=0.2%) (**Figure 12**). Most of the trials showed statistically nonsignificant effects that were consistent with a benefit or with no effect, but with wide CIs. The Iranian postcard-based trial was the only one that reported a statistically significant reduction in the risk of suicide attempts after 12 months among those who received the intervention (3.0%) compared with those who did not (5.1%).[136] This trial also reported that usual care in Iran was minimal, so would likely be less effective than usual care in the United States. The large Australian trial in general primary care older adults reported a composite outcome of suicide attempt or ideation, and found a statistically significant 20% reduction in the intervention group.[152]

Among the trials that attempted to improve treatment adherence through direct contact with the patient, there appeared to be a trend of larger effects with shorter followup. The two trials reporting the largest positive effects were the alcohol assessment and counseling session at 6-months followup (38% reduction in DSH)[132] and the case management intervention at 4-months followup (36% reduction in suicide attempts).[150] Effects at 12 to 13 months ranged from 0 to 21 percent reduction in suicide attempts,[129,147,149] and the trial with the longest followup (24 months) reported a 16 percent increase in suicide attempts.[123]

Other health outcomes (KQ 4). Among patients with major depression, PROSPECT reported a reduction in all-cause mortality after 5 years; the mortality rate in the intervention group was 44.7 deaths per 1,000 person-years (95% CI, 34.1 to 57.6) compared with 49.7 in the control group (95% CI, 37.4 to 64.6), for an adjusted hazard ratio of 0.55 (95% CI, 0.36 to 0.84).[114]

Aside from PROSPECT, only five trials reported other health outcomes, none with statistically significant group differences (**Appendix H Tables 3** and **4**). A Swedish trial of two phone contacts to assess the patient and provide encouragement to stay in or return to treatment if needed found no group differences in global assessment of functioning.[129] The trial based in the

United States using the mobile crisis team found no group differences in symptoms or functional health status.[133] Neither trial reporting health care use found group differences in ED[130] or inpatient admissions.[127] No differences in nonsuicidal mortality were seen in the trial of a letter-based intervention in the United States among suicide attempters refusing further treatment.[143]

Intermediate outcomes (KQ 5). In PROSPECT, the proportion of patients reporting suicidal ideation was reduced in the intervention group at 4- and 8-month followup, but not at the 12-, 18-, or 24-month followup (**Appendix H Table 5**).[114] The intervention participants, however, reported lower depression scale scores than control participants at all but one of the followups, although absolute differences were small (**Appendix H Table 6**). The largest group difference in change in depression from baseline was seen at the 4-month followup, when the intervention group reported an average 7.4-point drop on the Hamilton Rating Scale for Depression (HRSD) compared with a 4-point drop in the control group. Both groups began the study below the cut-off indicating moderate depression, but above the "normal" range, and both groups stayed above the "normal" range at all followups. Effect of the intervention on depression varied by ethnicity in PROSPECT: white intervention participants showed 2- to 4-point greater reductions in the HRSD than nonwhite (primarily African American) participants. There were no group differences in the large Australian trial of older adults,[152] in which 8 percent of participants scored in the "moderate depression" range or higher on the nine-item depression scale of the Patient Health Questionnaire at baseline and at followup.

The trial in adolescents found no group differences in suicidal ideation, depression, or hopelessness at 12-month followup (**Appendix H Tables 12, 13,** and **14**, respectively).[162] Twenty-three percent in both groups reported having suicidal ideation at some point between baseline and 12-month followup, and both groups showed substantial improvement in depression, which averaged above the cut-off for probable depression at both baseline and followup in both groups. Study authors found modest improvements in hopelessness in both groups; both groups started and ended in the "mild" hopelessness range.

Three additional trials reported intermediate outcomes (**Appendix H Table 5**). The intervention group in the Swedish trial showed slightly greater reductions in suicidal ideation than the control group between the 1-month (before the first intervention call took place) and 12-month assessments.[129] Scores on the SSI dropped by 2.1 points in the intervention group and 1.0 point in the control group. Initial SSI scores, however, were the lowest of all the included trials that used the SSI, and the modest difference in improvement between the groups seems unlikely to represent a clinically significant effect on the 38-point scale. The American mobile crisis team trial reported no group differences in the SSI over 3 months, although both groups showed greater reductions in this trial than the previous one (approximately six-point reductions in both groups).[133] In the Iranian trial, fewer participants in the intervention group answered "yes" to the question "Did you have any suicidal thoughts during the study period?" after 12 months (29% in the intervention group vs. 42% in the control group; $p<0.05$).[136]

The same American trial that reported no group differences in suicidal ideation also reported no group differences in depression (**Appendix H Table 5**).[133] Both groups' average HRSD scores declined by about five points, and were above the cut-off for moderate depression at both time points. No other enhanced usual care trials reported hopelessness (**Appendix H Table 7**).

Key Question 6: For Those Identified as Being at Increased Risk of Suicide, What Are the Harms of Behaviorally-Based or Pharmacologic Treatment to Reduce Suicide Risk? Do the Harms Vary by Population Characteristics?

Psychotherapy Interventions

Adults. Very few psychotherapy trials in adults reported adverse effects beyond the trials' main outcomes. One CBT trial in adults reported that none of the suicide attempts were a result of study participation.[126] The trial of a video-based problem-solving intervention reported that no participants withdrew from the study due to worsening symptoms.[106] Finally, a study of writing as a means for reducing suicidal ideation reported that three participants asked to speak with a research supervisor because they became upset after writing or because their writing revealed current suicidal ideation.[138] We cannot determine whether this is truly a harm (triggering suicidal ideation) or a potential benefit (connecting the participant with treatment they may not have sought otherwise).

One trial reported a nonstatistically significant increase in suicide deaths.[137] This trial was very small (n=80), however, and had only one death in either group and very wide CIs associated with the effect, so is unlikely to reflect a truly harmful effect.

Adolescents. Four of the 11 trials reporting suicide attempts reported nonstatistically significant increases in suicide attempts of 22 to 113 percent (**Figure 8**).[153,156,157] Although one was a very small trial with few events and very wide CIs associated with the effect, the other two likely had enough events to represent more stable effects, although they were statistically nonsignificant. The possibility of harm cannot be ruled out in currently or recently suicidal adolescents undergoing CBT or developmental group therapy.

Medication Interventions

The trial of lithium treatment reported that 13 percent of the participants taking lithium dropped out of the study due to adverse effects compared with 2 percent of those taking the placebo, although the statistical significance of this difference was not reported.[139] Overall dropout rates were comparable between groups. Specific adverse effects were not reported.

Enhanced Usual Care

Adverse effects were rarely reported in trials of interventions that attempted to enhance usual care. One trial of a mobile assessment team reported that no adverse events were reported in either treatment group.[133] Another trial involving a single phone call at either 1 or 3 months postsuicide attempt to check in with the patient and encourage (re-)engagement in treatment reported a combined "adverse events" outcome of death, suicide attempt, or loss to followup, which was statistically similar in all groups (1-month call, 23%; 3-month call, 28%; control

group, 30%; p=0.25).[147] This type of composite outcome can be problematic, as deaths and loss to followup are of very different importance.[166,167]

One trial showed a nonstatistically significant increase in deaths after 12 months, but this was based on only a single suicide death (in the intervention group), so this cannot be said to represent clear evidence of harm.[114] Two trials showed nonstatistically significant increases in suicide attempts of 11 percent in a practice-based intervention in the United Kingdom[115] and 16 percent in a trial with a prescribed schedule of visits.[123] CIs were very wide for the latter trial, so the effect is unlikely to represent true harm. The trial of the practice-based intervention, however, did some further exploration of the effect and found a statistically significant harmful effect in the subset of participants with no prior history of DSH, in whom the odds of DSH during 1-year followup were increased by 32 percent (95% CI, 1.02 to 1.70).[115] This was a fairly low-intensity intervention for patients presenting to the Accident and Emergency Service after DSH. Researchers notified general practitioners of their patient's DSH episode and sent them assessment and treatment guidelines, along with a letter they could send to the patient inviting them to make an appointment. How this intervention could be harmful is difficult to understand, but it is worth noting that there may be risks associated with this intervention.

CHAPTER 4. DISCUSSION

Summary of Findings

Suicide prevention is a national priority. Primary care could potentially play an important role in helping identify people at increased risk of suicide and provide them with them appropriate treatment. Suicide risk, however, can be difficult to accurately assess because some individuals may attempt to conceal suicidal thoughts and because some may express suicidal thoughts without serious intention to die.[196] Even in high-risk populations, suicide is a comparatively rare event and the known risk factors associated with suicide are relatively common even in people who are not at high risk of suicide, thus compromising both positive and negative predictive ability.

While screening instruments have been developed for a quick risk assessment, very few studies have reported diagnostic accuracy characteristics of sensitivity, specificity, or related statistics relative to an interview with a clinician or other trained interviewer. Minimal evidence (two studies) suggests that there are screening tools that can identify adults and older adults in primary care who are at increased risk of suicide, at the cost of many false-positives. Screening accuracy data were even more limited in adolescents. Neither of the instruments demonstrated excellent performance characteristics in adolescents, and the screening populations in which they were tested had relatively poor applicability to general primary patients. Screening studies in adolescents were primarily applicable to high-risk populations, such as those with depression or other mental health issues. Instrument accuracy aside, we identified only very minimal data that examined whether suicide risk screening increased or reduced the likelihood of suicidality or other distress. Our results are consistent with those of an earlier review of suicide screening in adolescents, which concluded that data were very limited and future research was essential to determine whether and how screening can reduce suicide in young people.[197]

While we found more evidence evaluating the effects of treatment, the included studies included too few deaths to determine whether any type of treatment reduced the risk of suicide deaths. In adults, however, psychotherapy targeting suicide prevention reduced the risk of suicide attempts by an estimated 32 percent. In contrast, psychotherapy did not reduce the risk of suicide attempts in adolescents, and the data did not allow us to rule out the possibility of harm. Psychotherapy also showed small beneficial effects on depression for both adolescents and adults. Other beneficial outcomes were either sparsely reported (e.g. inpatient or emergency health care use), did not show greater improvement with suicide prevention interventions than usual care (e.g., suicidal ideation), or were limited in both ways (e.g., hopelessness, functioning). Psychotherapy trials were primarily in very high-risk populations, with the majority limited to people who had presented to an ED with a suicide attempt.

Interventions that primarily focused on enhancing usual care had little impact on suicide deaths, suicide attempts, or related outcomes. One large-scale trial of older primary care patients, however, did report a 20 percent reduction in the combined outcome of suicide attempts or ideation after a 24-month intervention involving education and training of general practitioners who volunteered to participate in the study.[152] Since these providers responded to an invitation

for volunteers, they may be more motivated to improve their practice than a typical practitioner.

Our findings were generally consistent with other recent reviews of suicide prevention or management of self-harm.[75,85,198,199] Each of these recent reviews generally included the same body of research, but they grouped trials differently. Nonetheless, they all found insufficient evidence for the effect on suicide deaths due to a small number of events. They also all often found moderate-sized, but frequently statistically nonsignificant, reductions in suicide attempts or self-harm, and all were limited by the included trials' sparse reporting of other outcomes. The most recent and comprehensive of these reviews, published by NICE, concluded that psychological and psychosocial interventions may be effective compared with usual care, although there was uncertainty due to variations in populations, treatment modalities, and comparison arms. Only one intervention included in the NICE review demonstrated a beneficial effect on adolescents.[85]

Table 13 provides an overall summary of the evidence.

Further Discussion of Screening

A recent study examined whether screening adolescents for suicide risk in primary care was feasible and whether it increases rates of detection and referral.[90] This study found that added suicide items to an existing standardized psychosocial history interview in electronic medical records of three different pediatric practices more than doubled the rate of suicide screening in pediatric practices (odds ratio [OR], 2.49 [95% CI, 2.02 to 2.97] for all practices combined). Further, providers detected three to five times more cases of people in need of treatment (OR, 4.33 [95% CI, 3.72 to 4.94] for all practices combined). Rates of referral to treatment were comparable to rates of detection. This study did not examine the proportion who followed up the referral and engaged in treatment, however, nor did it report health outcomes of individuals. Thus, while these data are promising, evidence is still lacking as to whether systematic screening would decrease suicide attempts and deaths.

Given the paucity of data on screening, we also searched for related bodies of literature that might provide information on the usefulness and accuracy of suicide risk screening instruments. This search yielded eight studies that examined how well instruments for suicide risk screening can predict future suicide attempts or deaths in those who were administered the instrument during a suicidal or mental health crisis (i.e., during hospitalization or an ED visit related to a suicide attempt or for mental health reasons).[200-207]

These studies' results were widely variable. Sensitivity ranged from 60 to 97 percent and specificity ranged from 25 to 61 percent. The studies differed in instruments examined, target ages, time to followup, and outcomes examined, making it difficult to determine why performance characteristics in some studies were much better. The large (n=9,086) study of the Manchester Self-Harm Rule in adults was based on direct interview and medical records. This study reported sensitivity of 94 to 97 percent, but specificity of only 25 to 26 percent for self-harm (including suicide deaths) in the subsequent 6 months among those who presented to an ED because of an episode of self-harm.[201] Another large-scale (n=2,489) study found sensitivity of

67 to 77 percent (males and females reported separately), specificity of 49 to 75 percent, and PPV of 4 percent for suicide deaths in the subsequent 5 years.[205]

Further Discussion of Treatment

Treatment in Adults

We presented evidence primarily on two major types of treatment, psychotherapy and enhanced usual care. The participants in the included adult psychotherapy trials that reported suicide attempts were generally classified as at very high risk of committing suicide, usually stemming from a history of multiple suicide attempts, which resulted in very high incidence of suicide attempts even after treatment. The proportion of control patients with suicide attempts at followup ranged from 11 to 68 percent in the psychotherapy trials. This result contrasts to the screening accuracy studies, which were conducted in general primary care patients. Thus, the indirect evidence linking screening and treatment is not good, based on poor fit between populations in the two bodies of evidence.

While suicide attempts were reduced by a pooled average of 32 percent in adult psychotherapy trials, the interventions' effects on intermediate outcomes such as suicidal ideation and depression were either small or nonexistent. These results were reported primarily in psychotherapy trials. Control groups received usual care, however, which may be effective in some cases. This is evidenced by the fact that both usual care and suicide prevention-focused treatments generally showed improvement in intermediate outcomes.

Trials of enhanced usual care found that these interventions' effects on suicide attempts were smaller than in psychotherapy trials and, with only one exception, not statistically significant. Although data were not encouraging, a number of trials with promising results had low power, and these approaches to enhancing usual care may be worth replicating with larger samples. In addition, although most of the enhanced usual care trials were limited to people with recent ED or inpatient treatment for a suicide attempt, a smaller proportion of participants had suicide attempts at followup (0.5% to 28% of control participants). The fact that the incidence of suicide attempts in these trials was lower than in the psychotherapy trials could be due to either the lower overall risk in these patients (e.g., due to enrolling fewer participants with multiple previous suicide attempts) or more effective usual care (which we could not determine with available evidence). Both of these could influence the results. In addition, some of the enhanced usual care interventions alone may not be sufficient to reduce suicide attempts, but may be useful components of a larger systemwide approach that includes psychotherapy.

We found very minimal data on medication's effectiveness in preventing suicidal behavior. These data were limited to a single, short-term, fair- to poor-quality lithium trial that was plagued by high attrition. This study reported hazard ratios that suggest a benefit compared with placebo, but these results were not statistically significant. While the authors did report a statistically lower rate of suicide deaths per patient-year, this was based on only three suicide deaths and could be biased due to high attrition. Participants taking lithium were more likely to drop out of the study due to adverse effects, but the study did not describe which adverse effects

were experienced by the participants.

Lithium is commonly used for treating bipolar disorder and has been shown to reduce the risk of suicide in observational studies[208,209] and controlled trials of unipolar and bipolar patients who are not necessarily suicidal compared with placebo or other agents (Peto OR, 0.26 [95% CI, 0.09 to 0.77]).[79] The use of lithium in patients screening positive for suicidality has not been thoroughly studied. Lithium is associated with important adverse effects that were not described in the one trial included in this review. These risks include an increased risk of hypothyroidism and hyperparathyroidism, and reduced urinary concentrating ability (leading to thirst, polyuria, progressive renal insufficiency, and, in rare cases, end-stage renal failure or nephrotic syndrome).[210,211] Despite these risks, a recent decision analysis concluded that lithium initiation and continuation for bipolar disorder was recommended in most cases.[212] Additional adverse effects include tremor, gastrointestinal disturbance, weight gain, dry mouth, and cognitive disturbance, such as difficulties with memory, vigilance, and tracking.[210,211]

The NICE guidance on long-term self-harm management recommends that drug treatment not be offered as a specific intervention to reduce self-harm because of the potential toxicity of psychoactive medications.[85] The NICE guidance, however, recommends providing treatment, including pharmacologic, to treat associated conditions such as depression, substance misuse, BPD, and bipolar disorder, but urges clinicians to be aware of medications' toxicity and avoid high-toxicity medications such as tricyclic antidepressants. A long-term (44 years) prospective study of people with depressive spectrum disorders who had an inpatient psychiatric admission found that the use of antidepressants alone or with a neuroleptic medication lowered suicide rates, even though those treated with these medications were more severely ill than those who were not.[209,213]

Treatment in Adolescents

When identified, statistically nonsignificant increases in suicide attempts were usually found in adolescents. The research on iatrogenic suicidality related to antidepressants suggests that adolescents react differently from adults to pharmacologic treatment.[77] In addition, research suggests that risk factors and methods of committing suicide differ between younger versus older teens.[214] Thus, different age groups appear to have different treatment needs and risks. The evidence base in adolescents is still small and few approaches have yet to be replicated, which is very important since initial trials have been shown to often overestimate results found in subsequent research.[215] In this review, we found such a situation when results for the one intervention that did show beneficial results in a first trial[160] were not replicated in two subsequent good-quality trials.[155,157]

Psychotherapy trials were primarily in high-risk youth, most with a recent suicide attempt or acute suicidal ideation. These samples are consistent with the samples in the screening studies but may have low applicability to youth identified through primary care screening. One trial, however, was conducted in U.S. youth identified through primary care and ED screening.[108] This trial generally reported effects that were among the largest of the adolescent trials and should be considered for replication. Another trial in substance abusing adolescents of fairly intensive CBT involving both parents and youth reported an effect size of similar magnitude and should also be

considered for replication.[163] While suicidal youth need treatment, caution and close monitoring and care coordination is warranted, and these trials suggest that active parental involvement in treatment may be important. Further research is urgently needed.

It is difficult to determine why adolescents may differ from adults in their response to treatment, but we have a few hypotheses. Adolescents are generally more impulsive than adults, which may make suicide attempts more unpredictable and less amenable to treatment. Additionally, given that adolescents have had fewer years to gain experience, they are presumably less skilled at managing or communicating distress than adults. Also, serious mental health issues often have their first onset during adolescence, so treatment may not yet be optimized and youth would have had little chance to learn how to manage their mental health issues. Similarly, many people begin experimentation with substances during adolescence, which may further impair emotional well-being and judgment along with increasing their impulsivity, all of which may contribute to difficulty in preventing suicide attempts. It should be noted, however, that evidence related to potential paradoxically increased suicidality with psychotherapy (in this review) and antidepressant use (in other reviews) is limited to suicide attempts (and ideation, in the case of antidepressants). Deaths in youth are still very rare and data are insufficient to determine whether there are any treatment effects (beneficial or harmful) on suicide deaths.

Potential for Suicide Screening in Primary Care

Primary care could have an important role to play in identifying patients at increased risk of suicide. Data suggest that a high proportion of people who make a suicide attempt have recently seen a primary care provider. Existing data may even underestimate this opportunity, since they were collected prior to publication of the National Suicide Prevention Strategy[93] and before the current trend toward greater treatment of mental health issues in primary care.[216-218] While important, global risk factors alone (e.g., age, sex, mental health diagnoses) are insufficient predictors of suicide risk. These factors, however, could be useful in identifying patients who would benefit from ongoing direct monitoring of suicide risk, perhaps in the context of broader mental health screening and monitoring. The USPSTF recommends screening adults and adolescents for depression in health care settings with systems in place to ensure accurate diagnosis, appropriate treatment, and sufficient followup.[219] Suicide screening is likely embedded in many depression screening approaches, or could easily be added. One study found fairly strong correlations between the first five items of the SSI (a semistructured clinician-rating scale) and single suicide items on the HRSD ($r=0.55$) and BDI ($r=0.48$).[220]

Potentially Important Approaches Not Included in This Review

This review did not include a number of important approaches that have relevance to primary care. These approaches were not included either because no eligible trials were found or because they were outside the scope of the review.

Adequately treating underlying mental health issues is an important approach to suicide

prevention. Given the high proportion of people with mental health issues among those who commit suicide or make suicide attempts, and given that there are effective treatments available for relevant mental health disorders (e.g., depression, substance misuse, and PTSD), direct treatment for these disorders may reduce suicide attempts and/or deaths. Trials examining the effectiveness of treatment on remission of mental health disorders or reduced symptomatology, however, are inconsistent in reporting of suicide-related outcomes. This leads to concerns about publication bias where those outcomes are reported. In addition, this evidence was outside the scope of our report.

Although we included studies of screening initiated by a recent ED visit or psychiatric hospitalization, we did not include screening studies or treatment trials that were exclusively or primarily conducted in ED or inpatient settings, since this was outside the scope of what could likely be provided or referred to by primary care providers. Of the 15 trials of treatment in these settings we found in our initial searches,[221-235] a nonsystematic examination suggests their results are consistent with the included trials. Several psychotherapy trials in adults showed a range of absolute differences between groups in suicide attempts at followup, which ranged from substantial declines to slight increases, and most group differences were not statistically significant. As with the body of evidence included in our review, there were few trials conducted in adolescents.[221-223] However, given that the risk of suicide attempt is high soon after discharge, when treatment is unlikely to have taken effect yet, a close examination of this literature may have revealed greater benefits (albeit with very limited applicability to primary care).

We found no medication trial of clozapine that met our inclusion criteria, the one medication that is approved by the Food and Drug Administration for treatment of suicidal behavior. The approval is for patients with schizophrenia and schizoaffective disorders, however, and we excluded trials limited to patients with chronic psychotic illness (including schizophrenia), and found no trials eligible for our review (i.e., no trials in other populations).

We also planned to include trials of interventions addressing restriction of suicide means, given the observational and ecological data supporting this approach to suicide prevention. However, we found no trials that met inclusion criteria.

Limitations of the Review

There are a number of limitations to this review, some of which are related to the evidence identified and some due to inherent challenges with this topic. As mentioned above, there was little evidence in primary care-relevant populations on the diagnostic accuracy of primary care-feasible screening instruments relative to a clinical interview for finding patients at current increased risk of suicide, and none were conducted in general-risk adolescents. We identified even less information on benefits or harms of screening, and none on adolescents in health care settings. Although the body of evidence for treatment was much larger, it primarily addressed very high-risk patients with a recent ED visit or hospitalization for self-harm, and there was very little evidence on its effectiveness in older adults and racial/ethnic minorities. Differences in suicide rates among different ethnic groups in the United States and across difference countries suggest that cultures vary in motivation for and meaning of suicide, and that risk-based screening

as well as culturally-tailored interventions may be important.[236]

Most of the data in the included studies were for suicide attempts or self-harm or intermediate outcomes such as suicidal ideation or depression. Suicide attempts and self-harm, while important outcomes in their own right, are not good surrogates for suicide death. As such, we cannot assume the reductions in suicide attempts means that the intervention will reduce the number of deaths.[237]

We also identified a number of inherent difficulties in researching the effects of treatment on suicide risk. First, suicide death is a very rare outcome and power is nearly always going to be insufficient to detect potentially important reductions in single-site trials. Very large collaborative trials are likely required to achieve sufficient power to see effect on suicide deaths.[238] If all participants in all psychotherapy trials reporting deaths were treated as a single study that found a 57 percent reduction in suicide deaths (0.62% in the intervention group vs. 1.44% in the control group), four times the participants would have been needed to achieve statistical significance. Power would likely be even more dramatically limited in studies of screen-detected patients. Assuming an annual suicide rate of 100 per 100,000 persons (twice as high as older white males, who have the highest rates of any age-sex-race subgroup) and the ability of treatment to affect a 40 percent reduction in suicide, over 83,000 people per group would be required to see a statistically significant result. Thus, it will always be difficult to build a coherent chain of evidence from broad population-based screening through treatment, since treatment studies will necessarily be limited to very high-risk groups in order to have a hope of having sufficient power to detect a treatment effect.

Second, control groups must include usual care because of the potential for death or other serious adverse events if left untreated, which in many cases will involve extensive treatment. Therefore, results of included studies may underestimate the absolute effects of treatment. Finally, patients at highest risk (in whom there is the best chance of having enough power to show a beneficial effect) are often excluded from studies because their condition is considered dangerously unstable. As such, researchers or Institutional Review Boards may not be willing to risk allocating the most disturbed patients to anything other than the highest possible level of treatment. This may again have the effect of attenuating the benefit that can be found in trials of suicide prevention treatment. Despite the difficulties and challenges, further research in this area is of paramount importance.

Future Research Needs

A number of areas of needed research have been identified by this review. More trials of treatment in adolescents are needed, perhaps including enhancements to usual care in addition to psychotherapy such as care management or collaborative approaches between specialty and primary care providers. Based on included studies, we hypothesized that interventions targeting parents as well as youth may be most effective; further research examining this hypothesis would be welcomed. In addition, treatment trials targeting high-risk groups such as older adults and Native Americans that are tailored to their cultural and/or developmental needs are needed. Replication of some enhanced usual care approaches in adults may also be valuable, particularly

approaches that show at least moderate-sized but statistically nonsignificant effect sizes.[132,147,150]

More information is also needed on performance characteristics of screening instruments as well as benefits and harms of screening, especially in general-risk adolescents. Information on effectiveness of general versus targeted screening in primary care would also be useful. Use of technology may be helpful for conducting large-scale screening studies.

We identified 11 ongoing trials (**Appendix I**).[239-249] Seven trials are evaluating psychotherapeutic interventions: CBT,[239-241,247,248] problem-solving therapy,[244] and DBT.[245] Two New Zealand trials are evaluating the effectiveness of a six-component treatment package in patients with DSH that includes psychotherapy, improved access, increasing support, and postcards.[242,243] The final trials are large-scale, multisite trials. One is evaluating the effectiveness of a safe storage box for pesticides in Sri Lanka (n=200,000); the other is evaluating three suicide prevention interventions (gatekeeper training, awareness training, and professional screening) in 11 European countries (n=11,000).[246] Most of the trials target specific high-risk groups, such as adolescents with substance abuse problems and patients with a history of DSH, suicidal thoughts, and/or ideation, which may help fill the evidence gaps.

Conclusion

Suicide prevention is a topic of high national importance in which primary care providers may have a role to play. Although evidence was limited, primary care-feasible screening tools could likely identify adult patients at increased risk of suicide who may need treatment, and a larger body of evidence showed that psychotherapy can reduce the risk of suicide attempts. There was little evidence on the accuracy of screening in adolescents (and none in general-risk adolescent populations), and treatment did not demonstrate a positive effect. Results in adolescents also did not rule out the possibility of harm (i.e., increased suicide attempts) with some psychotherapeutic treatments. More research on how to effectively identify and treat adolescents at increased risk of suicide is urgently needed.

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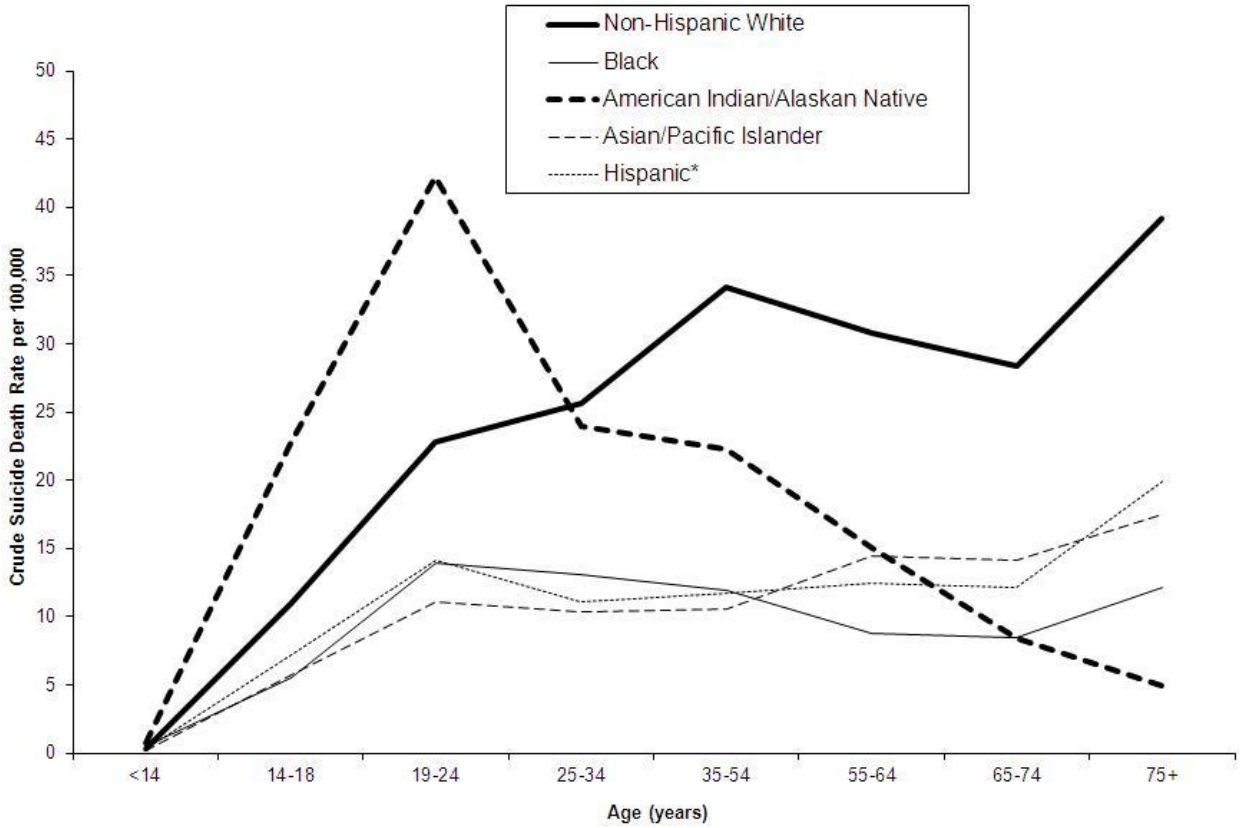
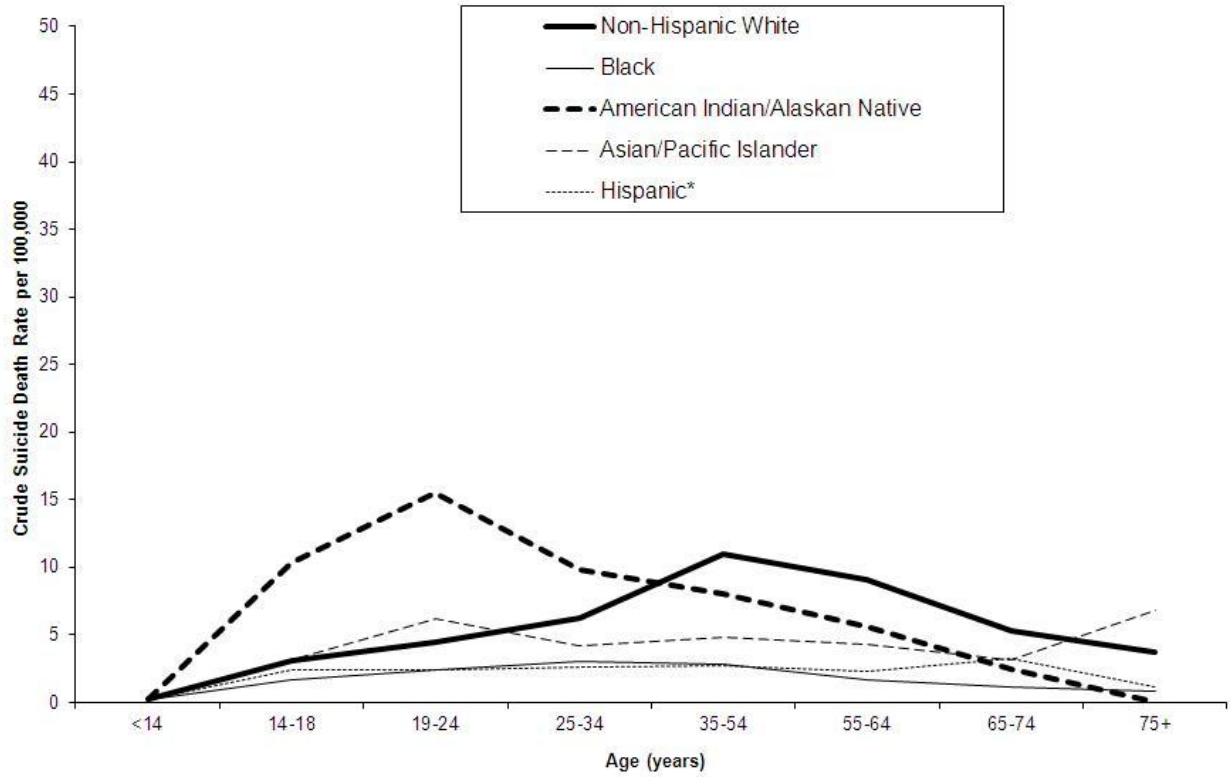
Figure 1. Suicide Injury Death Rates Among Males in the United States, 2009



*Hispanic also includes white Hispanics and black Hispanics.

Source: Centers for Disease Control and Prevention, Web-based Injury Statistics Query and Reporting System.[6]

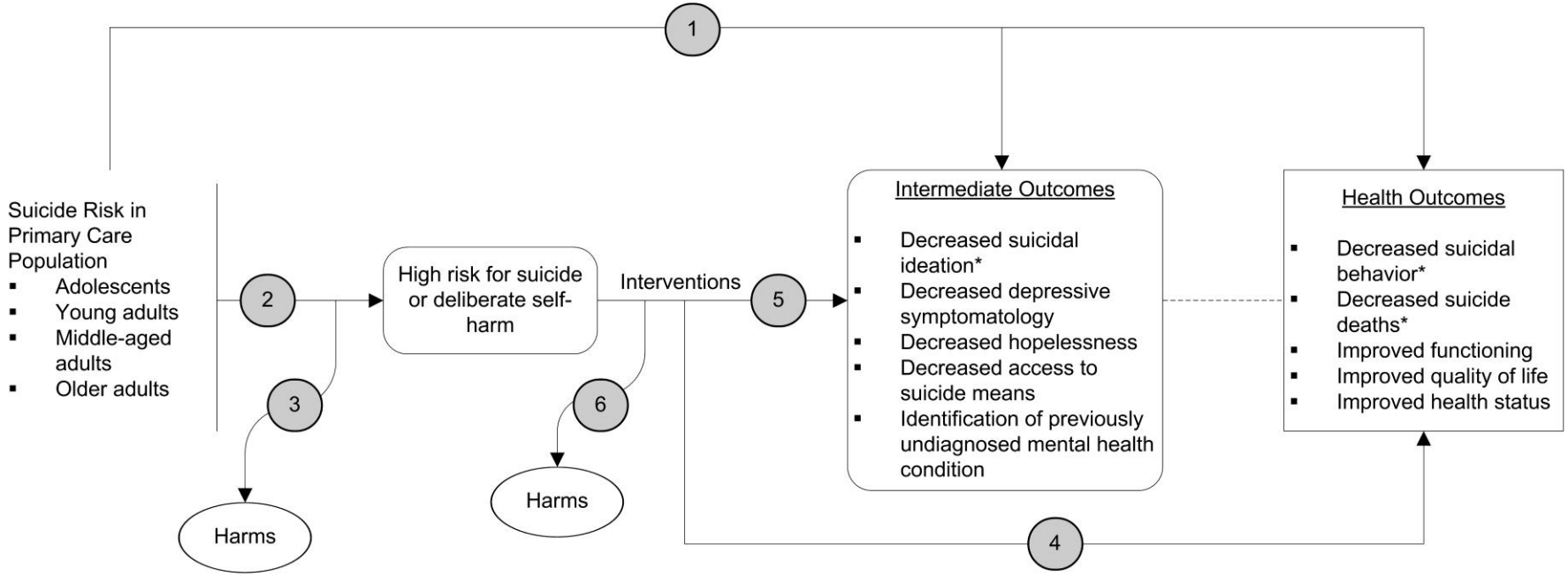
Figure 2. Suicide Injury Death Rates Among Females in the United States, 2009



*Hispanic also includes hhite Hispanics and black Hispanics.

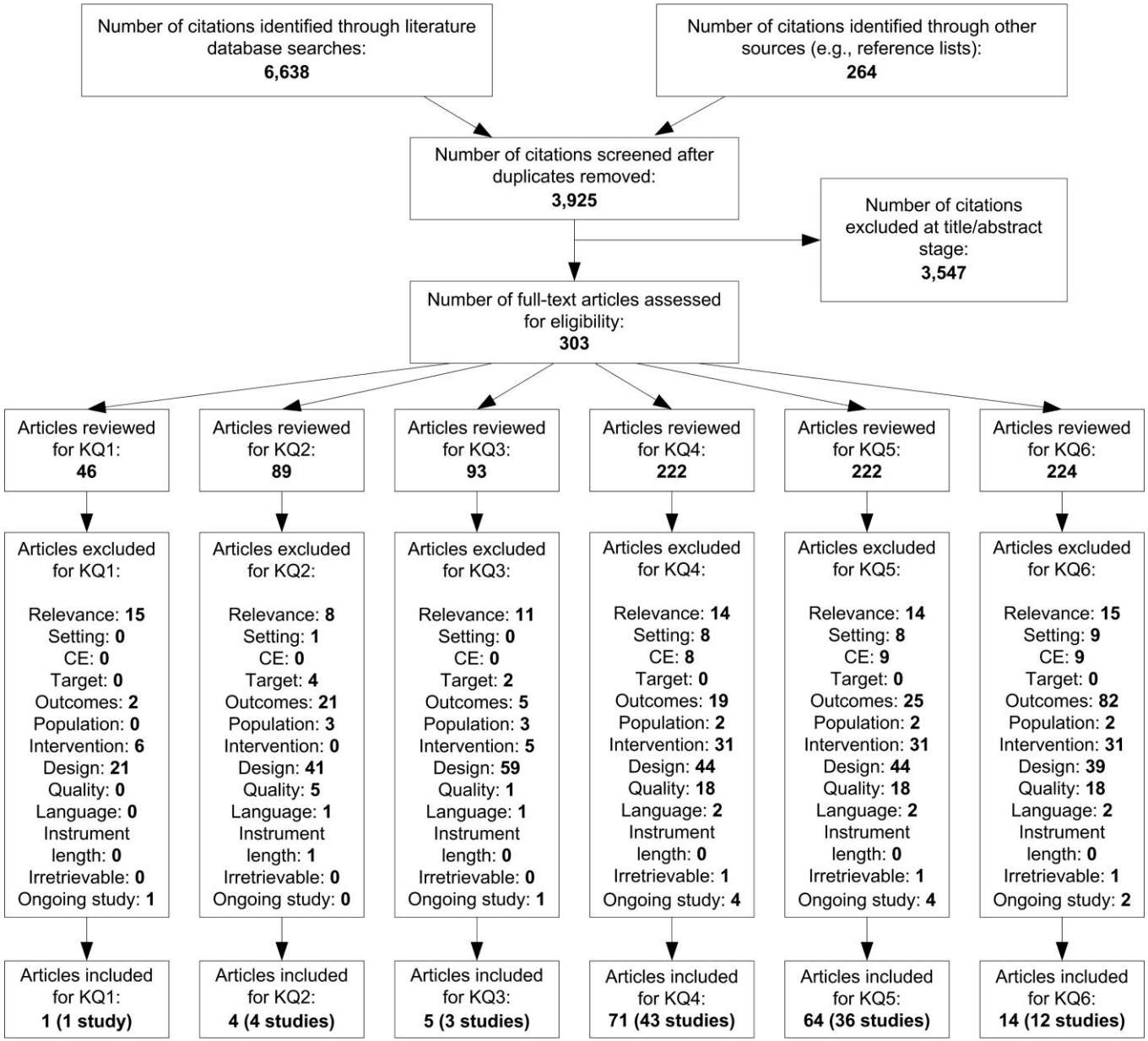
Source: Centers for Disease Control and Prevention, Web-based Injury Statistics Query and Reporting System.[6]

Figure 3. Analytic Framework



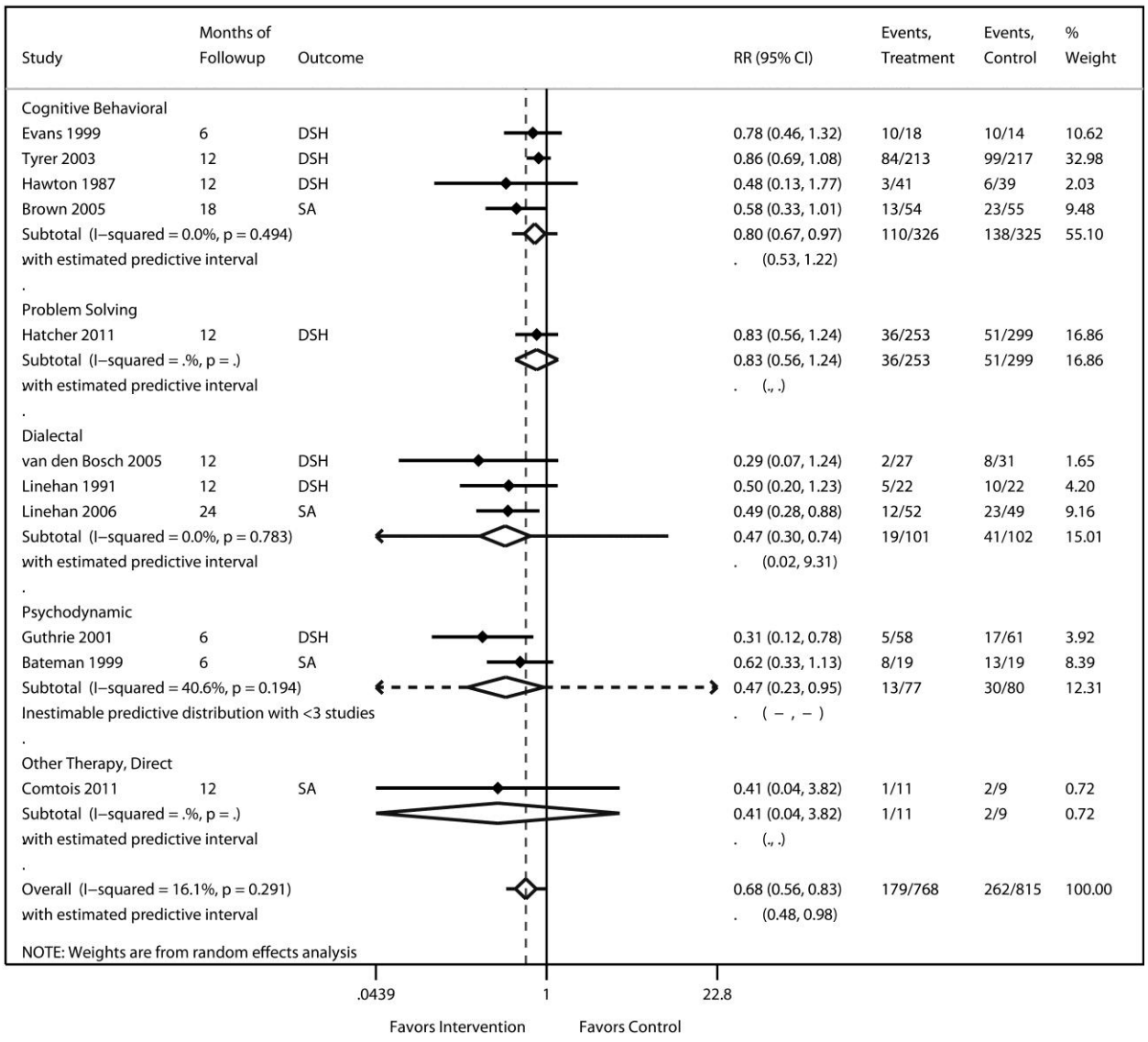
*All studies must report at least one suicide-specific outcome measure.

Figure 4. Literature Flow Diagram



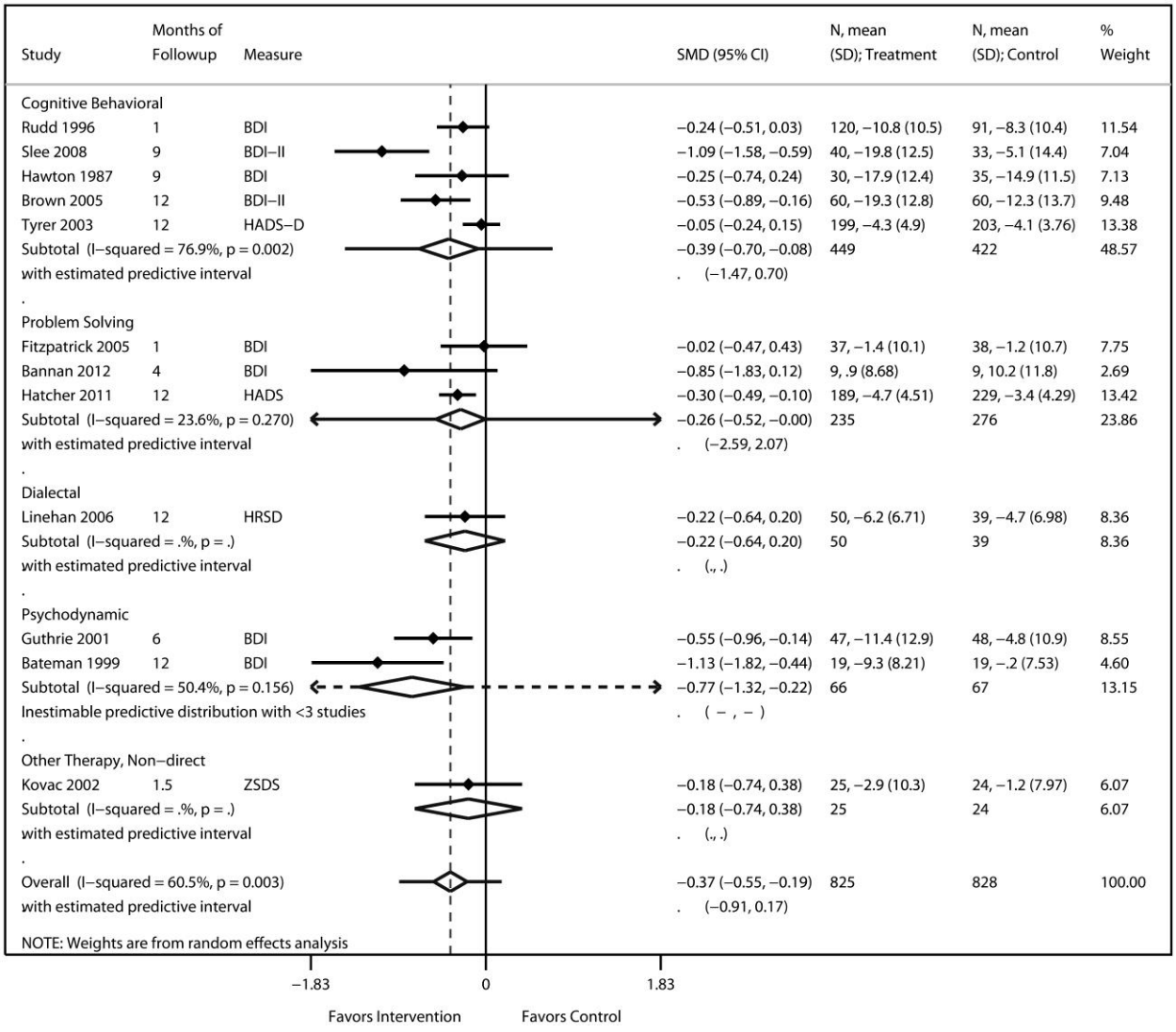
Abbreviations: CE = comparative effectiveness; KQ = key question.

Figure 5. Forest Plot of Suicide Attempts in Psychotherapy Trials: Adults



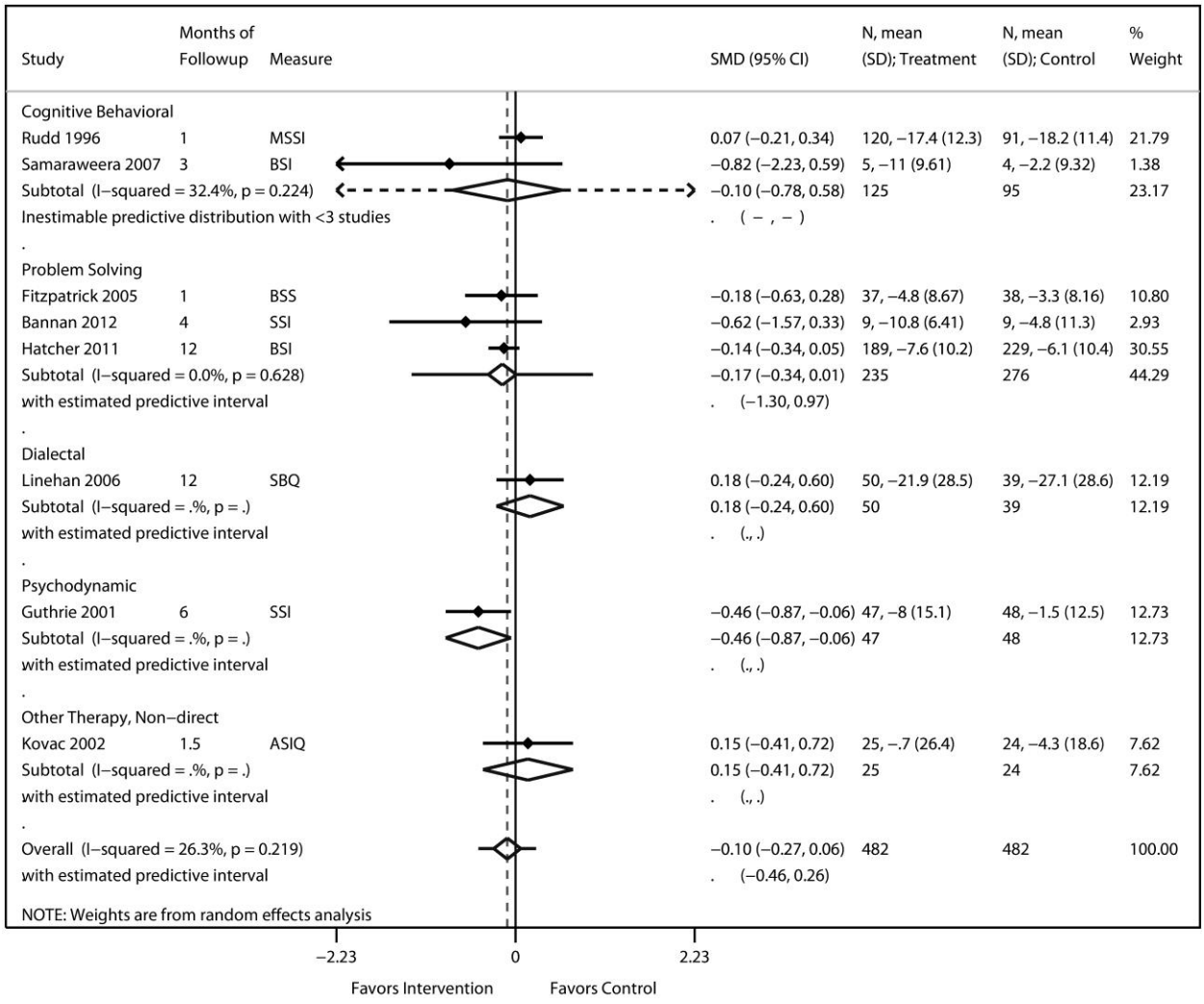
Abbreviations: CI = confidence interval; DSH = deliberate self-harm; RR = relative risk; SA = suicide attempt; SD = standard deviation.

Figure 6. Forest Plot of Depression in Psychotherapy Trials: Adults



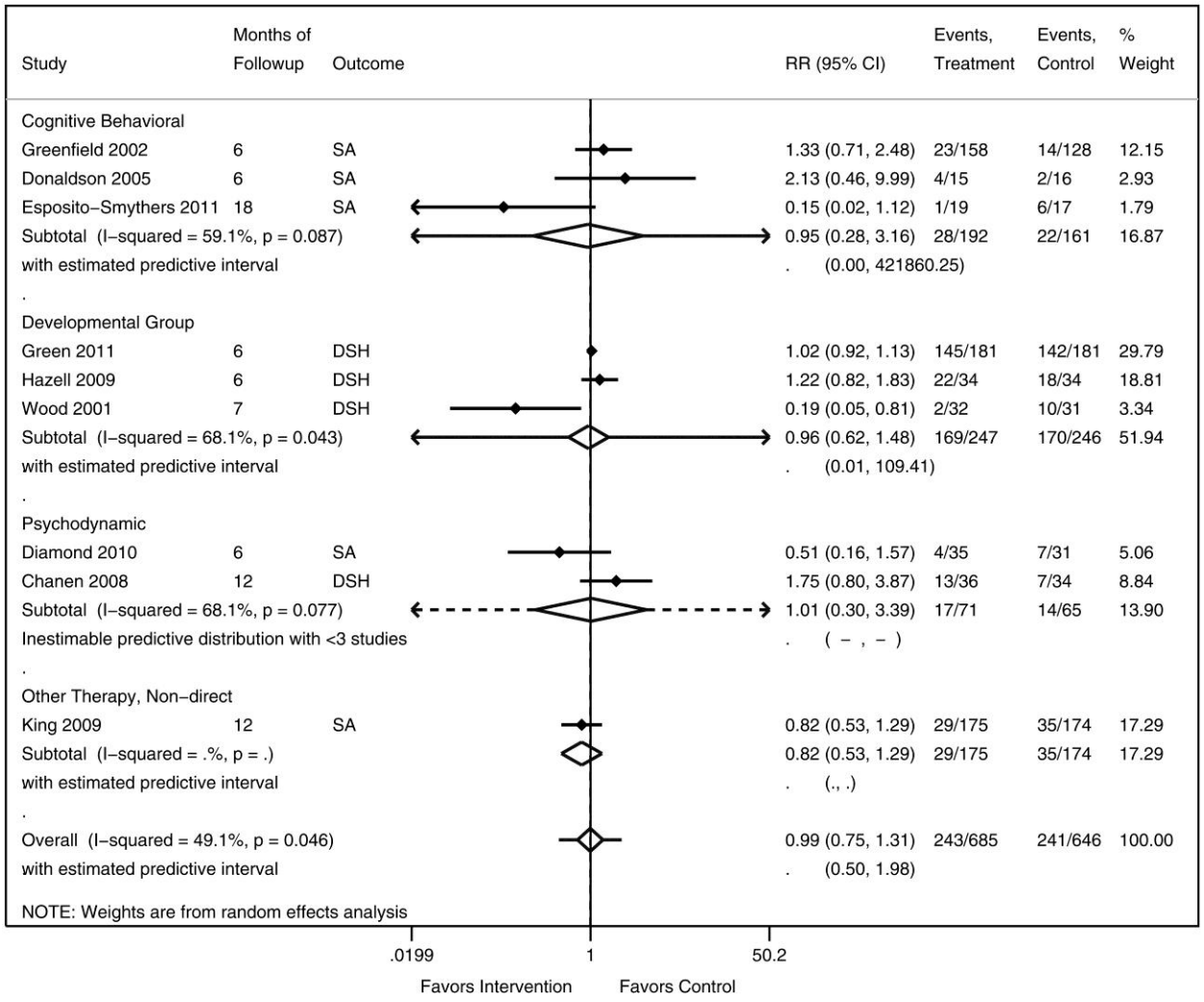
Abbreviations: BDI = Beck Depression Inventory; CI = confidence interval; HADS = Hospital Anxiety and Depression Scale; HRSD = Hamilton Psychiatric Rating Scale for Depression; SD = standard deviation; SMD = standardized mean difference; ZSDS = Zung Self-Rating Depression Scale.

Figure 7. Forest Plot of Suicidal Ideation in Psychotherapy Trials: Adults



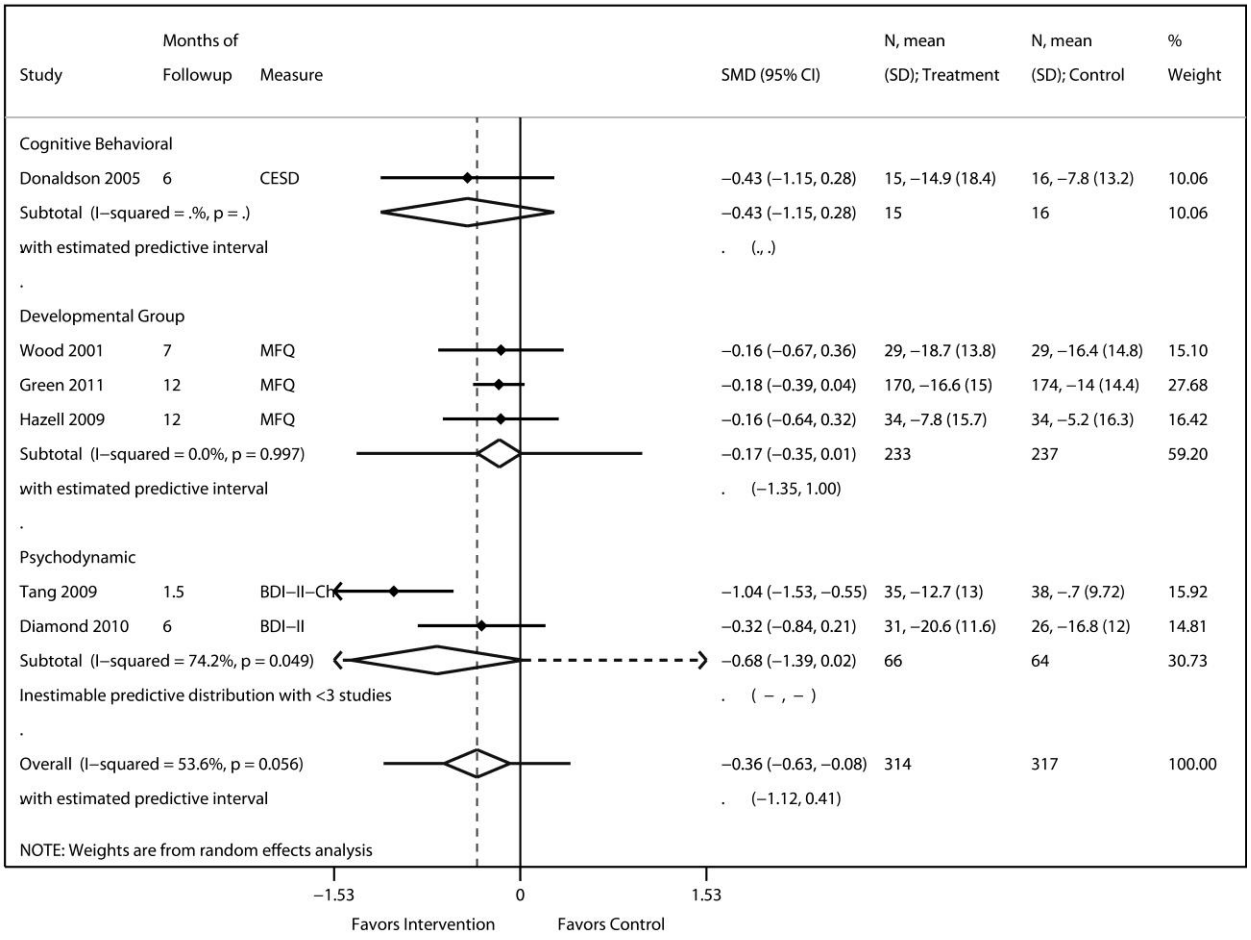
Abbreviations: ASIQ = Adults Suicidal Ideation Questionnaire; BSI = Beck Suicide Ideation Scale; BSS = Beck Suicide Scale; CI = confidence interval; MSSI = Modified Scale for Suicidal Ideation; SBQ = Suicide Behavior Questionnaire; SD = standard deviation; SMD = standardized mean difference; SSI = Scale for Suicidal Ideation.

Figure 8. Forest Plot of Suicide Attempts in Psychotherapy Trials: Adolescents



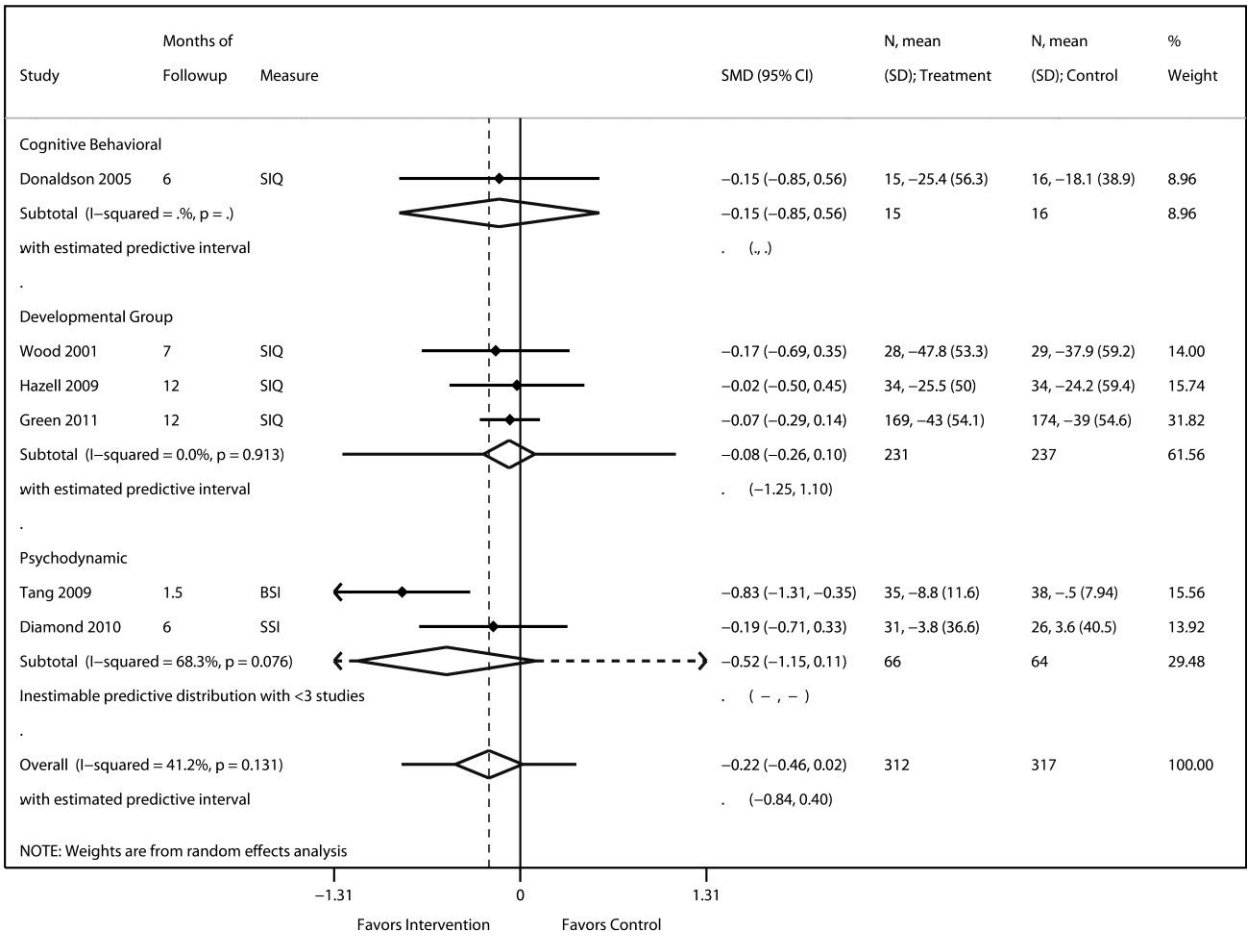
Abbreviations: CI = confidence interval; DSH = deliberate self-harm; RR = relative risk; SA = suicide attempt; SD = standard deviation.

Figure 9. Forest Plot of Depression in Psychotherapy Trials: Adolescents



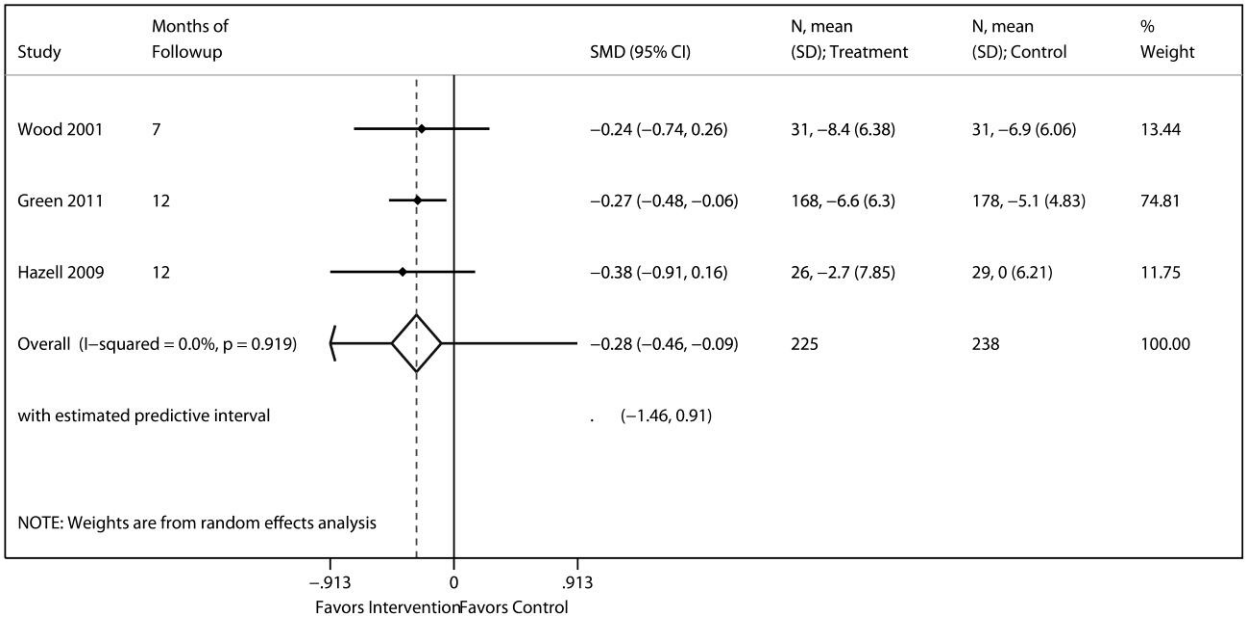
Abbreviations: BDI = Beck Depression Inventory; CES-D = Center for Epidemiologist Studies Depression Scale; CI = confidence interval; MFQ = Mood and Feelings Questionnaire; SD = standard deviation; SMD = standardized mean difference.

Figure 10. Forest Plot of Suicidal Ideation in Psychotherapy Trials: Adolescents



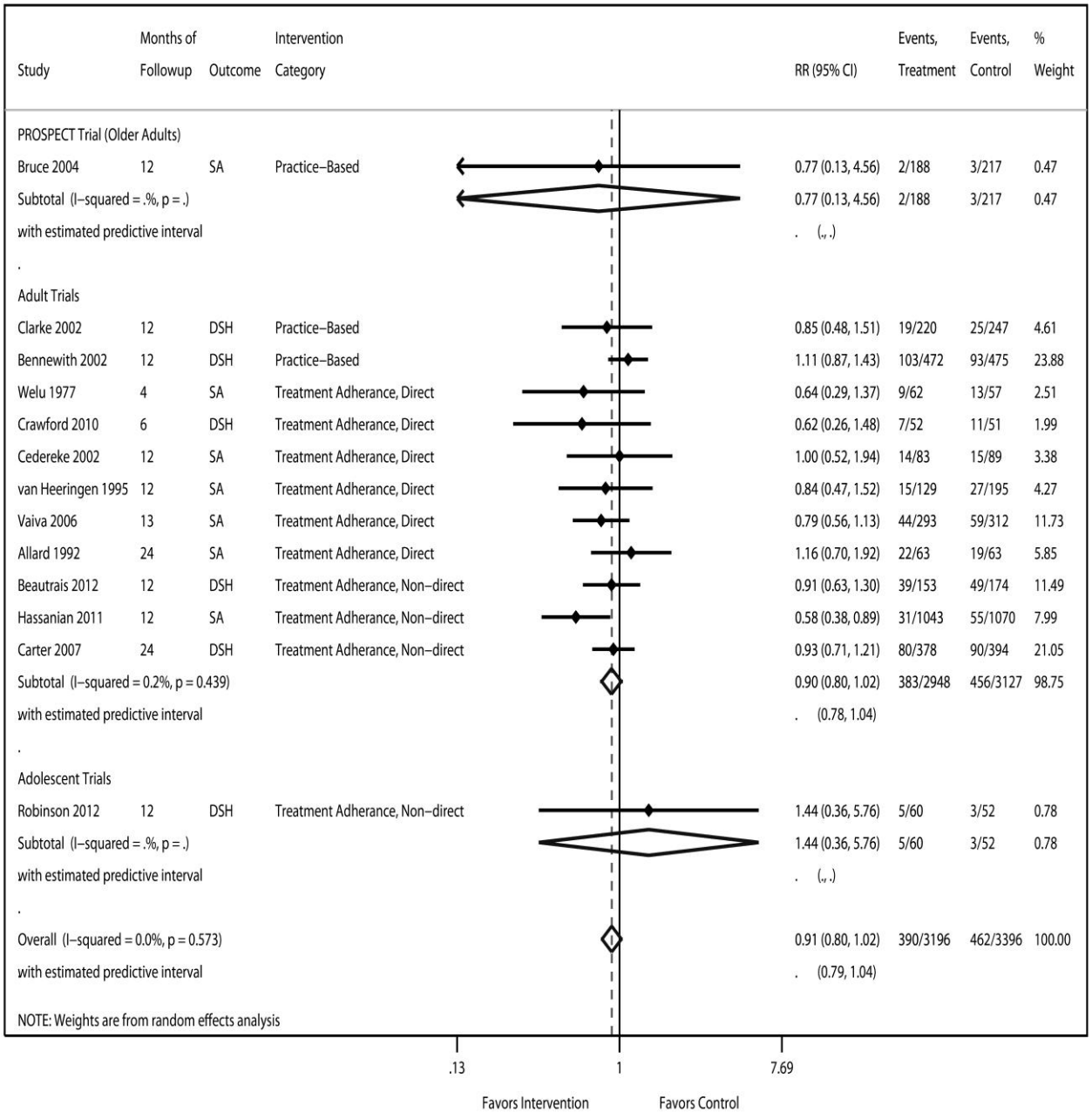
Abbreviations: BSI = Beck Suicidal Ideation Scale; CI = confidence interval; SD = standard deviation; SIQ = Suicide Ideation Questionnaire; SMD = standardized mean difference; SSI = Scale for Suicidal Ideation.

Figure 11. Forest Plot of Functioning in Psychotherapy Studies: Adolescents



Abbreviations: CI = confidence interval; SD = standard deviation; SMD = standardized mean difference.

Figure 12. Forest Plot of Suicide Attempts in Enhanced Usual Care Studies



Abbreviations: CI = confidence interval; DSH = deliberate self-harm; RR = relative risk; SA = suicide attempt; SD = standard deviation.

Table 1. Definitions of Suicide-Related Terms

Term	Definition
Suicide	Death caused by self-directed injurious behavior with any intent to die as a result of the behavior.[2]
Suicide attempt	A nonfatal self-directed potentially injurious behavior with any intent to die as a result of the behavior. A suicide attempt may or may not result in injury.[2]
Suicidal self-directed violence	Behavior that is self-directed and deliberately results in injury or the potential for injury to oneself. There is evidence, whether implicit or explicit, of suicidal intent. This encompasses suicide deaths and suicide attempts.[2]
Other suicidal behavior and preparatory acts	Acts or preparation toward making a suicide attempt, but before potential for harm has begun. This can include anything beyond a verbalization or thought, such as assembling a method (e.g., buying a gun, collecting pills) or preparing for one's death by suicide (e.g., writing a suicide note, giving things away).[2,3] Referred to as "aborted suicide attempt" by the American Psychiatric Association.[4]
Suicidal ideation	Passive thoughts about wanting to be dead or active thoughts about killing oneself, not accompanied by preparatory behavior.[3]
Self-harm	An act with nonfatal outcome, in which an individual deliberately initiates a nonhabitual behavior that, without intervention from others, will cause self-harm, or deliberately ingests a substance in excess of the prescribed or generally recognized therapeutic dosage, and which is aimed at realizing changes which the subject desired via the actual or expected physical consequences.[5]
Suicidal behavior	Includes suicide, suicide attempts, other suicidal behavior, and preparatory acts.

Table 2. Suicide Screening Recommendations of Other Organizations

Organization, Year of Recommendation	Recommendation
American Academy of Child and Adolescent Psychiatry, 2001	Recommends that clinicians be aware of patients at high risk for suicide.[69]
American Academy of Pediatrics, 2007	Recommends pediatricians ask questions about mood disorders, sexual orientation, suicidal thoughts, and other risk factors associated with suicide during the medical history taking at routine medical care visits.[68]
American Medical Association, 1997	All adolescents should be asked annually about behaviors or emotions that indicate recurrent or severe depression or risk of suicide, and screen for depression or suicidal risk in those with risk factors such as family dysfunction, declining school grades, history of abuse, etc.[71]
Canadian Coalition for Seniors' Mental Health, 2006	Health care providers should assess for suicide risk among those with risk factors, such as prior suicidal behavior.[70]
Canadian Task Force on Preventive Health Care, 1994	There is poor evidence to include or exclude routine evaluation of suicide risk during a periodic health examination.[72]
Michigan Quality Improvement Consortium, 2008/2009	Recommends a periodic health maintenance examination in adults,[73] including a behavioral assessment that evaluates suicide threats. It also recommends education and counseling for suicide threats among parents, children, and adolescents.[74]

Table 3. Test Performance Characteristics of Suicide Screening Instruments (Key Question 2)

Population	Study, Quality	Sample	Prevalence of suicide*	Reference test (time to test)	Instrument (threshold)	Test positive (%)	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)
Adolescents	Holi 2008[118] Fair	Depressed adolescent outpatients ages 13 to 19 years at a psychiatry clinic (n=218)	27.1% suicidal or self-harming act in past 2 weeks	K-SADS-PL (median, 6 days)	Mental health clinicians' suicidality assessment (categorized as suicidal or not based on 2 items)	25.2	51.6 (95% CI, 38.6 to 64.5)	85.3 (95% CI, 78.7 to 90.4)	58.2 (95% CI, 44.1 to 71.3)	81.6 (95% CI, 74.8 to 87.2)
	Thompson 1999[119] Fair	High school students ages 14 to 20 years at risk of dropping out of high school (n=581)	21.7% high risk of suicide (timeframe NR)	CRA after computer-assisted interview with clinician (7 to 10 days)	SRS (4 risk categories; categories I, II, III considered positive screen)	50.5	87 (95% CI, 80.2 to 92.6)	60 (95% CI, 55.1 to 64.3)	37.8 (95% CI, 32.2 to 43.6)	94.4 (95% CI, 91.0 to 96.8)
Adults	Olfson 1996[67] Fair	Primary care patients ages 18 to 70 years (n=1,001)	3.3% suicidal ideation during the past month	Nurse-administered structured interview (24 hours)	3 items from the SDDS-PC (affirmative response): 1) thoughts of death	20.2	100 (95% CI, NR)	81.0 (95% CI, 78.5 to 83.5)	5.9 (95% CI, 2.6 to 9.2)	100 (95% CI, NR)
					2) wishing you were dead	7.9	91.7 (95% CI, 76.1 to 100.0)	93.1 (95% CI, 91.5 to 94.7)	13.9 (95% CI, 6.3 to 21.5)	99.8 (95% CI, 99.5 to 100.0)
					3) feeling suicidal	3.3	83.3 (95% CI, 62.2 to 100.0)	97.7 (95% CI, 69.8 to 98.6)	30.3 (95% CI, 14.6 to 46.0)	99.8 (95% CI, 99.5 to 100.0)
Older adults	Heisel 2010[120] Fair	Primary care patients ages 65 to 95 years (n=626)	11% suicidal ideation (timeframe NR)†	SCID suicide items or suicide item from HAM-D (NR)	Suicide subscale (5 items) of the GDS: 1) cut score ≥1	26.2	79.7 (95% CI, 68.3 to 88.4)	80.4 (95% CI, 76.9 to 83.6)	33.5 (95% CI, 26.4 to 41.3)	97.0 (95% CI, 95.0 to 98.3)
					2) cut score ≥2	12.5	55.1 (95% CI, 42.6 to 67.1)	92.8 (95% CI, 90.3 to 94.8)	48.7 (95% CI, 37.2 to 60.3)	94.3 (95% CI, 92.1 to 96.1)
					3) cut score ≥3	5.8	34.8 (95% CI, 23.7 to 47.2)	97.8 (95% CI, 96.2 to 98.9)	66.7 (95% CI, 49.0 to 81.4)	92.4 (95% CI, 89.9 to 94.4)

*Percent of participants who scored positive for suicidal behavior on the reference test.
†Combined suicide ideation variable (6.5% endorsed the HAM-D suicide ideation item; 9.9% endorsed the SCID suicide ideation item; 94.4% concordance).

Abbreviations: CI = confidence interval; CRA = Clinician Risk Assessment; GDS = Geriatric Depression Scale; HAM-D = Hamilton Rating Scale for Depression; K-SADS-PL = Schedule for Affective Disorders and Schizophrenia for School-Age Children—Present and Lifetime Version; NPV = negative predictive value; NR = not reported; PPV = positive predictive value; SCID = Structured Clinical Interview for DSM Disorders; SDDS-PC = Symptom-Driven Diagnostic System for Primary Care; SRS = Suicide Risk Screen.

Table 4. Included Trials for Benefits and Harms of Treatment With Outcomes Reported in Adults and Older Adults (Key Questions 4 and 5)

Intervention category	Study	Population description	N randomized	Country	Suicide deaths	Suicide attempts/ DSH	Hospitalization or ED use	Other health outcome	Suicidal ideation	Depression	Hopelessness
Cognitive behavioral therapy	Brown 2005[126, 168,169]	Adults (18-66 years) with a suicide attempt within 48 hours of visit to ED, identified in ED	120	United States		■**			□	■*	◘
	Evans 1999[134]	Adults (16-50 years) presenting to participating mental health center or hospital following DSH	34	United Kingdom		□*		□		■	
	Hawton 1987[137]	Adults (≥16 years) admitted to general hospital following overdose and "continuing problems which they were willing to tackle with the help of the counselors"	77	United Kingdom	□	□*		□		□*	
	Marasinghe 2012[142]	Adults (15-74 years) admitted to hospital after attempting self-harm; displayed significant suicidal intent at the interview or on the BSSI	68	Sri Lanka					■	■	
	Rudd 1996[144]	Young adults with suicide attempt or suicidal ideation with mood disorder or suicidal ideation and alcohol (age range NR)	302	United States					□*	□*	□
	Samaraweera 2007[105]	Adult (15-64 years) sample from a population study, screening positive for suicidality	10	Sri Lanka					■**		
	Slee 2008[145,170]	Adults (15-35 years) visiting a mental health center due to self-harm	90	The Netherlands	□	■	◘			■*	
	Tyrer 2003[146, 171-174]	Adults (16-65 years) presenting to Accident and Emergency Service after episode of DSH, with ≥1 previous attempts	480	United Kingdom	□	□*		□		□*	
Dialectical behavior therapy	Carter 2010[128]	Adult female (18-65 years) BPD patients with ≥3 DSH episodes in the past year	73	Australia		□	■	◘			
	Linehan 1991[140]	Adult female (18-45 years) BPD patients with ≥2 episodes of DSH in the past 5 years, including one in the past 8 weeks	63	United States		□*	■		□	□	□

Table 4. Included Trials for Benefits and Harms of Treatment With Outcomes Reported in Adults and Older Adults (Key Questions 4 and 5)

Intervention category	Study	Population description	N randomized	Country	Suicide deaths	Suicide attempts/ DSH	Hospitalization or ED use	Other health outcome	Suicidal ideation	Depression	Hopelessness
	Linehan 2006[141, 175,176]	Adult female (18-45 years) BPD patients with ≥2 episodes of DSH in the past 5 years, including one in the past 8 weeks	111	United States	□	■*	■		□*	□*	
	van den Bosch 2005[148,177]	Adult female (18-65 years) BPD patients recruited from mental health institutions and addiction treatment services	64	The Netherlands		□*					
Problem-solving therapy	Bannan 2012[109]	Adults (18-53 years) with a self-poisoning episode, previous DSH within past 12 months	20	Ireland					□*	■**	■*
	Fitzpatrick 2005[106]	University students (18-24 years) screening positive for suicide (on BSS), participated in study for extra class credit	110	United States	□				■**	■**	□*
	Hatcher 2011[107]	Adults (≥16 years) presenting to hospital for self-harm, but not hospitalized for more than 48 hours	522	New Zealand		□*			■**	■*	■*
Psycho-dynamic or interpersonal therapy	Bateman 1999[124,178]	Adult (16-65 years) BPD patients, referred to psychiatric unit	44	United Kingdom		■**	■	■		■*	
	Guthrie 2001[135, 179]	Adults (18-65 years) presenting to ED after episode of DSH	119	United Kingdom	□	■*			■*	◘*	
Other therapy, with direct therapeutic contact	Comtois 2011[131]	Adults (19-62 years) evaluated for suicide attempt or imminent risk, but judged safe for discharge; no mental health care available for 2 weeks	32	United States		□*	□	■	■		
Other therapy, without direct therapeutic contact	Kovac 2002[138]	University students (18-42 years) who screened positive for increased risk of suicide	121	United States					□*	□*	
Medication: Lithium	Lauterbach 2008[139]	Adults (≥18 years) with a suicide attempt in past 3 months and depressive spectrum disorder, identified through screening at psychiatric ED and inpatient unit	167	Germany	■	□					

Table 4. Included Trials for Benefits and Harms of Treatment With Outcomes Reported in Adults and Older Adults (Key Questions 4 and 5)

Intervention category	Study	Population description	N randomized	Country	Suicide deaths	Suicide attempts/ DSH	Hospitalization or ED use	Other health outcome	Suicidal ideation	Depression	Hopelessness
Practice-based interventions	Almeida 2012[152,180]	General practitioners recruited older adult patients (60-101 years)	373 GPs, 21,762 patients	Australia		■†				□	
	Bennewith 2002[115]	Adult (16-95 years) DSH patients identified through case registry, updated weekly, of all DSH patients in hospital Accident and Emergency Service	1,932	United Kingdom		□*					
	Clarke 2002[130]	Adults (≥20 years) presenting to Accident and Emergency Service following DSH	526	United Kingdom		□*	□				
	Szanto 2007[151]	General practitioners (age range NR) providing services to inhabitants of region with high suicide rates	Two geographic locations, n≈127,000	Hungary	□						
	Bruce 2004[114, 181-187]	Depressed older adults (60-94 years), recruited from primary care screening for depression	598	United States	□	□*		■	◘	■	
Improving treatment adherence with direct person-to-person contact	Allard 1992[123]	Individuals with an ED visit for suicide attempt at study hospitals (age range NR)	150	Canada	□	□*					
	Cedereke 2002[129]	Individuals treated at ED for suicide attempt, recruited 1 month after attempt (age range NR)	216	Sweden	□	□*		□	■		
	Crawford 2010[132]	Adults (18-65 years) presenting to ED following DSH and misusing alcohol	103	United Kingdom		□*					
	Currier 2010[133]	Suicidal adults (18-69 years) identified and enrolled in ED	122	United States				□	□	□	
	Vaiva 2006[147]	Adults (18-65 years) with a suicide attempt by drug overdose, cleared for discharge from ED	605	France	□	□*					
	van Heeringen 1995[149]	Adult (≥15 years) suicide attempters referred to Accident and Emergency Services	516	Belgium	□	□*					
	Welu 1977[150]	Adult (≥16 years) suicide attempters brought to ED	143	United States		□*					

Table 4. Included Trials for Benefits and Harms of Treatment With Outcomes Reported in Adults and Older Adults (Key Questions 4 and 5)

Intervention category	Study	Population description	N randomized	Country	Suicide deaths	Suicide attempts/ DSH	Hospitalization or ED use	Other health outcome	Suicidal ideation	Depression	Hopelessness
Improving treatment adherence without direct person-to-person contact	Beautrais 2012[125]	Adults (≥16 years) presenting to psychiatric ED with suicide attempt or DSH	327	New Zealand		□*					
	Carter 2007[127, 188]	Adults (≥16 years) presenting to Toxicology Service for self-poisoning	772	Australia		□*	□				
	Hassanian 2011[136]	Adolescents and adults (≥12 years) with a hospital admission for self-poisoning	2,300	Iran		■*			■		
	Motto 2001[143]	Individuals refusing further treatment 1 month postdischarge inpatient stay after suicide attempt (age range NR)	843	United States	◘			□			

*Included in meta-analysis, shown on forest plot figure.
**Difference in statistical significance of results between meta-analysis and original study, usually due to differences in outcomes analyzed (e.g., change from baseline in meta-analysis vs. repeated measures group*time effect in study; analyzing risk ratios in meta-analysis vs. odds ratios in study, use of unadjusted results in meta-analysis but adjusted p-values are presented in study).
†Combined outcomes of suicide attempts and suicidal ideation.

■ Statistically significant group differences for half or more of reported outcomes/followups.

◘ Statistically significant group differences for at least one but fewer than half of reported followups or analyses.

□ No statistically significant group differences reported.

Abbreviations: BPD = borderline personality disorder; BSSI = Beck Scale for Suicidal Ideation; DSH = deliberate self-harm; ED = emergency department; NR = not reported.

Table 5. Included Trials for Benefits and Harms of Treatment With Outcomes Reported in Adolescents (Key Questions 4 and 5)

Intervention Category	Study	Population description	N randomized	Country	Suicide deaths	Suicide attempts/ DSH	Hospitalization or ED use	Other health outcome	Suicidal ideation	Depression	Hopelessness
Cognitive behavioral therapy	Donaldson 2005[153]	Adolescents (12-17 years) presenting to ED or inpatient unit after suicide attempt	39	United States		□*			□*	□*	
	Esposito-Smythers 2011[163,189]	Adolescent (13-17 years) psychiatric inpatients with a suicide attempt in past 3 months or significant suicidal ideation in the past month, and an alcohol or cannabis use disorder	40	United States		■*	■		□	□	
	Greenfield 2002[156]	Adolescents (12-17 years) presenting to ED after suicide attempt	286	Canada	□	□*	■	□	□		
Developmental group therapy	Green 2011[155,190]	Adolescents (12-17 years) with two DSH episodes in past 12 months, recruited from mental health services centers	366	United Kingdom	□	□*	□	□**	□*	□*	
	Hazell 2009[157]	Adolescents (12-16 years) with two DSH episodes in past 12 months (including one in past 3 months), referred to mental health service	72	Australia		□*	□	□*	□*	□*	
	Wood 2001[160]	Adolescents (12-16 years) referred to mental health services after deliberate self-harm	63	United Kingdom		■*		□*	□*	□*	
Psychodynamic or interpersonal therapy	Chanen 2008[164]	Adolescents (15-18 years) with two or more symptoms of BPD referred to mental health services for acute, severe mental health problems	86	Australia		□*		□			
	Diamond 2010[108,191]	Adolescents (12-17 years) identified as suicidal by screening during primary care or ED visits	66	United States		□*			■**	□*	
	Tang 2009[159]	Adolescents (12-18 years) with moderate-severe depression, suicide ideation, previous suicide attempt, moderate-severe anxiety, or significant hopelessness, based on school-based screening. Random sample from participating schools selected for study	73	Taiwan					■*	■*	■

Table 5. Included Trials for Benefits and Harms of Treatment With Outcomes Reported in Adolescents (Key Questions 4 and 5)

Intervention Category	Study	Population description	N randomized	Country	Suicide deaths	Suicide attempts/ DSH	Hospitalization or ED use	Other health outcome	Suicidal ideation	Depression	Hopelessness
Other therapy, with direct therapeutic contact	Eggert 2002[154,192-194]	Adolescents (14-19 years) at increased risk of high school dropout who screened positive for increased risk of suicide	238	United States		□			■	■	■
	Hooven 2012[161]	Adolescents (14-19 years) who screened positive for suicide risk or at least two of the following: moderate depression, moderate suicidal ideation/threats, and/or alcohol and drug use	615	United States		□			■	◘	◘
Other therapy, without direct therapeutic contact	King 2009[158]	Hospitalized adolescents (13-17 years) with suicidal ideation or attempt within the last 4 weeks	448	United States	□	□*	□		◘	□	□
Improving treatment adherence without direct person-to-person contact	Robinson 2012[162,195]	Young individuals (15-24 years) with a history of suicide threats, ideation, attempts, and/or DSH and did not meet entry criteria for service, either because they were not unwell enough or were receiving treatment elsewhere	165	Australia		□			□	□	□

*Included in meta-analysis, shown on forest plot figure.
**Difference in statistical significance of results between meta-analysis and original study, usually due to differences in outcomes analyzed (e.g., change from baseline in meta-analysis vs. repeated measures group*time effect in study; analyzing risk ratios in meta-analysis vs. odds ratios in study, use of unadjusted results in meta-analysis but adjusted p-values are presented in study).
■Statistically significant group differences for half or more of reported outcomes/followups.
◘Statistically significant group differences for at least one but fewer than half of reported followups or analyses.
□No statistically significant group differences reported.

Abbreviations: DSH = deliberate self-harm; ED = emergency department.

Table 6. Population Characteristics of Included Studies: Adults and Older Adults (Key Questions 4 and 5)

Intervention category	Study	Age range (mean age)	% Female	% Nonwhite	% Substance use diagnosis	% Depressive or mood disorder diagnosis	% Previous suicide attempt (average # of previous attempts)	% Previous DSH (average # of previous DSH)
Cognitive behavior therapy	Brown 2005[126,168,169]	18-66 (35)	61	65	68	77	72 (NR)	NR (NR)
	Evans 1999[134]	16-50 (NR)	NR	NR	NR	NR	NR (NR)	100 (NR)
	Hawton 1987[137]	≥16 (29)	66	NR	NR	NR	31 (NR)	NR (NR)
	Marasinghe 2012[142]	15-74 (31)	50	100	NR	NR	NR (NR)	NR (NR)
	Rudd 1996[144]	"Young adult" (22)	18	39	44 (alcohol only)	18	41 (NR)	NR (NR)
	Samaraweera 2007[105]	15-64 (36)	60	NR	0 (alcohol dependence)	NR	NR (NR)	NR (NR)
	Slee 2008[145,170]	15-35 (24)	90	2	16	89	58 (NR)*	NR (13)*
	Tyrer 2003[146,171-174]	16-65 (32)	68	10	0 (alcohol or drug dependence)	NR	NR (NR)	100 (NR)
Dialectical behavior therapy	Carter 2010[128]	18-65 (24)	100	NR	69	NR	NR (NR)	100 (20)*
	Linehan 1991[140]	18-45 (NR)	100	NR	0 (substance dependence)	NR	NR (NR)	100 (NR)§
	Linehan 2006[141,175,176]	18-45 (29)	100	13	30	72	NR (NR)	100 (NR)
	van den Bosch[148,177]	18-65 (35)	100	3	82	NR	71 (NR)	93 (14)‖
Problem-solving therapy	Bannan 2012[109]	18-53 (29)	NR	NR	0 (alcohol or drug dependence	50	NR (NR)	100 (2)¶
	Fitzpatrick 2005[106]	18-24 (19)	54	25	NR	NR	NR (NR)	NR (NR)
	Hatcher 2011[107]	≥16 (34)	69	39	NR	NR	NR (NR)	55 (NR)
Psychodynamic or interpersonal therapy	Bateman 1999[124,178]	16-65 (32)	50	NR	39 (periodic substance abuse)	57	NR (NR)	NR (8-9)‖
	Guthrie 2001[135,179]	18-65 (31)	56	12	NR	NR	60 (NR)	NR (NR)
Other therapy, with direct therapeutic contact	Comtois 2011[131]	19-62 (37)	62	44	NR	NR	NR (5.4)	NR (NR)
Other therapy, without direct therapeutic contact	Kovac 2002[138]	18-42 (23)	73	26	NR	54 (previous treatment for depression)	14 (NR)†	NR (NR)
Medication: Lithium	Lauterbach 2008[139]	≥18 (39)	57	NR	8	76	44 (NR)	NR (NR)
Practice-based interventions	Almeida 2012[152,180]	60-101 (72)	59	NR	13 (risky alcohol use)	8 (per PHQ-9 screen)	4.2 (NR)‡‡	NR (NR)
	Bennewith 2002[115]	16-95 (32)	59	NR	NR	NR	NR (NR)	13 (NR)
	Clarke 2002[130]	≥20 (33)	56	NR	13 (alcohol abuse)	56 (per HADS screen)	NR (NR)	47 (NR)
	Bruce 2004[114,181-187]	60-94 (70)	72	28	NR	66	NR (NR)	NR (NR)
	Szanto 2007[151]	NR (NR)	NR††	NR††	NR	NR	NR (NR)	NR (NR)

Table 6. Population Characteristics of Included Studies: Adults and Older Adults (Key Questions 4 and 5)

Intervention category	Study	Age range (mean age)	% Female	% Nonwhite	% Substance use diagnosis	% Depressive or mood disorder diagnosis	% Previous suicide attempt (average # of previous attempts)	% Previous DSH (average # of previous DSH)
Improving treatment adherence with direct person-to-person contact	Allard 1992[123]	NR (NR)	57	NR	53	87	50 (2)	NR (NR)
	Cedereke 2002[129]	NR (41)	66	NR	NR	42 (mood disorder)	NR (1.1)	NR (NR)
	Crawford 2010[132]	18-65 (37)	49	NR	100 (alcohol misuse)	NR	NR (NR)	NR (NR)
	Currier 2010[133]	18-69 (33)	57	40	>50 (“over half” tested positive for drugs)	19	“majority” (NR)	NR (NR)
	Vaiva 2006[147]	18-65 (36)	73	NR	NR	NR	9 (NR)‡	NR (NR)
	van Heeringen 1995[149]	≥15 (34)	57	NR	NR	15 (mood disorder)	30 (NR)	89 (NR)¶
	Welu 1977[150]	≥16 (29)	NR	NR	40 (drink to excess)	NR	60 (NR)	NR (NR)
Improving treatment adherence without direct person-to-person contact	Beautrais 2012[125]	≥16 (34)	66	NR	NR	NR	NR (NR)	18 (0.4)**
	Carter 2007[127,188]	≥16 (33)	68	NR	NR	NR	NR (NR)	17 (NR)¶
	Hassanian 2011[136]	≥12 (24)	66	NR	9 (illicit drug use)	NR	34 (NR)	NR (NR)
	Motto 2001[143]	NR (33)	56	NR	NR	NR	NR (NR)	NR (NR)

*In the past 3 months.
†Previous treatment for suicide attempt.
‡Four or more attempts in past 3 years.
§Participants were parasuicidal.
‖Median number of self-mutilation acts.
¶Self-poisoning.
**In the past 12 months.
††Two regions were comparable in proportion of females (52%) and older residents (22%).
‡‡Combined outcome of suicide attempts and suicidal ideation.

Abbreviations: DSH = deliberate self-harm; HADS = Hospital Anxiety and Depression Scale; NR = not reported; PHQ-9 = Personal Health Questionnaire 9-item Depression Scale.

Table 7. Population Characteristics of Included Studies: Adolescents (Key Questions 4 and 5)

Intervention category	Study	Age range (mean age)	% Female	% Nonwhite	% Substance use diagnosis	% Depressive or mood disorder diagnosis	% Previous suicide attempt (average # of previous attempts)	% Previous DSH (average # of previous DSH)
Cognitive behavior therapy	Donaldson 2005[153]	12-17 (15)	82	15	19 (alcohol) 45 (cannabis)	29	48 (NR)	NR (NR)
	Esposito-Smythers 2011[163,189]	13-17 (16)	67	11	64 (alcohol) 83 (cannabis) 14 (other substance)	94	75 (NR)	72 (NR)
	Greenfield 2002[156]	12-17 (14)	69	29	>50 (~50% report each of alcohol abuse and illegal drug use)	48	37 (NR)*	NR (NR)
Developmental group therapy	Green 2011[155,190]	12-17 (NR)	88	6	NR	62	NR (NR)	100 (21)§
	Hazell 2009[157]	12-16 (15)	90	NR	0 (substance misuse) 4 (dysfunctional alcohol use)	57	NR (NR)	100 (NR)
	Wood 2001[160]	12-16 (14)	78	NR	44 (intoxicated at least weekly)	83	NR (NR)	79 (4.1)‡
Psychodynamic or interpersonal therapy	Chanen 2008[164]	15-18 (16)	76	NR	37 (substance abuse)	15	NR (NR)	94 (9.5)‖
	Diamond 2010[108,191]	12-17 (15)	83	74	NR	47	62 (NR)	NR (NR)
	Tang 2009[159]	12-18 (15)	66	NR	0 (substance abuse)	100	NR (NR)	NR (NR)
Other therapy, with direct therapeutic contact	Eggert 2002[154,192-194]	14-19 (16)	49	57	NR	NR	NR (0.2)†	NR (NR)
	Hooven 2012[161]	14-19 (16)	60	34	NR	NR	NR (NR)	NR (NR)
Other therapy, without direct therapeutic contact	King 2009[158]	13-17 (16)	71	16	21 (alcohol or substance abuse)	88	75 (NR)	NR (NR)
Improving treatment adherence without direct person-to-person contact	Robinson 2012[162,195]	15-24 (19)	64	NR	25 (substance use or dependence disorder)	67	16 (NR)	68 (10.7)

*In the past 6 months.
†In the past 1 month.
‡Self-poisoning.
§In the past 12 months.
‖Median number of lifetime "parasuicide" episodes.

Abbreviations: DSH = deliberate self-harm; NR = not reported.

Table 8. Intervention Characteristics of Included Studies: Adults and Older Adults (Key Questions 4 and 5)

Intervention category	Study	Brief description of intervention	Control condition	# of sessions	Duration of treatment (m)	Sessions per week during most intensive phase
Cognitive behavioral therapy	Brown 2005[126,168,169]	Individual cognitive therapy	UC by community clinicians, including case management	10	2.5	2
	Evans 1999[134]	Brief manual-based problem-focused individual cognitive therapy	Psychiatric UC: inpatient, outpatient, day-hospital, community treatment	2-6	NR	NR
	Hawton 1987[137]	Brief problem-focused individual therapy	General practitioner care (including referrals as needed)	1-8	NR	NR
	Marasinghe 2012[142]	Brief mobile phone-based counseling and prerecorded messages; one initial in-person session	UC with waitlist	11	6	3
	Rudd 1996[144]	2-week partial hospitalization (9 hours per day), psychoeducational and psychotherapeutic groups and (as needed) individual crisis counseling	UC: inpatient and/or outpatient care (e.g., individual and/or group therapy, time-limited stress management group, open-ended process-orientated support group)	18	0.5	7
	Samaraweera 2007[105]	Culturally relevant (for Sri Lanka) individual cognitive behavioral	UC, involved referral to local psychiatrist and mental health team.	3-6	0.75 -1	1
	Slee 2008[145,170]	Individual CBT with option for partner or parent participation	UC included psychotropic medications, psychotherapy, and psychiatric hospitalizations	12	5.5	1
	Tyrer 2003[146,171-174]	Brief manual-based problem-focused individual cognitive therapy	UC, initial psychiatric assessment followed by outpatient care, occasional day-patient care or referral back to the general practitioner	5-7	3-6	NR
Dialectical behavior therapy	Carter 2010[128]	Team-based, manualized, directive group and individual treatment	UC with 6-month waitlist	100+ (estimate)	12	NR
	Linehan 1991[140]	Team-based, manualized, directive group and individual treatment	UC, given alternative therapy referrals	104	12	2
	Linehan 2006[141,175,176]	Team-based, manualized, directive group and individual treatment	Community treatment by selected experts	104	12	2
	van den Bosch[148,177]	Team-based, manualized, directive group and individual treatment	UC, clinical management from original referral source, attended no more than two sessions per month	104	12	2
Problem-solving therapy	Bannan 2012[109]	Problem-solving therapy group	UC, standard individual therapy in outpatient or day hospitals	8	2	2
	Fitzpatrick 2005[106]	Problem-solving video/slide presentation	Video-matched control; focused on current health issues such as proper diet, exercise and sleep habits	1	1 day	NA
	Hatcher 2011[107]	Manual-based individual problem-solving therapy	UC, possible referral to multidisciplinary teams, mental health crisis teams, alcohol or drug treatment centers, etc.	4-9	3	NR

Table 8. Intervention Characteristics of Included Studies: Adults and Older Adults (Key Questions 4 and 5)

Intervention category	Study	Brief description of intervention	Control condition	# of sessions	Duration of treatment (m)	Sessions per week during most intensive phase
Psychodynamic or interpersonal therapy	Bateman 1999[124, 178]	Long-term partial hospitalization, guided by psychoanalytic model and twice weekly long-term psychoanalytic group	UC; could involve inpatient admission, partial hospitalization program, outpatient consultation, community center attendance, medication	400 (estimate)	17	7
	Guthrie 2001[135, 179]	Psychodynamic individual interpersonal therapy	UC; assessment by a casualty doctor in the ED; referral to outpatient psychiatry, addiction services, or advised to consult with general practitioner	4	1	NR
Other therapy, with direct therapeutic contact	Comtois 2011[131]	Collaborative assessment and management of suicidality	Enhanced UC: intake by psychiatric provider, 1 to 11 visits as needed with case manager for medication management	4-12	NR	NR
Other therapy, without direct therapeutic contact	Kovac 2002[138]	Writing about difficult times with or without encouragement to "reinterpret" the stressful events through writing	Writing about mundane matters; same number of sessions as intervention group	4	0.5	2
Medication: Lithium	Lauterbach 2008[139]	200 mg/wk increase until sufficient blood level attained (0.6 to 0.8 mmol/L) (with UC)	Placebo with UC	NA	12	NA
Practice-based interventions	Almeida 2012[152, 180]	An educational intervention targeting GPs that included a practice audit with personalized automated feedback, printed educational materials, and 6 monthly newsletters	A practice audit with no feedback, printed materials or newsletters	NA	24	NA
	Bennewith 2002[115]	Notified GP of DSH episode, provided letter GP could send to patient and practice guidelines for assessment and treatment	UC, no specialist services	NA	NA	NA
	Bruce 2004[114,181-187]	PCP given treatment guidelines for depression in older adults, assigned care manager to advise PCP and provide psychotherapy if needed; informed if patient reported suicidal ideation	UC plus physician education on depression treatment guideline, notification when patient diagnosed with depression or reported suicidal ideation; risk management guidelines followed in these cases	NA	NA	NA
	Clarke 2002[130]	Case management: comprehensive assessment and determination of treatment needs, monitoring treatment and patient status	UC: triage and medical and psychiatric assessment/treatment as required	NA	NA	NA

Table 8. Intervention Characteristics of Included Studies: Adults and Older Adults (Key Questions 4 and 5)

Intervention category	Study	Brief description of intervention	Control condition	# of sessions	Duration of treatment (m)	Sessions per week during most intensive phase
	Szanto 2007[151]	5-year depression-management educational program for GPs and nurses with consultation service, special depression treatment clinics	UC	4 main provider education sessions with additional optional lectures	60	NA
Improving treatment adherence with direct person-to-person contact	Allard 1992[123]	Specific schedule of treatment prescribed, (starting with weekly visits, then tapering off); outreach in case of missed appointments; content of treatment left to discretion of provider	UC: subjects requiring admission were put under the care of other personnel; otherwise, treated by regular hospital personnel	Up to 19	12	1
	Cedereke 2002[129]	Phone contacts to assess and provide encouragement to stay in/return to treatment if needed	UC	2	8	2
	Crawford 2010[132]	Appointment card with alcohol counselor; counselor visit included assessment, advice on alcohol reduction, referral to treatment	Information leaflet on alcohol and health	1	1 day	NA
	Currier 2010[133]	Extensive clinical assessment within 48 hours of discharge at location of participant's choice, referral to community resources	UC, offered assessment appointment at clinic within 5 days of discharge, with same content as intervention group visit	1	1 day	NA
	Vaiva 2006[147]	Single phone contact 1 or 3 months postdischarge to revisit recommended treatment, encourage re-engagement in treatment if needed, provide crisis counseling as needed	UC, no telephone contact	1	1 day	NA
	van Heeringen 1995[149]	Home visits for patients noncompliant with initial treatment referral, followup to check on compliance	All patients referred to outpatient after-care	1-2	NR	NR
	Welu 1977[150]	Contact immediately after ED discharge by phone; home visit for assessment and treatment plan/referral, continued monitoring	UC; either given an appointment slip for an evaluation at the Community Mental Health Center the next day or immediately hospitalized	NR	4	2

Table 8. Intervention Characteristics of Included Studies: Adults and Older Adults (Key Questions 4 and 5)

Intervention category	Study	Brief description of intervention	Control condition	# of sessions	Duration of treatment (m)	Sessions per week during most intensive phase
Improving treatment adherence without direct person-to-person contact	Beautrais 2012[125]	Sent postcards at 2 wk, 6 wk, 3 mo, 6 mo, 9 mo, and 12 mo after DSH episode wishing patient well, inviting them to contact provider	UC, crisis assessment and referral to inpatient community-based mental health services	0	12	NA
	Carter 2007[127,188]	Sent postcards at 1, 2, 3, 6, 8, 10, and 12 mo after DSH episode wishing patient well, inviting them to contact provider	UC	0	12	NA
	Hassanian 2011[136]	Sent postcards at 1, 2, 3, 6, 8, 10, and 12 mo after DSH episode in addition to receiving one on birthday wishing patient well, inviting them to contact provider	UC (which is minimal in Tehran)	0	12	NA
	Motto 2001[143]	24 letters over 5 years, expressing concern and inviting participant to contact staff member	No further contact	0	60	NA

Abbreviations: CBT = cognitive behavioral therapy; DSH = deliberate self-harm; ED = emergency department; GP = general practitioner; NA = not applicable; NR = not reported; PCP = primary care provider; UC = usual care.

Table 9. Intervention Characteristics of Included Studies: Adolescents (Key Questions 4 and 5)

Intervention category	Study	Brief description of intervention	Control condition	# of sessions	Duration of treatment (m)	Sessions per week during most intensive phase
Cognitive behavioral therapy	Donaldson 2005[153]	Individual skills-based treatment and brief contact with parents at each session and 1 to 3 family sessions	Unstructured sessions addressing reported symptoms and problems on same schedule of sessions as intervention group	12-16	6	1
	Esposito-Smythers 2011[163,189]	Individual skills development with youth, parenting and other skills development for parents with separate therapist, and family sessions targeting suicidality and substance misuse	UC, determined and provided by community-based providers, including availability of resource information, emergency and nonemergent appointments	34+	12	1
	Greenfield 2002[156]	Phone contact immediately after ED visit, involving in-depth assessment and treatment	UC, continue treatment initiated in ED, including hospitalization, outpatient care or referral to a variety of community resources	NR	NR	NR
Developmental group therapy	Green 2011[155,190]	Developmental group psychotherapy	UC, varied by center	6+	1.5+	1
	Hazell 2009[157]	Developmental group psychotherapy	UC, provided by community-based adolescent mental health service, such as individual or family counseling, medication, or care coordination activities	6+	Up to 12	1
	Wood 2001[160]	Developmental group psychotherapy	UC, included family sessions, nonspecific counseling with adolescent, and psychotropic medications	6+	6+	1
Psychodynamic or interpersonal therapy	Chanen 2008[164]	Cognitive analytic therapy	UC, standardized good clinical care with modular treatment package	24	6	1
	Diamond 2010[108,191]	Process-oriented and emotion-focused attachment-based family therapy	Facilitated referral process (found provider, set up initial appointment, encouraged attendance) with ongoing clinical monitoring	NR	3	NR
	Tang 2009[159]	Intensive individual interpersonal psychotherapy	Psychoeducation and irregular individual supportive counseling with teacher who learned basic counseling skills	18	1.5	3
Other therapy, with direct therapeutic contact	Eggert 2002[154,192-194]	Computer-assisted suicide assessment, motivational counseling session, and identification of school-based case manager to support connection between school, parents, and youth	Interviewer implemented school policy and used standardized social connections procedures, including notifying parents and staff personnel	1	1 day	NA

Table 9. Intervention Characteristics of Included Studies: Adolescents (Key Questions 4 and 5)

Intervention category	Study	Brief description of intervention	Control condition	# of sessions	Duration of treatment (m)	Sessions per week during most intensive phase
	Hooven 2012[161]	C-CARE: Computer-assisted suicide assessment, motivational counseling session, and identification of school-based case manager to support connection between school, parents, and youth P-CARE: 2 parent sessions, reviewing suicide risk, support and communication skills, conflict reduction, youth mood management C+P-CARE: Both of the above	UC, 30-minute interview addressing suicide risk factors, derived from C-CARE interview (involves connection to school resources and parent phone call)	C-CARE:1 P-CARE:2	NR	NA
Other therapy, without direct therapeutic contact	King 2009[158]	Youth-nominated support person trained to provide support to the youth	UC	NA	NA	NA
Improving treatment adherence without direct person-to-person contact	Robinson 2012[162, 195]	Monthly postcards for 12 months, expressing interest in person's well-being, reminding them about previously identified sources of help, describing 1 of 6 rotating self-help strategies (e.g., physical activity, books, Web sites)	UC, treatment support the individual was receiving at the time (e.g., support from general practitioner, school counselor, private psychiatrist or psychologist) and received initial sources of help interview but no postcards	0	12	NA

Abbreviations: ED = emergency department; NA = not applicable; NR = not reported; UC = usual care.

Table 10. Summary of Results: Adults

Intervention category	Trials, n	Suicide deaths	Suicide attempt or DSH	Hospital/ED use, other health outcomes	Suicidal ideation	Depression	Hopelessness
Psychotherapy	k=19 n=2,460	□□□□□ □ 3 deaths in IGs, 7 deaths in CG; insufficient power	■■■■■* □□□□□□□□ RR, 0.68 (95% CI, 0.56 to 0.83)‡ k=11, I^2=16.1%	*Inpatient psychiatric or ED*: ■■■■◘ □ *Social functioning:* ■□□□□ □ *Quality of life*: ■■□ *Other functioning:* ■	■■■■■ ■□□□□□□ SMD, -0.10 (95% CI, -0.27 to 0.06) k=8, I^2=26.3%	■■■■■ ■■■■◘□ □□□□□ SMD, -0.37 (95% CI, -0.55 to -0.19)‡ k=12, I^2=60.5%	■■■◘†□□ □ Mixed results, sparsely reported
Medication: Lithium	k=1 n=167	■ IG: 0% CG: 3.6% (at 13 mo)	□ 1 mo: IG: 2.7% CG: 2.9% 3 mo: IG: 5.9% CG: 16.7% Incident rate/person-year: IG: 12.7 CG: 21.7	No data	No data	No data	No data
Enhanced usual care	k=13 n=8,555 + k=1 population-based study n≈127,000 residents	◘□□□□ □ IG: 27 deaths CG: 32 deaths, excluding population-based trial; insufficient power; no group differences in suicide death rate in population-based trial	■□□□□ □□□□□□ RR, 0.90 (95% CI, 0.80 to 1.02)‡ k=11, I^2=0.2%	*Global functioning*: □ *Functional health status*: □ *Nonsuicidal deaths*: □ *Admission to ED/inpatient*: □□	■■**□ Largest effect in Iranian trial with very minimal usual care: % reporting suicidal ideation during study period: IG: 29% CG: 42%	Mean (SD) change from baseline on HRSD □ IG: -5.7 (NR) CG: -5.2 (NR) (at 3 mo)	No data

□=outcome was reported, groups were not statistically different from each other at any followup.
■=outcome was reported, intervention group showed greater improvement than control group at half or more of the followup assessments.
◘=outcome was reported, intervention group showed greater improvement than control group at fewer than half of followup assessments.
*Number of DSH episodes, rather than percent with any attempt/episode.
†Group differences at 6 months, but not 1, 3, 12, or 18 months.
‡Statistically significant.
**Percent reporting suicidal ideation.

Abbreviations: CI = confidence interval; DSH = deliberate self-harm; HRSD = Hamilton Rating Scale for Depression; NR = not reported; RR = risk ratio; SMD = standardized mean difference; SSI = Scale for Suicidal Ideation (range, 0-38).

Table 11. Summary of Results: Adolescents

Intervention category	Trials, n	Suicide deaths	Suicide attempt or DSH	Hospital/ED use, other health outcomes	Suicidal ideation	Depression	Hopelessness
Psychotherapy	k=12, n=2,392	□□□ One death (in CG) in all 3 trials	■■□□□ □□□□□□ RR, 0.99 (95% CI, 0.75 to 1.31) k=9, I^2=49.1% 4 trials reported ≥22% increase in risk	*Inpatient psychiatric*: ■■□□□ (at 6-12 mo) *Global functioning*: ■□□□□ (primarily development group therapy trials)	■■ ■■◘ □□□□□□ SMD, -0.22 (95% CI, -0.46 to 0.02) k=6, I^2=41.2%	■■ ◘□□ □□□□□ SMD, -0.36 (95% CI, -0.63 to -0.08)† k=6, I^2=53.6%	■■ ◘□ Sparsely reported, small group differences
Enhanced usual care	k=1, n=165	No data	□ Self-harm with intent to die: 12 mo: IG: 8.5% CG: 5.9%	No data	□ Serious suicidal ideation in the past 12 mo: 12 mo: IG: 23.3% CG: 23.5%	□ Mean (SD) change from baseline on CESD: IG: -10.0 (NR) CG: -12.0 (NR) (at 12 mo)	□ Mean (SD) change from baseline on BHS: BL: IG: -2.2 (NR) CG: -2.9 (5.6) (at 12 mo)

□=outcome was reported, groups were not statistically different from each other at any followup.
■=outcome was reported, IG showed greater improvement than CG at half or more of the followup assessments.
◘=outcome was reported, IG showed greater improvement than CG at fewer than half of followup assessments.
*Trial with large difference likely used low-effectiveness CG (at 1.5 mo).[159]
†Statistically significant.

Abbreviations: BHS = Beck Hopelessness Scale; BL = baseline; CG = control group; CI = confidence interval; DSH = deliberate self-harm; IG = intervention group; NR = not reported; RR = risk ratio; SD = standard deviation; SMD = standardized mean difference.

Table 12. Summary of Results: Older Adults

Intervention category	Trials, n	Suicide deaths	Suicide attempt or DSH	Hospital/ED use, other health outcomes	Suicidal ideation	Depression	Hopelessness
Enhanced usual care	k=2 n=22,360	□ 1 death (in IG)	■□ 20%-23% reduction in risk of suicide attempt or combined outcome of suicide attempt or suicidal ideation	*Nonsuicidal deaths*: □	◘* % reporting ideation: 8 mo: IG: 17.2% CG: 18.6% 12 mo: IG: 14.6% CG: 13.4%	■□ Greater reduction in depression in IG than CG in depressed sample; no group differences in percent screening positive for depression in general primary care sample (24 mo)	No data

□=outcome was reported, groups were not statistically different from each other at any followup.
■=outcome was reported, intervention group showed greater improvement at one or more followups than control group.
◘=outcome was reported, IG showed greater improvement than CG at fewer than half of followup assessments.
*Statistically significant at 4- and 8-month followup but not at 12, 18, or 24 months.

Abbreviations: CG = control group; DSH = deliberate self-harm; ED = emergency department; IG = intervention group.

Table 13. Summary of Evidence

Population	# of studies (k), # of observations (n)	Design	Major limitations	Consistency	Applicability	Overall quality	Summary of findings
Key Question 1 (benefits of screening)							
Adults and older adults	k=1, n=443	RCT	Single trial, only 2 weeks followup, limited to adults	NA	Moderate: Primary care patients screening positive for depression in the United Kingdom	Fair	Among primary care patients screening positive for depression, there were no differences in suicidal ideation after 2 weeks between those screened for suicide risk and those screened for other health behaviors; only 1 suicide attempt in the whole trial. Data not reported separately for older adults.
Adolescents	No data	NA	NA	NA	NA	NA	No data
Key Question 2 (accuracy of screening)							
Adults	k=1, n=1,001	Diagnostic accuracy	Few studies, no replication of specific screening instruments, only 1 study had short time period between screener and reference (≤24 hours),[67] median time lag between tests ≥6 days in other studies	NA	High: Primary care in the United States[67]	Fair	3 suicide items were examined separately; sensitivity was ≥83% and specificity was ≥81% relative to a nurse-administered structured interview on the same day.
Older adults	k=1, n=626	Diagnostic accuracy		NA	High: Primary care in the United States[120]	Fair	Sensitivity and specificity of suicide-related items on the GDS were 80% for suicidal ideation in the past 2 weeks, at lowest of 3 cut-points examined.
Adolescents	k=2, n=799	Diagnostic accuracy		Low	Low-Moderate: At risk of dropout from U.S. high school;[119] Finnish mental health patients[118]	Fair	Study with best applicability to U.S. primary care reported sensitivity of 87% and specificity of 60% for the SRS.
Key Question 3 (harms of screening)							
Adults and older adults	k=1, n=443	RCT	Single trial with only 2-week followup	NA	Moderate: Primary care patients in the United Kingdom	Fair	No increase in suicide attempts or ideation after screening, slightly higher proportion of those who were screened withdrew consent for followup (6.6% of screened vs. 2.2% of unscreened). Data not reported separately for older adults.
Adolescents	k=2, n=2,650	RCT	Only 2 trials using different instruments, maximum followup of 2 days	Moderate	Low-Moderate: Australian and U.S. high school students screened in classroom setting	Fair	No adverse effects on emotions; Australian youth screening positive found screening more distressing and less worthwhile than those screening negative.

Table 13. Summary of Evidence

Population	# of studies (k), # of observations (n)	Design	Major limitations	Consistency	Applicability	Overall quality	Summary of findings
Key Questions 4 & 5 (benefits of treatment): Psychotherapy							
Adults	k=19, n=2,460	RCT	Populations inconsistently described; no data specifically on racial/ethnic minorities	Moderate	Low-Moderate: Many conducted outside of the United States, only trial that involved population-based screening was conducted in Sri Lanka[105]	Fair	Sample sizes insufficient to determine group differences in suicide deaths; psychotherapy reduced the risk of suicide attempts by 32% (RR, 0.68 [95% CI, 0.56 to 0.83]); pooled effects showed a small benefit for depression but not suicidal ideation. Most data were from trials of CBT or related interventions. Trials of DBT were limited to female patients with BPD.
Older adults	No data specific to older adults	NA	NA	NA	NA	NA	No trials limited to older adults, no subgroup analyses examining effects in older adults.
Adolescents	k=12, n=2,392	RCT	Little replication of interventions; populations inconsistently described; no data specifically on racial/ethnic minorities	Moderate	Low-Moderate: Many conducted outside of the United States, the few involving screening were conducted in school settings	Good (developmental group therapy); Fair (other therapies)	Insufficient data on suicide deaths; few approaches reduced suicide attempts or ideation compared with UC; pooled effects showed a small benefit for depression but not suicidal ideation. Some trials showed statistically nonsignificant increase in suicide attempts (by 22% to 113%), raising the possibility of harm.
Key Questions 4 & 5 (benefits of treatment): Medication							
Adults (Lithium)	k=1, n=167	Placebo-controlled RCT	Only 1 trial with high attrition beyond 3 months	NA	Moderate: German adults identified through ED and inpatient screening	Fair	3 suicide deaths, all in placebo group; short-term nonstatistically significant reduction in suicide attempts (HR for time to suicide attempt, 0.52; p=0.20); no benefit for suicidal ideation compared with placebo plus UC.
Older adults	No data	NA	NA	NA	NA	NA	No trials limited to older adults, no subgroup analyses examining effects in older adults.
Adolescents	No data	NA	NA	NA	NA	NA	No trials limited to adolescents, no subgroup analyses examining effects in adolescents.
Key Questions 4 & 5 (benefits of treatment): Enhanced Usual Care							
Adults	k=13, n=8,555 + k=1 population-based study n≈127,000 residents	RCT and 1 CCT[151]	Populations inconsistently described; no data specifically on racial/ethnic minorities; little replication of interventions	Moderate	Low-Moderate: Many trials conducted outside the United States	Fair	1 of 7 trials found reduced risk of deaths, at 2 years followup (1.8% deaths in intervention group vs. 3.5% in control group) in participants who were sent periodic letters expressing interest in patient's well-being, among persons who refused treatment after a suicide attempt, but effects reduced and no longer statistically significant beyond 2 years;[143] reductions in suicide attempts or other health outcomes generally not seen; suicidal ideation and depression were rarely reported.

Table 13. Summary of Evidence

Population	# of studies (k), # of observations (n)	Design	Major limitations	Consistency	Applicability	Overall quality	Summary of findings
Older adults	k=2, n=22,360	RCT	1 trial limited to those with depression with insufficient power for suicide deaths and attempts;[114] large study only reported composite outcome of suicide attempts plus ideation[152]	NA	High: 1 conducted in general primary care patients,[152] the other identified participants through primary screening for depression[114]	Fair	Primary care-based intervention in depressed older adults including care manager showed benefits for depression, mixed results for suicidal ideation, but no benefit for suicide deaths, attempts, or nonsuicidal deaths.[114] Education and training for providers reduced the risk of suicide attempts and ideation combined by 20% in a general primary care population of older adults, but had no effect on depression.[152]
Adolescents	k=1, n=165	RCT	Single trial with highly selected population, groups not entirely comparable at baseline, insufficient power for suicide attempts	NA	Low: Australia, highly selected population	Fair	No group differences in suicide attempts, suicidal ideation, depression, or hopelessness.
Adults	*Psychotherapy:* k=3, n=351 *Medication:* k=1, n=167 *Enhanced UC:* k=2, n=727 + remaining KQ 4 & 5 trials for paradoxical effects	RCT	Spare reporting of harms; methods of data collection not described	Moderate	Low-Moderate: Most of trials reporting harm conducted in the United States, but 2 of the U.S-based trials were in university students participating in study for class credit	Fair	No psychotherapy or enhanced UC trials identified any harmful effects; participants taking lithium were more likely to drop out of study due to adverse effects (13% taking lithium vs. 2% taking placebo). In full group of KQ 4 & 5 trials, several reported nonstatistically significant increases in suicide attempts or DSH, though most of these trials had few events and wide CIs; 1 trial in the United Kingdom of a practice-based intervention found a 32% (95% CI, 1.02 to 1.70) increase in the odds of DSH in patients with no previous history of self-harm.
Older adults	No data specific to older adults	NA	NA	NA	NA	NA	No trials limited to older adults, no subgroup analyses examining effects in older adults.

Table 13. Summary of Evidence

Population	# of studies (k), # of observations (n)	Design	Major limitations	Consistency	Applicability	Overall quality	Summary of findings
Adolescents	*Psychotherapy:* KQ 4 & 5 trials for paradoxical effects	RCT	No direct reporting of harms	Low	Low-Moderate*:* Many conducted outside of United States, the few involving screening were conducted in school settings	Good (developmental group therapy); Fair (other therapies)	No trials directly reported harms; 4 of 11 KQ 4 & 5 trials reported statistically nonsignificant increases in suicide attempts or self-harm of 22% or more. Trial with largest increase was very small (n=31 with followup) with few events, but reported 22% to 33% increases in suicide attempts in remaining 2 trials.[153]

Abbreviations: BPD = borderline personality disorder; CBT = cognitive behavioral therapy; CI = confidence interval; DBT = dialectic behavioral therapy; DSH = deliberate self-harm; ED = emergency department; GDS = Geriatric Depression Scale; HR = hazard ratio; KQ = key question; NA = not applicable; RCT = randomized controlled trial; RR = relative risk; SRS = Suicide Risk Scale; UC = usual care.

Appendix A Table 1. Suicide Risk Screening Instruments[250]

Instrument	Administrator	Number of items	Estimated time to administer	Range of score, threshold	Target behavior or purpose	Target user	Time frame assessed	Validation
Adult Suicidal Ideation Questionnaire (ASIQ)[99]	Self-administered	25	5 minutes	0 to 150	Suicide ideation and behavior	Adults	Past month	High internal consistency (0.96 to 0.98); administered among different populations and settings; highly correlated with HRSD and other measures of depression
Beck Depression Inventory (BDI), versions I and II[251,252]	Self-administered	21 (1 suicide item)	NR	Single suicide item, ranges from 1 to 4	Depression including suicide ideation	Adults and adolescents	NR	Suicide item moderately correlated with BSI (0.56 to 0.58) in inpatient and outpatient psychiatric patients
Beck Hopelessness Scale (BHS)[101]	Self-administered	20	5 minutes	0 to 20	Positive and negative beliefs about future	Adults and adolescents	Past week	High internal reliability in clinical and nonclinical populations (0.87 to 0.93); standardized in psychiatric in- and outpatients; used in many other populations and settings; significant associations with SIS and moderately correlated with SSI
Beck Scale for Suicide Ideation (BSI)[253]	Self-administered	21 (19 summed for total score)	10 minutes	0 to 38	Suicidal ideation and behavior	Adults and adolescents	Past week	High interrater reliability (0.87 to 0.97); development samples include psychiatric adolescent and adult in- and outpatients; used in many other settings and populations; highly correlated with SSI (0.90 to 0.94); moderately correlated with BDI and BHS
Harkavy Asnis Suicide Survey (HASS), versions I, II, and Demo[254]	Self-administered (HASS-I and II) or clinician-administered (HASS-Demo)	21	5 to 10 minutes	NR	Suicide ideation and behavior		NR	NR
Hamilton Rating Scale for Depression (HRSD)[255]	Clinician-administered	17-, 21-, and 24-item versions (1 suicide item)	NR	Single suicide item, ranges from 0 to 4	Depressive symptom severity including suicide ideation and behavior	Adults	NR	High interrater reliability (0.92) for suicide item; suicide item highly correlated with ASIQ, SSI, and BDI
Positive and Negative Suicide Ideation Inventory (PANSI)[256]	Self-administered	20	5 minutes	20 to 100	Positive and negative thoughts related to suicide attempts		Past 2 weeks, including today	High internal reliability for both subscales (0.80 to 0.93); standardized among undergraduate college students

Appendix A Table 1. Suicide Risk Screening Instruments[250]

Instrument	Administrator	Number of items	Estimated time to administer	Range of score, threshold	Target behavior or purpose	Target user	Time frame assessed	Validation
Paykel Suicide Items[257]	Clinical-administered	5	A few minutes	NA (yes or no questions; not initially designed as a scale)	Suicide ideation		Past week, month, year, or lifetime	Studied in a psychiatric catchment area
Suicide Behaviors Questionnaire (SBQ)[258]	Self-administered	4 (original version included 34 items)	5 minutes	5 to 19	Suicidal ideation and behavior	Adults	Past year	Adequate internal consistency (0.75 to 0.80); used in many settings and populations; significantly correlated with SSI
Suicidal Behaviors Questionnaire Revised (SBQ-14)[259]	Self-administered	34 (10 of 14 items measure 5 suicide behavior domains for total score)	NR	NR	Suicidal ideation and behavior	Adults	Present day, past, and lifetime	High internal reliability (0.73 to 0.92); standardized among men and women, used in many settings and populations; total score positively correlated with SSI, BDI, and BHS
Suicidal Behaviors Questionnaire for Children (SBQ-C)[260]	Self-administered	4	5 minutes	NR	Suicidal ideation and behavior	Children (younger than age 10 years)	NR	Moderate reliability (alphas 0.83 to 0.79)
Symptom Driven Diagnostic System for Primary Care, Suicide Items (SDDS-PC)[261,262]	Self-administered (part 1), clinician-administered (part 2)	16 (3 suicide items) followed by 6 5-minute modules by clinician	5 minutes	NA (checklist)	Suicide ideation		NR	
Self-Harm Behavior Questionnaire (SHBQ)[263]	Self-administered	22, four sections	NR	0 to 78; suicide attempt (0 to 25), suicide threat (0 to 21), and suicide ideation (0 to 14) 0 to 22 for inpatients	Comprehensive screening for suicidal thoughts and behavior and nonsuicidal self-harm. 4 subscales: nonsuicidal self-harm, suicide attempts, suicide threat, and suicide ideation	Adolescents	Lifetime (attempts), past year (attempts), current (ideation, plans, behavior)	College students, ethnically diverse high school students (all U.S.); assessed internal consistency (alphas all ≥0.90), convergent validity (correlation 0.25 to 0.49 with SIQ, correlation -0.11 to -0.48 with Reasons for Living Scale); factor structure consistent for Caucasian, African American, and Hispanic students; some differences in strength of correlation between the groups[264]

Appendix A Table 1. Suicide Risk Screening Instruments[250]

Instrument	Administrator	Number of items	Estimated time to administer	Range of score, threshold	Target behavior or purpose	Target user	Time frame assessed	Validation
Suicidal Ideation Questionnaire (SIQ)[265]	Self-administered	30 (adult form has 25 items)	10 minutes	0 to 180; 41 is raw cutoff score indicative of potential for suicidal risk	Suicidal ideation	Adolescents grades 10-12	Past month	Strong reliability (alphas of 0.97 for adolescents, 0.96 for young adults, and 0.93 for younger adolescents [SIQ-JR]); high consistency (0.72 to 0.76); failed to discriminate between high and low risk for suicide attempt among adolescents
Suicidal Ideation Questionnaire-Junior (SIQ-JR)[265]	Self-administered	15	NR	0 to 90	Suicidal ideation	Adolescents junior high (ages 12 to 14 years)	Past month	See SIQ
Suicide Ideation Scale (SIS)[266]	Self-administered	10	5 minutes	10 to 50	Suicidal ideation	College students (age NR)	Past year	High internal consistency (0.86); standardized with college psychology students; moderately correlated with CES-D and BHS
Suicidal Ideation Screening Questionnaire (SIS-Q)[267]	Clinician-administered	4	NR	NR	Suicide ideation; sleep disturbance, mood disturbance, and hopelessness		Past year	Correctly identified 84% of general medical population with suicide ideation; studied in adults and general medical settings
Suicide Probability Scale (SPS)[268]	Self-administered	36	10 minutes	36 to 144	Suicidal ideation, hopelessness, negative self-evaluation, and hostility	Adolescents and children (age NR)	Current	High internal reliability (0.93), also high for subscales (0.62 to 0.89); standardized with adolescents and adults from general population; significantly associated with SPSS, BHS, and BDI in college students and adult psychiatric inpatients
Scale for Suicide Ideation (SSI)[269]	Clinician-administered	21 (19 summed for total score)	10 minutes	0 to 38	Suicide ideation and behavior		Day of interview	Moderately high internal consistency (0.84 to 0.89); high interrater reliability (0.83 to 0.98); standardized with adult psychiatric in- and outpatients; used in many other settings and populations; significantly associated with suicide items from BDI and HRSD

Appendix A Table 1. Suicide Risk Screening Instruments[250]

Instrument	Administrator	Number of items	Estimated time to administer	Range of score, threshold	Target behavior or purpose	Target user	Time frame assessed	Validation
Scale for Suicide Ideation, Self-Report (SSI-SR)[270]	Self-administered	21 (19 summed for total score)	10 minutes	0 to 38	Suicide ideation and behavior			High internal consistency (0.90 to 0.97); positive correlation with SSI and BDI; respondents typically score higher with computer-generated test than paper

Abbreviations: CES-D = Center for Epidemiologist Studies Depression Scale; NA = not applicable; NR = not reported; SPSS: Social Problem Solving Scale.

Appendix A Table 2. Selected Depression and Hopelessness Screening Instruments

Instrument	Number of items	Range of score, threshold
Beck Depression Inventory (I and II)[251]	21	0 to 63; minimal depression (0-13), mild depression (14-19), moderate depression (20-28), severe depression (29-63)
Beck Hopelessness Scale (BHS)[101]	20	0 to 30; normal (0-3), mild hopelessness (4-8), moderate hopelessness (9-14), severe hopelessness (>14)
Children's Depression Rating Scale, Revised (CDSR-R)[271]	17	17 to 113; need for further evaluation (55-64), likely depressive disorder (≥65)
Center for Epidemiologic Studies Depression Scale (CES-D)[271]	20	0 to 60; possible cases of depression (≥16)
Hamilton Rating Scale for Depression (HRSD)[255]	17	Varies by version, 0 to 54 in commonly used version; normal (0-7), moderate depression (≥20)
Hospital Anxiety and Depression Scale (HADS)[271]	14 (7 specific to depression)	0 to 21; normal (0-7), probable presence of depression (≥11)
Kiddie-Schedule for Affective Disorders and Schizophrenia for School Age Children–Present and Lifetime (KSADS-PL)[271]	82	Items divided across 20 diagnostic criteria and individually scored (most range from 0 to 3); symptoms not present (1), subthreshold levels of symptomatology (2), threshold criteria (3)
Montgomery-Asberg Depression Rating Scale (MADRS)[271]	10	0 to 60; higher scores indicate greater depressive severity
Moods and Feelings Questionnaire (MFQ)[271]	34	0 to 68 (child, parent, and short versions also available)
Zung Self-Rating Depression Scale (ZSDS)[271]	20	20 to 80; normal (<50), mild depression (50-59), moderate to marked depression (60-69), severe depression (>70)

Primary Research

Database: Ovid **MEDLINE**(R) without Revisions 1996 to July 17, 2012, Ovid MEDLINE(R) Daily Update July 17, 2012, Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations July 17, 2012< July 17, 2012> [**Clinical Trials**]

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1 suicide/ or suicidal ideation/ or suicide, attempted/
2 Self-Injurious Behavior/
3 suicid$.ti.
4 parasuicid$.ti.
5 self harm$.ti.
6 1 or 2 or 3 or 4 or 5
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Database: Ovid **MEDLINE**(R) without Revisions 1996 to July 17, 2012, Ovid MEDLINE(R) Daily Update July 17, 2012, Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations July 17, 2012 [**Screening Instruments**]

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1 suicide/ or suicidal ideation/ or suicide, attempted/
2 Self-Injurious Behavior/
3 suicid$.ti.
4 parasuicid$.ti.
5 self harm$.ti.
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7 (Suicide Ideation adj3 scale$).ti,ab.
8 (Suicide Ideation adj3 survey$).ti,ab.
9 (Suicide Ideation adj3 inventory).ti,ab.
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13 (suicide intent adj3 inventory$).ti,ab.
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15 (Hopelessness adj3 scale$).ti,ab.
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18 ((Harkavy$ or Asnis$) and suicid$).ti,ab.
19 suicide probability.ti,ab.
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34 (manchester and self harm).ti,ab.
35 suicide assessment.ti,ab.
36 (beck depression and suicid$).ti,ab.
37 (hamilton rating and suicid$).ti,ab.
38 (symptom driven diagnos$ and suicid$).ti,ab.
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48 accuracy.ti,ab.

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51 Diagnostic Errors/
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59 39 and 58
60 limit 59 to english language
61 limit 60 to yr="2002 -Current"

Database**: PsycINFO** 2002 to July Week 2 2012
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16 or/11-15
17 10 and 16
18 Beck Depression.tm.
19 Suicid$.tm.
20 hopelessness.tm.
21 harkavy$.tm.
22 asnis$.tm.

23 paykel$.tm.
24 self harm.tm.
25 hamilton rating.tm.
26 symptom driven.tm.
27 or/18-26
28 27 and suicid$.mp.
29 10 or 28
30 Test Reliability/
31 Test Validity/
32 sensitivit$.ti,ab.
33 specificit$.ti,ab.
34 predictive value.ti,ab.
35 accuracy.ti,ab.
36 or/30-35
37 29 and 36
38 17 or 37
39 limit 38 to english language
40 limit 39 to yr="2002 -Current"

Database: **CINAHL**: Clinical trials or screening instruments
---
S16 s3 or s13 Limiters - Published Date from: 20020101-20120717; Language: English
S15 s3 or s13 Limiters - Language: English
S14 s3 or s13
S13 s9 and s12
S12 s10 OR s11
S11 (TI sensitiv*) OR (AB sensitiv*) OR (TI specificit*) OR (AB specificit*) OR (TI accuracy) OR (AB accuracy) OR (TI psychometric*) OR (AB psychometric*)
S10 ((MH "Sensitivity and Specificity")) OR (MH "Predictive Validity") OR (MH "ROC Curve") OR (MH "False Negative Results") OR (MH "False Positive Results") OR (MH "Diagnostic Errors") OR (MH "Reproducibility of Results") OR (MH "Reference Values") OR (MH Psychometrics)
S9 S5 OR S8
S8 S6 AND S7
S7 (TX suicid*)
S6 (TX harkavy*) OR (TX asnis*) OR (TX suicide n1 probability) OR (TX suicide n1 status) OR (TX paykel*) OR (TX suicide n1 assessment) OR (TX beck n1 depression) OR (TX hamilton n1 rating) OR (TX symptom n1 driven)
S5 s1 AND s4
S4 (TX questionnaire*) OR (TX scale*) OR (TX survey*) OR (TX inventory*)
S3 s1 AND s2

S2 (MH "Randomized Controlled Trials") OR (MH "Clinical Trials") OR (MH "Random Assignment") OR (MH "Single-Blind Studies") OR (MH "Double-Blind Studies") OR (MH "Triple-Blind Studies") OR TX clinical n1 trial* OR TX controlled n1 trial* OR PT Clinical trial OR PT randomized controlled trial
S1 (MH suicide) OR (MH "Suicidal ideation") OR (MH "Suicide, Attempted") OR (MH "Injuries, Self-Inflicted") OR (TI suicid*) OR (TI parasuicid*) OR (TI self n1 harm)

Database: **CCRCT**, July 2012

(suicid*) or (parasuicid*) or (self next harm), from 2002 to 2012 in Clinical Trials

Systematic Reviews

Database: **CDSR** <Issue 4 of 12, Apr 2011>

(suicide*):ti,ab,kw or (suicidal*):ti,ab,kw or (self next harm):ti,ab,kw, from 2004 to 2011

Database: **DARE**

(((suicide*):TI OR (suicidal*):TI OR ("self harm"):TI OR ("self-harm"):TI) and (Systematic review:ZDT and Abstract:ZPS) FROM 2004 TO 2011)

Database: **PubMed**
---
1) "Suicide"[Majr:NoExp] OR "Suicide, Attempted"[Majr] OR "Suicidal Ideation"[Majr]
2) #1 AND systematic[sb] Limits: English, Publication Date from 2004 to 3000
3) suicid*[ti]
4) #3 AND systematic[sb] AND (in process[sb] OR publisher[sb] OR pubmednotmedline[sb]) Limits: English, Publication Date from 2004 to 3000
5) #2 OR #4

Database: **PsycINFO** <2002 to April Week 2 2011>
Search Strategy:
---
1 *Attempted Suicide/ or *Suicide Prevention/ or *Suicide/
2 *suicidal ideation/
3 1 or 2
4 limit 3 to ("0830 systematic review" or 1200 meta analysis)
5 Meta Analysis/
6 meta analysis.id.
7 (systematic: adj3 (review: or overview)).ti,ab.
8 5 or 6 or 7
9 3 and 8
10 4 or 9
11 limit 10 to (english language and yr="2004 -Current")

Appendix C. Inclusion/Exclusion Criteria

Category	Included	Excluded
Included Conditions	Suicidal behavior, suicide deaths	Studies limited to episodes of self-harm where there is no intention of death
Population	All ages KQs 1-3 (screening): either • Unselected primary care or comparable • Primary care patients at elevated risk due to comorbid condition or history of deliberate self-harm KQs 4-6 (treatment benefits and harms): • People with a high risk of suicide • People with a history of suicidal behavior • People with selected mental health disorders (depression [unipolar and bipolar], substance use, PTSD, borderline personality disorder)	Studies limited to patients with a history of a chronic psychotic disorder, including schizophrenia Studies of physician-assisted suicide in terminally ill Studies targeting suicide while hospitalized, incarcerated, in an institutional setting, or on active military duty Studies limited to patients with mental health disorders, unless suicide is primary outcome *and* the mental health disorder is depression (unipolar or bipolar), substance abuse, PTSD, or borderline personality disorder Studies limited to people with medical disorders (e.g., chronic pain, traumatic brain injury) Studies limited to people in the midst of a suicidal crisis, identified through their use of health care services related to a suicide attempt (e.g., in the ED) KQ 6 (harms of treatment): trials that are not limited to people at elevated risk of suicide

Appendix C. Inclusion/Exclusion Criteria

Category	Included	Excluded
Intervention	KQs 1-3 (screening): Brief* standardized instrument designed to identify people at high risk of suicide; self-report, clinician-administered, or electronically delivered *No more than 15 minutes if completed prior to clinician visit (e.g., in the waiting room), or no more than 5 minutes if used during a visit KQs 4-6 (treatment): • Primary outcome is suicide prevention • Behavioral, pharmacologic; must target suicidal behavior or ideation • Include helplines, on-line interventions • Include counseling or home visits for environmental change to reduce access to means of suicide • Conducted in primary care, referable from primary care, or feasible** for implementation in a health care setting **criteria for feasibility: **Who Targeted**: Individual-level identification of being a patient/in need of intervention **Who Delivered**: Usually involves primary care clinicians (family practice physicians, internal medicine, obstetrics-gynecology, pediatrics, general practitioner), other physicians, nurses, nurse practitioners, physician assistants, or related clinical staff (dietitians, health educators, mental health practitioners, or other counselors) in some direct or indirect way, or is seen as connected to the health care system by the participant **How Delivered**: To individuals or in small groups (15 or less). Generally involve no more than 8 group sessions total, and intervention time period is no longer than 12 months **Where Delivered**: Could be delivered anywhere (including via the Web, interactive technologies, in the home) **Components**: Must not include components that could not be replicated in most health care settings, including environmental components (media message, signage) or intervenes on groups in closed (pre-existing) social networks (e.g., worksites or churches), or use of authority figures (e.g. military commanders, workplace supervisors)	KQs 4-6 (intervention): Intervention involving components that could not be replicated in most health care settings, including environmental components (media message, signage) or intervenes on groups in closed (pre-existing) social networks (e.g., worksites or churches), or use of authority figures (e.g., military commanders, workplace supervisors) Primary target is not suicide prevention Intervention initiated in ED or inpatient setting
Comparator	KQs 1, 3 (benefits and harms of screening): Usual care, no screening KQs 4-6 (benefits and harms of treatment): Usual primary or specialty care, placebo medication along with behaviorally-based treatment, compared with active agent plus same behaviorally-based treatment	KQs 4-6: Comparing two active treatments or two different screening instruments, both offered in addition to usual care

Appendix C. Inclusion/Exclusion Criteria

Category	Included	Excluded
Outcomes	KQs 1, 4-5 (benefits of screening and treatment): **Primary** (must report at least one): • KQs 1, 4: suicide attempts, episodes of deliberate self-harm, suicide deaths • KQ 5: suicidal ideation **Secondary** (will be abstracted if available): • KQs 1,4: improved level of functioning, improved quality of life or improved health status • KQ 5: decreased depressive severity, decreased hopelessness, decreased access to means of suicide, increased identification and treatment of previously unrecognized mental health condition (depression, PTSD, substance abuse, borderline personality disorder) KQ 2 (screening instruments): sensitivity, specificity, positive predictive value, negative predictive value KQ 3 (harms of screening): paradoxical increase in suicidal ideation or behavior, negative effects of false-positives (such as overtreatment), others as reported in screening trials KQ 6: paradoxical increase in suicidal ideation or behavior, serious adverse effects, withdrawals due to adverse effects of medications, others as reported in treatment trials	KQs 4-6 (treatment): Trials only reporting rate of identification of those at high risk (e.g., trials of clinician training to identify people at high risk of suicide that report no patient outcomes) KQ 1 (benefits of screening): Rate of identification of those at high risk (e.g., trials of clinician training to identify people at high risk of suicide that report no patient outcomes)
Timing	No minimum followup	
Setting	KQs 2-3 (screening): • Health care (primary or specialty, including ED) • School or community setting (if population comparable to general primary care) KQs 1, 4-6 (treatment): • Health care (primary or specialty, including ED) • Community • School-based health clinics	KQs 2-3: Settings other than health care, schools, or community (e.g., worksite, church, residential, institutional, corrections, active duty military) KQs 1, 4-6 (treatment): curriculum-based interventions in schools, conducted through school counselors/nurses (interventions in school health clinics are acceptable)
Country	All countries	
Study Design	KQs 1, 3-6 (benefits and harms of screening and treatment): RCT, CCT KQ 2 (screening instruments): study of diagnostic accuracy reporting sensitivity and specificity (or comparable statistics) compared with an independently-assessed gold standard, such as a structured interview. KQ 6 (harms of pharmacologic treatment): • Comparative cohort studies • Large registry or noncomparative observational studies for rare harms	All other designs
Language	English	NonEnglish

Abbreviations: CCT = controlled clinical trial; ED = emergency department; KQ = key question; PTSD = posttraumatic stress disorder; RCT = randomized controlled trial.

Appendix D. Excluded Studies

Exclusion Codes:
E1a. Suicide prevention was not primary aim
E1b. Study not relevant for other reason
E1c. Focus on treatment-emergent suicide
E1d. Focus on nonsuicidal self-harm
E2. Wrong setting
E3. Comparative effectiveness study
E4. Instrument does not target suicide risk
E5. No relevant outcomes
E6a. Limited to those with comorbidities
E6b. Limited to patients in midst of suicidal crisis
E6c. Wrong population
E6d. Not limited to those with increased suicide risk
E7a. Not one of the specified interventions
E7b. Not primary care feasible or referable
E7c. Timing of intervention
E8. Wrong study design
E9a. High or differential attrition
E9b. Other quality issues
E10. NonEnglish publication
E11. Instrument not brief
E12. Unable to locate
E13. Trial pending assessment/ongoing study

1. Medication may help prevent suicide in teens. Brown University Child Adolesc Psychopharmacol Update 2003 Mar;5(3):1-4. PMID: None. **KQ4E8, KQ5E8, KQ6E8.**
2. Rate of repeated suicide attempts halved with cognitive therapy. Drug Benefit Trends 2005;17(9):402. PMID: None. **KQ4E8, KQ5E8, KQ6E8.**
3. Protective effects of adjunctive lithium for at-risk suicidal patients. Brown University Psychopharmacol Update 2008 Dec;19(12):1. PMID: None. **KQ4E8, KQ5E8, KQ6E8.**
4. Alexopoulos GS, Reynolds CF, III, Bruce ML, et al. Reducing suicidal ideation and depression in older primary care patients: 24-month outcomes of the PROSPECT study. Am J Psychiatry 2009 Aug;166(8):882-90. PMID: 19528195. **KQ6E5.**
5. Allard R, Marshall M, Plante MC. Intensive follow-up does not decrease the risk of repeat suicide attempts. Suicide Life Threat Behav 1992;22(3):303-14. PMID: 1440744. **KQ5E5.**
6. Almeida OP, Pirkis J, Kerse N, et al. A randomized trial to reduce the prevalence of depression and self-harm behavior in older primary care patients. Ann Fam Med 2012 Jul;10(4):347-56. **KQ6E5.**
7. Aoun S. Deliberate self-harm in rural Western Australia: results of an intervention study. Aust N Z J Ment Health Nurs 1999 Jun;8(2):65-73. PMID: 10661074. **KQ4E8, KQ5E8, KQ6E5.**
8. Arensman E, McAuliffe C, Corcoran P, et al. Findings of the POPMACT study. Psychol Med 2004;34(6):1143-4. PMID: 15554583. **KQ6E5.**
9. Asarnow JR, Baraff LJ, Berk M, et al. An emergency department intervention for linking pediatric suicidal patients to follow-up mental health treatment. Psychiatr Serv 2011;62(11):1303-9. PMID: 22211209. **KQ4E7c, KQ5E7c, KQ6E7c.**
10. Aseltine RH, Jr., DeMartino R. An outcome evaluation of the SOS Suicide Prevention Program. Am J Public Health 2004 Mar;94(3):446-51. PMID: 14998812. **KQ4E2, KQ5E2, KQ6E2.**
11. Aseltine RH, Jr., James A, Schilling EA, et al. Evaluating the SOS suicide prevention program: a replication and extension. BMC Public Health 2007;7:161. PMID: 17640366. **KQ4E2, KQ5E2, KQ6E2.**
12. Awata S, Bech P, Koizumi Y, et al. Validity and utility of the Japanese version of the WHO-Five Well-Being Index in the context of detecting suicidal ideation in elderly community residents. Int Psychogeriatr 2007 Feb;19(1):77-88. PMID: 16970832. **KQ1E8, KQ2E4, KQ3E8.**
13. Bannan N. Group-based problem-solving therapy in self-poisoning females: A pilot study. Couns Psychother Res 2010;10(3):201-13. PMID: None. **KQ4E5, KQ6E5.**
14. Bao Y, Alexopoulos GS, Casalino LP, et al. Collaborative depression care management and disparities in depression treatment and outcomes. Arch Gen Psychiatry 2011;68(6):627-36. PMID: 21646579. **KQ6E5.**

15. Barkin SL, Finch SA, Ip EH, et al. Is office-based counseling about media use, timeouts, and firearm storage effective? Results from a cluster-randomized, controlled trial. Pediatrics 2008 Jul;122(1):e15-e25. PMID: 18595960. **KQ4E1a, KQ5E1a, KQ6E1a.**
16. Barnes AJ. Attachment-based family therapy reduces suicidal ideation in adolescents. Evid Based Ment Health 2011 Feb;14(1):8. PMID: 21266605. **KQ6E5.**
17. Bateman A, Fonagy P. Effectiveness of partial hospitalization in the treatment of borderline personality disorder: a randomized controlled trial. Am J Psychiatry 1999 Oct;156(10):1563-9. PMID: 10518167. **KQ6E5.**
18. Bateman A, Fonagy P. Treatment of borderline personality disorder with psychoanalytically oriented partial hospitalization: an 18-month follow-up. Am J Psychiatry 2001 Jan;158(1):36-42. PMID: 11136631. **KQ6E5.**
19. Battaglia J, Wolff TK, Wagner-Johnson DS, et al. Structured diagnostic assessment and depot fluphenazine treatment of multiple suicide attempters in the emergency department. Int Clin Psychopharmacol 1999 Nov;14(6):361-72. PMID: 10565804. **KQ4E7c, KQ5E7c, KQ6E7c.**
20. Bauer J. Clinical highlights. Cognitive therapy can prevent repeat suicide attempts. RN 2005 Nov;68(11):24. PMID: None. **KQ4E8, KQ5E8, KQ6E8.**
21. Beautrais AL, Gibb SJ, Faulkner A, et al. Postcard intervention for repeat self-harm: randomised controlled trial. Br J Psychiatry 2010 Jul;197(1):55-60. PMID: 20592434. **KQ5E5, KQ6E5.**
22. Beck AT. Community-based cognitive therapy for suicide attempters. 2004. http://www.mrw.interscience.wiley.com/cochrane/clcentral/articles/073/CN-00497073/frame.html. Accessed November 20, 2011. PMID: None. **KQ4E8, KQ5E8, KQ6E8.**
23. Bennewith O, Stocks N, Gunnell D, et al. General practice based intervention to prevent repeat episodes of deliberate self harm: cluster randomised controlled trial. BMJ 2002 May 25;324(7348):1254-7. PMID: 12028981. **KQ5E5.**
24. Berrino A, Ohlendorf P, Duriaux S, et al. Crisis intervention at the general hospital: An appropriate treatment choice for acutely suicidal borderline patients. Psychiatry Res 2011;186(2-3):287-92. PMID: 20667602. **KQ4E7c, KQ5E7c, KQ6E7c.**
25. Biggam FH. The development of social problem-solving interventions in young offender mental health services: a focus upon self-harm and suicide risk. Social Problem Solving and Offending. Evidence, Evaluation and Evolution. Hoboken, NJ: John Wiley & Sons Ltd.; 2005. p. 145-62. PMID: None. **KQ4E8, KQ5E8, KQ6E8.**
26. Bogner HR, Morales KH, Post EP, et al. Diabetes, depression, and death: a randomized controlled trial of a depression treatment program for older adults based in primary care (PROSPECT). Diabetes Care 2007;30(12):3005-10. PMID: 17717284. **KQ6E5.**
27. Brent DA, Greenhill LL, Compton S, et al. The Treatment of Adolescent Suicide Attempters study (TASA): predictors of suicidal events in an open treatment trial. J Am Acad Child Adolesc Psychiatry 2009 Oct;48(10):987-96. PMID: 19730274. **KQ4E3, KQ5E3, KQ6E3.**
28. Brown GK, Wiltsey Stirman S. Psychiatric telephone contact following emergency department discharge reduces suicide re-attempts in people originally admitted for attempted suicide. Evid Based Ment Health 2007 Feb;10(1):19. PMID: 17255388. **KQ4E8, KQ5E8, KQ6E8.**
29. Bruce ML, Ten Have TR, Reynolds CF, III, et al. Reducing suicidal ideation and depressive symptoms in depressed older primary care patients: a randomized controlled trial. JAMA 2004 Mar 3;291(9):1081-91. PMID: 14996777. **KQ6E5.**
30. Burleson JA, Kaminer Y, Goldston DB, et al. Suicidal ideation among alcohol-use disordered adolescents in treatment and aftercare. 68th Annual Scientific Meeting of the College on Problems of Drug Dependence. Scottsdale, AZ. 2005. PMID: None. **KQ4E1a, KQ5E1a, KQ6E1a.**
31. Byers AL, Bruce ML, Raue P. Suicidal ideation in non-depressed elderly primary care patients: The PROSPECT Study. Am J Geriatr Psychiatry 2009;17:A86. PMID: None. **KQ6E5.**
32. Carpenter DJ, Fong R, Kraus JE, et al. Meta-analysis of efficacy and treatment-emergent suicidality in adults by psychiatric indication and age subgroup following initiation of paroxetine therapy: a complete set of randomized placebo-controlled trials. J Clin Psychiatry 2011 Feb 22;72(11):1503-14. PMID: 21367354. **KQ4E8, KQ5E8, KQ6E8.**
33. Carter GL, Clover KA, Bryant JL, et al. Can the Edinburgh Risk of Repetition Scale predict repetition of deliberate self-poisoning in an Australian clinical setting? Suicide Life Threat Behav 2002;32(3):230-9. PMID: 12374470. **KQ2E8, KQ3E8.**

34. Carter GL, Clover K, Whyte IM, et al. Postcards from the EDge project: randomised controlled trial of an intervention using postcards to reduce repetition of hospital treated deliberate self poisoning. BMJ 2005 Oct 8;331(7520):805. PMID: 16183654. **KQ6E5.**
35. Carter GL, Clover K, Whyte IM, et al. Postcards from the EDge: 24-month outcomes of a randomised controlled trial for hospital-treated self-poisoning. Br J Psychiatry 2007 Dec;191:548-53. PMID: 18055960. **KQ5E5, KQ6E5.**
36. Carter GL, Willcox CH, Lewin TJ, et al. Hunter DBT project: randomized controlled trial of dialectical behaviour therapy in women with borderline personality disorder. Aust N Z J Psychiatry 2010 Feb;44(2):162-73. PMID: 20113305. **KQ6E5.**
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40. Chan SS, Wong CS, Chiu HF. The validity of proxy-based NEO-Five Factor Inventory data in suicide research: a study of 18- to 64-year-old Hong Kong Chinese who attempted suicide. East Asian Arch Psychiatry 2011 Jun;21(2):58-63. PMID: 21838208. **KQ1E8, KQ2E5, KQ3E8.**
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42. Chen WJ, Chen CC, Ho CK, et al. Community-based case management for the prevention of suicide reattempts in Kaohsiung, Taiwan. Community Ment Health J 2012 Feb 3 PMID: 22302211. **KQ4E8, KQ5E8, KQ6E8.**
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44. Chowdhury E, Hicks RC, Kreitman N. Evaluation of an after-care service for parasuicide (attempted suicide) patients. Soc Psychiatry 1973;8:67-81. PMID: None. **KQ4E9b, KQ5E9b, KQ6E9b.**
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53. Cotgrove A, Zirinsky L, Black D, et al. Secondary prevention of attempted suicide in adolescence. Am J Adolesc 1995;18:569-77. PMID: None. **KQ4E7c, KQ5E7c, KQ6E7c.**
54. Cottrell DJ. Group therapy does not reduce repeated deliberate self-harm in adolescents. Evid Based Ment Health 2010 Feb;13(1):17. PMID: 20164514. **KQ4E8, KQ5E8, KQ6E8.**
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63. Diamond GS, Wintersteen MB, Brown GK, et al. Attachment-based family therapy for adolescents with suicidal ideation: a randomized controlled trial. J Am Acad Child Adolesc Psychiatry 2010 Feb;49(2):122-31. PMID: 20215934. **KQ6E5.**
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65. Dube P, Kurt K, Bair MJ, et al. The p4 screener: evaluation of a brief measure for assessing potential suicide risk in 2 randomized effectiveness trials of primary care and oncology patients. Prim Care Companion J Clin Psychiatry 2010;12(6):2010. PMID: 21494337. **KQ2E6a, KQ3E6a.**
66. Edelstein BA, Heisel MJ, McKee DR, et al. Development and psychometric evaluation of the reasons for living--older adults scale: a suicide risk assessment inventory. Gerontologist 2009 Dec;49(6):736-45. PMID: 19546114. **KQ2E5, KQ3E8.**
67. Eggert LL, Thompson EA, Randell BP, et al. Preliminary effects of brief school-based prevention approaches for reducing youth suicide--risk behaviors, depression, and drug involvement. J Child Adolesc Psychiatr Nurs 2002 Apr;15(2):48-64. PMID: 12083753. **KQ6E5.**
68. Eskin M, Ertekin K, Demir H. Efficacy of a problem-solving therapy for depression and suicide potential in adolescents and young adults. Cognit Ther Res 2008;32:971-82. PMID: None. **KQ4E9a, KQ5E9a, KQ6E9a.**
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Appendix E Table 1. Quality Assessment Tools

Design	USPSTF quality rating criteria[272]	NICE methodology checklists[273]	The QUADAS tool[274]
Systematic reviews and meta-analyses	• Comprehensiveness of sources considered/search strategy used • Standard appraisal of included studies • Validity of conclusions • Recency and relevance are especially important for systematic reviews	• The study addresses an appropriate and clearly focused question • A description of the methodology used is included • The literature search is sufficiently rigorous to identify all the relevant studies • Study quality is assessed and taken into account • There are enough similarities between the studies selected to make combining them reasonable	Not applicable
Case-control studies	• Accurate ascertainment of cases • Nonbiased selection of cases/controls with exclusion criteria applied equally to both • Response rate • Diagnostic testing procedures applied equally to each group • Measurement of exposure accurate and applied equally to each group • Appropriate attention to potential confounding variables	• The study addresses an appropriate and clearly focused question • The cases and controls are taken from comparable populations • The same exclusion criteria are used for both cases and controls • What percentage of each group (cases and controls) participated in the study? • Comparison is made between participants and non-participants to establish their similarities or differences • Cases are clearly defined and differentiated from controls • Is it clearly established that controls are non-cases? • Measures have been taken to prevent knowledge of primary exposure influencing case ascertainment • Exposure status is measured in a standard, valid and reliable way • The main potential confounders are identified and taken into account in the design and analysis • Have confidence intervals been provided?	Not applicable

Appendix E Table 1. Quality Assessment Tools

Design	USPSTF quality rating criteria[272]	NICE methodology checklists[273]	The QUADAS tool[274]
Randomized controlled trials (RCTs)	• Initial assembly of comparable groups employs adequate randomization, including first concealment and whether potential confounders were distributed equally among groups • Maintenance of comparable groups (includes attrition, crossovers, adherence, contamination) • Important differential loss to follow-up or overall high loss to follow-up • Measurements: equal, reliable, and valid (includes masking of outcome assessment) • Clear definition of the interventions • All important outcomes considered	• The study addresses an appropriate and clearly focused question • The assignment of subjects to treatment groups is randomized • An adequate concealment method is used • Subjects and investigators are kept 'blind' about treatment allocation • The treatment and control groups are similar at the start of the trial • The only difference between groups is the treatment under investigation • All relevant outcomes are measured in a standard, valid and reliable way • What percentage of the individuals or clusters recruited into each treatment arm of the study dropped out before the study was completed? • All the subjects are analyzed in the groups to which they were randomly allocated (often referred to as intention-to-treat analysis) • Where the study is carried out at more than one site, results are comparable for all sites	Not applicable
Cohort studies	• Initial assembly of comparable groups employs consideration of potential confounders with either restriction or measurement for adjustment in the analysis; consideration of inception cohorts • Maintenance of comparable groups (includes attrition, crossovers, adherence, contamination) • Important differential loss to follow-up or overall high loss to follow-up • Measurements: equal, reliable, and valid (includes masking of outcome assessment) • Clear definition of the interventions • All important outcomes considered	• The study addresses an appropriate and clearly focused question • The two groups being studied are selected from source populations that are comparable in all respects other than the factor under investigation • The study indicates how many of the people asked to take part did so, in each of the groups being studied • The likelihood that some eligible subjects might have the outcome at the time of enrollment is assessed and taken into account in the analysis • What percentage of individuals or clusters recruited into each arm of the study dropped out before the study was completed? • Comparison is made between full participants and those lost to follow-up, by exposure status • The outcomes are clearly defined • The assessment of outcome is made blind to exposure status • Where blinding was not possible, there is some recognition that knowledge of exposure status could have influenced the assessment of outcome • The measure of assessment of exposure is reliable • Evidence from other sources is used to demonstrate that the method of outcome assessment is valid and reliable • Exposure level or prognostic factor is assessed more than once • The main potential confounders are identified and taken into account in the design and analysis • Have confidence intervals been provided?	Not applicable

Appendix E Table 1. Quality Assessment Tools

Design	USPSTF quality rating criteria[272]	NICE methodology checklists[273]	The QUADAS tool[274]
Diagnostic accuracy studies	• Screening test relevant, available for primary care, adequately described • Study uses a credible reference standard, performed regardless of test results • Reference standard interpreted independently of screening test • Handles indeterminate result in a reasonable manner • Spectrum of patients included in study • Sample size • Administration of reliable screening test	• The nature of the test being studied is clearly specified • The test is compared with an appropriate gold standard • Where no gold standard exists, a validated reference standard is used as a comparator • Patients for testing are selected either as a consecutive series or randomly, from a clearly defined study population • The test and gold standard are measured independently (blind) of each other • The test and gold standard are applied as close together in time as possible • Results are reported for all patients that are entered into the study • A pre-diagnosis is made and reported	• The spectrum of patients are representative of the patients who will receive the test in practice • Selection criteria are clearly described • The reference standard is likely to correctly classify the target condition • The time period between the reference standard and the index test is short enough to be reasonably sure that the target condition did not change between the two tests • The whole sample or a random selection of the sample receives verification using a reference standard of diagnosis • Patients receive the same reference standard regardless of the index test result • The reference standard is independent of the index test • The execution of the index test is described in sufficient detail to permit replication of the test • The execution of the reference standard is described in sufficient detail to permit its replication • The index test results are interpreted without knowledge of the results of the reference standard • The reference standard results are interpreted without knowledge of the results of the index test • The same clinical data is available when test results are interpreted as would be available when the test is used in practice • Uninterpretable/ intermediate test results are reported • Withdrawals from the study are explained

Appendix E Table 2. Quality Assessment of Included Studies: Adults and Older Adults (Key Questions 4 and 5)

Study	Valid random assignment	Allocation concealed	Blinding of outcomes assessment	Followup (m)	% IG followup	% CG followup	Handling of missing data	Additional quality concerns	Quality rating
Cognitive behavioral therapy									
Brown 2005[126, 168,169]	Y	Y	N	18	75.0	66.7	Random effects regressions and survival analysis including all participants	None	Fair
Evans 1999[134]	NR	Y	Y	4-6	100	87.5	Dropped noncompleters	Small sample size, greater attrition in CG, relatively low adherence to intervention	Fair
Hawton 1987[137]	NR	NR	Y†	4	92.7	92.3	Dropped noncompleters	Outcomes assessment blinding for only part of study, somewhat differential attrition at 9 months	Fair
				9	73.2	89.7			
Marasinghe 2012[142]	NR	NR	Y	6 and 12	100	100	No missing data	Fairly small sample size	Fair
Rudd 1996[144]	NR*	NR*	NR	1	66.3	75.2	Dropped noncompleters	Short followup	Fair (at 1 mo only)
				6	NR (<43% entire study)	NR (<43% entire study)			
Samaraweera 2007[105]	Y	NR	Y	2 and 3	100	100	No missing data	Very small sample size, followup not explicitly reported, groups differed on baseline measure of distress, no other baseline characteristics presented (age, sex), statistical methods NR	Fair
Slee 2008[145, 170]	Y	Y	N	3	83.3	88.1	Dropped IG participants who never started intervention, otherwise used multilevel model with all data	Dropped those in IG not receiving treatment (n=8)	Fair
				6	83.3	81.0			
				9	83.3	78.6			
Tyrer 2003[146, 171-174]	Y	Y	NR	12 (main outcomes)	89.1	90.0	Dropped noncompleters	None	Fair
				12 (other outcomes)	83.3	84.2			
Dialectical behavior therapy									
Carter 2010[128]	NR	Y	Y	3	68.4	82.9	Completers only and mixed models using all available data	Unacceptably high dropout in IG and differential at 6 months, high but acceptable at 3 months	Fair (at 3 mo only)
				6	52.6	88.6			
Linehan 1991[140]	NR	NR	Y	12	68.8	71.0	Dropped noncompleters	Small sample size, baseline characteristics not described overall or for each group	Fair

Appendix E Table 2. Quality Assessment of Included Studies: Adults and Older Adults (Key Questions 4 and 5)

Study	Valid random assignment	Allocation concealed	Blinding of outcomes assessment	Followup (m)	% IG followup	% CG followup	Handling of missing data	Additional quality concerns	Quality rating
Linehan 2006[141,175,176]	Y	NR*	Y	24	88.5	71.4	Imputation of missing data through repeated mixed-effects modeling	None	Fair
van den Bosch[148,177]	Y	NR	NR	12	79.3	71.4	Imputation through mixed-effects modeling, but did drop 6 participants who dropped out before receiving treatment	Small sample size	Fair
Problem-solving therapy									
Bannan 2012[109]	Y	Y	N	4	90	90	Dropped noncompleters	Outcomes assessment conducted by interventionist, very small sample size, groups differed on education and relationship status at baseline (differences not statistically significant)	Fair
Fitzpatrick 2005[106]	NR	NR	NR	1	NR (87% entire study)	NR (87% entire study)	Multilevel modeling to using all available data	Group-specific n randomized and attrition NR (but does state that attrition did not differ across groups)	Fair
				2	NR (82% entire study)	NR (82% entire study)			
				4	NR (67% entire study)	NR (67% entire study)			
Hatcher 2011[107]	Y	Y	Y	12 (continuous variables)	74.7	76.6	Almost full followup for health care use data, used mixed effects models with all available data for self-report data	None	Fair
				12 (self-reported measures)	73.5	75.6			
				12 (hospital records)	99.6	99.3			
Psychodynamic or interpersonal therapy									
Bateman 1999[124,178]	NR	NR	N	12	86.4	86.4	Completers-only analysis presented, but reported that the pattern of results were identical; all participants were included	Outcomess assessment not blind, but were based on objective clinical reports or self-report; groups differed at baseline on a number of characteristics, small sample size	Fair
				36	100(?)	100(?)			
Guthrie 2001[135,179]	Y	NR*	Y	6	81.0	78.7	Dropped noncompleters	None	Fair

Appendix E Table 2. Quality Assessment of Included Studies: Adults and Older Adults (Key Questions 4 and 5)

Study	Valid random assignment	Allocation concealed	Blinding of outcomes assessment	Followup (m)	% IG followup	% CG followup	Handling of missing data	Additional quality concerns	Quality rating
Other therapy, with direct therapeutic contact									
Comtois 2011[131]	Y	NR	Y	12	69	56	Mixed model analysis using all available data	Small sample size	Fair
Other therapy, without direct therapeutic contact									
Kovac 2002[138]	NR	Y	NR	1.5	NR (91.7% entire study)	NR (91.7% entire study)	Dropped noncompleters	Not certain assessor was blinded, though it was a different person from the one who had all other contact with participants; randomization and dropout NR by group, cannot be sure it was equal across groups	Fair
				6	NR (81.0% entire study)	NR (81.0% entire study)			
Medication: lithium									
Lauterbach 2008[139]	Y	Y	Y	1	88.1	81.9	Survival analysis including all available data	Possible selective reporting because it did not report psychopathology outcomes though they were assessed (as secondary outcomes); differences in important baseline characteristics	Fair
				12	33.3	28.9			
Practice-based interventions									
Almeida 2012[152,180]	Y	NR*	NR	24	GPs: 100 Patients: 88	GPs: 99 Patients: 88	Imputation by chained equations; those who died were not included in the ITT analysis	Outcome measurement process not described (e.g., mode of interaction: mail vs. phone vs. in-person)	Fair
Bennewith 2002[115]	Y	Y	Y	12	100	100	Appears assumed everyone without a record of suicide attempt in their chart did not have one, effectively assigning "no attempt" to those moving away	Participants were not directly interviewed to determine whether they had made a suicide attempt but relied on medical records, which makes it difficult to ascertain the real denominator with followup, though it did report that only 2% to 4% of a sample of participants left the area (so their suicide attempts would not have been identified), no patient-reported outcomes	Fair

Appendix E Table 2. Quality Assessment of Included Studies: Adults and Older Adults (Key Questions 4 and 5)

Study	Valid random assignment	Allocation concealed	Blinding of outcomes assessment	Followup (m)	% IG followup	% CG followup	Handling of missing data	Additional quality concerns	Quality rating
Bruce 2004[114, 181-187]	Y	NR*	N	12	69.0	68.7	Multilevel modeling to include all participants in analysis, with whatever data they provided	Assessment not blind (but did have high standards for interrater reliability), unsure why depressed sample was not "enrolled" sample, why the earlier sample was "enrolled" but never analyzed	Fair
Clarke 2002[130]	Y	Y	NR	12	100	100	No missing data	Some variables for baseline comparability unusable because a small proportion of participants completed them, complete followup based on medical records, but don't know if some left area (would be assigned as no re-admission), intervention adherence low	Fair
Szanto 2007[151]	NR	NR	NR	60	NA	NA	NR	Unclear how regions assigned to intervention groups; unclear whether medical examiner likely knew allocation, possibly was influenced by that knowledge; NR how denominators estimated	Fair
Improving treatment adherence with direct person-to-person contact									
Allard 1992[123]	NR	Y	N	24	83.9	85.1	Dropped noncompleters	Outcome assessment was not blinded and different between IG and CG (IG mostly assessed by their treatment provider), though efforts were made to confirm patient's self-report; high dropout of treatment	Fair
Cedereke 2002[129]	NR	Y	NR	12	83.2	81.7	Dropped noncompleters	None	Fair
Crawford 2010[132]	Y	Y	NR*	6 (main outcomes)	100	100	Primary outcomes based on medical records (no missing), dropped those with missing data for secondary outcomes	Complete followup based on medical records, but don't know if some left area (would be assigned as no re-admission)	Fair
				6 (other outcomes)	66.7	78.8			

Appendix E Table 2. Quality Assessment of Included Studies: Adults and Older Adults (Key Questions 4 and 5)

Study	Valid random assignment	Allocation concealed	Blinding of outcomes assessment	Followup (m)	% IG followup	% CG followup	Handling of missing data	Additional quality concerns	Quality rating
Currier 2009[133]	NR	Y	Y	0.5	79.3	75.0	LOCF	Minor baseline differences in demographics	Fair
				3	67.2	57.8			
Vaiva 2006[147]	Y	Y	Y	13	72.8% (1 mo call); 64.6% (3 mo call)	89.7	100% followup for suicide attempts and deaths, dropped noncompleters for interview outcomes	None	Fair
van Heeringen 1995[149]	NR	NR	NR	12	760	75.6	Dropped noncompleters	Unclear if randomization procedures truly random	Fair
Welu 1977[150]	Y	NR	NR	4	98.4	100	Only one missing case, which was dropped	Baseline differences on a number of variables but raw data not provided, outcomes assessment procedures not clearly standardized	Fair
Improving treatment adherence without direct person-to-person contact									
Beautrais 2012[125]	Y	Y	Y	12	100	100	No missing	Small nonstatistically significant difference in number of DSH episodes in previous 12 months (but not percent with previous DSH episode), no patient-reported outcomes	Fair
Carter 2007[127, 188]	Y	Y	Y	12 and 24	100	100	No missing data, appears outcomes based on medical records, so if someone left area would effectively treated as no attempt	Outcomes assessment not well described, assume it is based on medical records or unit records, so cannot tell if people moved away (and so were assumed to have no repeat attempt). Did have conservative results in that it retained people in the analysis who refused the intervention, no patient-reported outcomes	Good
Hassanian 2011[136]	Y	Y	N	12	90.7	93.0	Dropped noncompleters but also did sensitivity analyses; robustness of results to different assumptions about outcomes in missing participants	Only single item used to assess suicidal ideation, but did do extensive sensitivity analyses looking at how results would change with differing assumptions about missing cases	Fair

Appendix E Table 2. Quality Assessment of Included Studies: Adults and Older Adults (Key Questions 4 and 5)

Study	Valid random assignment	Allocation concealed	Blinding of outcomes assessment	Followup (m)	% IG followup	% CG followup	Handling of missing data	Additional quality concerns	Quality rating
Motto 2001[143]	NR	NR	NR	60 and 180	100	100	No missing (assumed missing were still alive)	Measurement methods minimally described, did not report number receiving full set of intervention letters	Fair

*Information not explicitly provided, but methods indicate that it was likely present.
†Only at first two (of five) followups.

Abbreviations: CG = control group; DSH = deliberate self-harm; IG = intervention group; ITT = intention to treat; LOCF = last observation carried forward; NR = not reported.

Appendix E Table 3. Quality Assessment of Included Studies: Adolescents (Key Questions 4 and 5)

Study	Valid random assignment	Allocation concealed	Blinding of outcomes assessment	Followup (m)	% IG followup	% CG followup	Handling of missing data	Additional quality concerns	Quality rating
Cognitive behavioral therapy									
Donaldson 2005[153]	NR	NR	NR	3 and/or 6	NR (79.5% entire study)	NR (79.5% entire study)	Dropped noncompleters	Small sample size, NR group-specific attrition	Fair
Esposito-Smythers 2011[163,189]	Y	Y	Y	3	95	85	Dropped those providing no data	Small sample size, groups not completely comparable at baseline	Fair
				6	85	85			
				12	80	85			
				18	75	85			
Greenfield 2002[156]	NR	NR*	NR*	2	NR (97.2% entire study)	NR (97.2% entire study)	Full followup for health care utilization, NR how handled self-report data	Unclear whether randomized trial	Fair
				6	NR (91.6% entire study)	NR (91.6% entire study)			
Developmental group therapy									
Green 2011[155,190]	Y	Y	Y	12	98.4	97.8	Described as ITT, so assume kept anyone with any followup data	Described reviewing session tapes for compliance, but NR results	Good
Hazell 2009[157]	NR*	Y	Y	12	97.1	91.9	LOCF	Fairly small sample, baseline differences in method of DSH, but controlled for in the analysis	Good
Wood 2001[160]	NR*	Y	Y	7	96.9	100	Only one missing case, which was dropped	Fairly small study	Good
Psychodynamic or interpersonal therapy									
Chanen 2008[164]	Y	Y	Y	12	77.3	80.9	Multiple imputation	Group not entirely comparable at baseline, retention <90 %	Fair
				24	79.5	75.0			
Diamond 2010[108,191]	Y	Y	N	6	94.3	83.9	Imputation of missing data through hierarchical linear modeling	Small sample size, outcomes assessment not blinded, but did require certification and provided supervision	Fair
Tang 2009[159]	NR	NR	NR	1.5	NR (96% entire study)	NR (96% entire study)	NR	Small sample size; sample size and followup NR by group	Fair
Other therapy, with direct therapeutic contact									
Eggert 2002[154,192-194]	Y	NR*	NR	2.5	78	78	Completers only and ITT analysis (multilevel modeling) that included all randomized participants	NR blinding of outcomes assessment, though did have question and answer procedures in place for outcomes assessment; NR adherence to intervention	Fair
				9	86	90			

Appendix E Table 3. Quality Assessment of Included Studies: Adolescents (Key Questions 4 and 5)

Study	Valid random assignment	Allocation concealed	Blinding of outcomes assessment	Followup (m)	% IG followup	% CG followup	Handling of missing data	Additional quality concerns	Quality rating
Hooven 2012[161]	NR	NR	NR	15	NR (87% entire study)	NR (87% entire study)	Imputation procedures used	Group-specific attrition NR, assessment procedures not described	Fair
Other therapy, without direct therapeutic contact									
King 2009[158]	Y	Y	Y	3	75.3	77.3	Imputation through mixed-effects modeling	None	Fair
				12	78.5	76.0			
Improving treatment adherence without direct person-to-person contact									
Robinson 2012[162,195]	Y	Y	Y	12	74	63	Completers and data substitution with multiple imputation	Unacceptably high attrition at 18 months, high but acceptable at 12 months; IG more likely to have history of DSH (64% vs. 53% in past year), higher incidence of substance abuse (31% vs. 19%), and lower incidence of anxiety disorders (51% vs. 75%)	Fair
				18	62	45			

*Information not explicitly provided, but methods indicate that it was likely present.
†Only at first two (of five) followups.

Abbreviations: CG = control group; DSH = deliberate self-harm; IG = intervention group; ITT = intention to treat; LOCF = last observation carried forward; NR = not reported.

Appendix F. Intervention Components[81]

Factor category	Intervention factor	Definition
Factor 1: Multimodal treatment	Multimodal treatment	Combination of individual, group, medication, art, or other treatments (Individual treatment that occasionally or may include other family members does not constitute multimodel)
	Team approach	Members of the team collaborate, communicate, and meet on a regular basis and think flexibly about the patient in an attempt to maximize effects of the treatment on the basis of all available clinical information. The treatment team has a designated leader, and the team implements the developed treatment plan in a consistent manner. (Having two therapists lead a group does not constitute a team approach.)
Factor 2: Clear treatment framework	Clear treatment framework	Treatment framework is established (appointment time, fees, vacations, cancellation policy, termination policy, confidentiality, accepted and prohibited behaviors)
Factor 3: Suicidality is an explicit target behavior	Target behavior	Therapy identifies target behaviors and systematically addresses them; suicidal behavior is explicit target behaviors
	Between-session self-monitoring	Patient keeps track of 1) problematic behaviors, thoughts, and feelings, including suicidality, and 2) use of coping skills between sessions
	In-session monitoring of suicidality	Therapist keeps track of levels of suicidality during session and addresses these shifts
Factor 4: Agreed-upon strategy to manage suicidal crises	Management of intersession crises I	There is a detailed plan for management of intersession suicidal crises
	Management of intersession crises II	Therapist plays an active role in management of intersession suicidal crises
Factor 5: Attention to affect	Attention to affect	Treatment emphasizes focus on emotional experiences of the patient, especially those experiences that contribute to suicide risk. Particular affects: anguish, aloneness, hopelessness, rage, self-hate, and loss of internal control
	Attention to in-session affect	The explicit focus of therapy is the focus on affective shifts in session
	Experiencing affect	Facilitating experience of affect
	Informal exposure to affect	Exposure to affect that does not use directed guidelines but happens as a by-product of other interventions
	Formal exposure to affect	Use of explicit guidelines to help the patient with exposure to affect
	Tolerance of internal states encouraged	Facilitation of tolerance of feelings, thoughts, opposing feelings/thoughts, and ambiguity
Factor 6: Focus on treatment relationship	Attention to relationship between the therapist and the patient	Thoughts, feelings, and behaviors associated with the relationship with the therapist are one of the explicit foci of the treatment
	Attention to feelings of patient toward therapist is explicit focus	Feelings of the patient toward the therapist are systematically examined; every feeling is examined as bearing upon the patient-therapist relationship
	Attention to reactions to the patient	Therapist pays attention to his or her emotional reactions to the patient; therapist makes use of these reactions in treatment
	Personal disclosure	Disclosure regarding personal life or personal experiences of the therapist that are not related to feelings toward the patient
Factor 7: Active therapist	Active therapist	Therapist 1) is able to show his or her emotional involvement through action, disclosure, or change in affect and 2) brings up thoughts, feelings, and behaviors related to the patient's difficulties
	Problem-solving	Teaching and applying problem-solving skills regarding real-life problems
	Advice	Direct or indirect suggestions are given regarding possible action steps
Factor 8: Interpretations	Interpretations	Making the dynamic unconscious (in the psychoanalytic sense) conscious
Factor 9: Exploratory interventions	Clarification	Making passively avoided thoughts or feelings conscious; recognizing patterns; connecting thoughts, feelings, and behaviors
	Confrontation	Bringing actively avoided thoughts or feelings to awareness
	Exploration	Chain analysis and behavior analysis
	Insight	Active facilitation of awareness of problem thought patterns, feelings, and behaviors and their interrelationships

Appendix F. Intervention Components[81]

Factor category	Intervention factor	Definition
Factor 10 Supportive interventions	Validation	Affirmation of existing thoughts, feelings, or behaviors of the patient
	Education	Provision of knowledge regarding treatment or patient's condition
	Support	Active and intentional instillation of hope
Factor 11: Change-oriented interventions	Manipulation	Planned use of external or internal contingencies to reinforce or suppress target behavior
	Homework	The patient receives formal assignments that are expected to be done outside of the treatment sessions
	Behavior change	Active facilitation of behavioral changes
	Challenging self-defeating behaviors	Self-defeating and treatment-interfering behaviors are taken up as they manifest themselves inside or outside treatment
Factor 12: Support for therapists	Support for therapists	Therapists get support and validation through regular group or individual (peer) supervision

Appendix G Table 1. Detailed Intervention Descriptions Among Adult and Older Adult Studies

Intervention category	Study	Intervention description
Cognitive behavioral therapy	Brown 2005[126,168,169]	Cognitive therapy + UC: Outpatient therapy specifically developed to prevent suicide attempts over 10 sessions (weekly or biweekly). Central feature was identification of proximal thoughts, images and core beliefs that were activated prior to suicide attempt. Cognitive and behavioral strategies applied to address the identified thoughts and beliefs; participants help to develop adaptive ways of coping with stressors. Specific vulnerability factors addressed (e.g., hopelessness, problem-solving). Relapse prevention therapy conducted near end of treatment. Additional sessions provided as needed (or in case of treatment failure). Usual care provided by community clinicians and case-management (weekly/monthly calls or mailings; referrals to mental health/addiction treatment or social services; contact with participants social network [e.g., family]).
	Evans 1999[134]	Manual-assisted cognitive therapy: Brief cognitively orientated and problem-focused therapy structured around six short chapters covering problem-solving, basic cognitive techniques to manage emotions and negative thinking, relapse prevention strategies. First chapter given by therapist; conduct a detailed behavioral chain analysis of circumstances surrounding DSH. Subsequent sessions, participant and therapist worked through relevant chapters (Table 1 provides manual content details) to help deal with specific problems. If no in-person attendance, remaining five chapters sent by mail. Between sessions, all participants encouraged to practice newly acquired skills (e.g., problem solving).
	Hawton 1987[137]	Brief problem-oriented outpatient counseling following the usual pattern provided by the clinical service. Included exploring meaning of the overdose, clarification of the participant's problems and agreement on the treatment goal, strategies to promote communication between parent/significant others; planning tasks to be performed between treatment sessions; attempts to link past experiences or those occurring in other contexts with difficulties the participant was experiencing, and assessment of the mental states. Conjoint therapy arranged when there were relationship problems.
	Marasinghe 2012[142]	Brief Mobile Treatment: Phase I included an assessment of mental health (1-2 hours); meditation (1 hour) including awareness of breathing, feelings/activities/ actions and thoughts; problem solving (30-60 minutes); interventions to increase social support (30-60 minutes) and reduce alcohol/drug use (30-60 minutes) and training to use mobile phones (10-20 minutes). Phase II included 10 telephone calls of 10 to 15 minute duration to assess suicidality/mood, a brief problem-solving/planning intervention, improve social support and reduce alcohol/drug use. Participants had continuous access to 5 minute audio messages (meditation or problem-solving); weekly short message service/helpline to get individual support if in crisis. Calls occurred at day 2, 4, and at weeks 1, 2, 4, 6, 10, 12, 18, and 24 post discharge.
	Rudd 1996[144]	Intensive, structured, time-limited group treatment. Structured problem solving and social competence paradigm targeting fundamental skill development, improved social functioning and adaptive coping. Daily 9-hour hospital stay for 2 weeks on a rotational basis (12-14 individuals, minimum of 8). Involved in weekly monitoring program through an unstructured 2 hour weekly support group with problem solving focus. Individual crisis intervention as needed. Three components of group treatment: 1) a traditional experiential-affective group: focus on precipitant of suicide act 2) psychoeducational classes: eight 1-hour classes covering goal setting, self-awareness, interpersonal trust, communication, impulsivity, anger control, emotion regulation, stress management, relaxation, and developmental issues. Homework assignments. 3) a problem-solving group: taught six-step approach in problem orientation, problem identification and goal setting, generation of alternatives, evaluation of alternatives, implementation, and evaluation. Sessions revolved around role-playing, active problem-solving, use of behavioral rehearsal, modeling and implementation of alternatives. Emphasis on problem-solving, social competence and adaptive coping; approximately 3.5 hours specifically to this component of each day.
	Samaraweera 2007[105]	Cognitive behavioral therapy: Focused in culturally relevant psychotherapeutic strategies w/key elements of recapitulation of the problem, acknowledging distress, explaining management strategies, concentrating on patient's explanatory models, return to normal activities and diary keeping.

Appendix G Table 1. Detailed Intervention Descriptions Among Adult and Older Adult Studies

Intervention category	Study	Intervention description
	Slee 2008[145,170]	Cognitive behavioral therapy + UC: Standardized intervention; outpatient sessions developed for preventing self-harm; 10 sessions provided weekly or as needed in case of crisis; two were followup sessions. Central feature was identification and modification of mechanisms that maintained self-harm. First assessed most recent self-harm episode; investigated how emotional, cognitive, and behavioral factors played a role in the maintenance of self-harm. Addressed dysfunctional cognitions, emotion regulation difficulties, and poor problem-solving. End of therapy focused on relapse prevention. Partner or parents could participate.
	Tyrer 2003[146,171-174]	Manual-assisted cognitive therapy: Brief cognitively orientated and problem-focused therapy. Single 70-page booklet (modified from six pilot booklets) illustrating multiple case examples designed to appeal to a set of diverse users. Themes include evaluation of self-harm attempt, crisis skills, problem solving, basic cognitive techniques to manage emotions and negative thinking and relapse prevention strategies. Treatment structured around current problems. Booklet can act as an aide between sessions and used for homework tasks.
Dialectical behavior therapy	Carter 2010[128]	Dialectical behavior therapy: Team-based approach including individual therapy, group-based skills training meeting weekly, telephone access to individual therapists (8:30AM-10PM) or hospital (10PM-8:30AM) following the Linehan model. Modules covered: interpersonal effectiveness, emotion regulation, and distress tolerance. Participants asked to discontinue any current therapy for at least the 12 month study.
	Linehan 1991[140]	Dialectical behavior therapy: Manualized directive, problem-oriented techniques (behavioral skill training, contingency management, cognitive modification, exposure to emotional cues). Therapist actively teaches and reinforces adaptive behavior (individual therapy); telephone contact between sessions; could be started up to 2 months before group therapy. Group therapy with psychoeducational focus: interpersonal skills, distress tolerance/reality acceptance skills, emotion regulation skills; no telephone calls accepted and patient crises referred to individual therapy.
	Linehan 2006[141,175,176]	Dialectical behavior therapy: CBT program to treat suicidal clients meeting criteria for BPD; targets suicidal behavior, behaviors that interfere with treatment delivery and other dangerous, severe or destabilizing behaviors. Address five functions: 1) increasing behavioral capabilities; 2) improving motivation for skillful behavior; 3) assuring generalization of gains to natural environment; 4) enhancing therapists' capabilities and motivation to treat patients effectively. Composed of weekly individual psychotherapy (1 hour); weekly group skills training (2.5 hours); telephone consultation as needed; and weekly therapist consultation team meetings.
	van den Bosch[148,177]	Dialectical behavior therapy: Combination weekly individual cognitive-behavioral psychotherapy session with a primary therapist, weekly skills training groups lasting 2 to 2.5 hours per session and weekly supervision and consultation meetings for the therapists. Individual therapy focused on motivational issues (including motivation to stay alive and stay in treatment); group therapy focused on self-regulation and change skills, self and other acceptance skills. Central principles of DBT focused on both acceptance and validation strategies and change strategies to achieve a synthetic (dialectical) balance in client functioning.
Problem-solving therapy	Bannan 2012[109]	Problem-solving therapy: Problem-solving approach adapted from Hawon divided into two phases: 1) analysis of problem and 2) analysis of solutions. Eight group therapy sessions conducted in the afternoon over 8 weeks: four held twice weekly, two held weekly, and two held at 2-week intervals.
	Fitzpatrick 2005[106]	Problem-solving therapy: Video/slide presentation focused on problem-solving and coping styles adapted from D'Zurilla/Nezu's PST manual. First 20 minutes provided info on identifying problems; reactions to problems; defining problems, solutions, emotions and stress. Next 10 minutes encouraging participants to elicit problems and response emotions (used Problem-Solving Self-Monitoring form). Final 10 minutes encouraging participants to apply problem-solving skills to personal problems.
	Hatcher 2011[107]	Problem-solving therapy: Based on model defined by D'Zurilla and Goldfried using a therapist manual and client workbook. Steps included problem orientation (approach to problems), problem listing and definition, brainstorming, devising an action plan and reviewing the plan. Final sessions had participants apply skills to circumstances around original self-harm episode.

Appendix G Table 1. Detailed Intervention Descriptions Among Adult and Older Adult Studies

Intervention category	Study	Intervention description
Psychodynamic or interpersonal therapy	Bateman 1999[124,178]	Partial hospitalization: Weekly individual psychoanalytic psychotherapy; thrice-weekly group analytic psychotherapy (1 hour each); once-a-week expressive therapy oriented toward psychodrama techniques (1 hour); weekly community meeting (1 hour); and medication review by resident psychiatrist (medication regimen consisted of antidepressant and antipsychotic drugs as appropriate). Therapies and contact organized in accordance to the psychoanalytic model of BPD as a disorder of attachment, separation tolerance and mentalization. A followup program was offered to IG participants; it included: group analytic treatment twice per week (180 hours over 18 months extended followup) and review in a psychiatric outpatient clinic if requested every 3 months
	Guthrie 2001[135,179]	Psychodynamic interpersonal therapy: Identifying and helping to resolve interpersonal difficulties that cause or exacerbate psychological distress. Adapted from Hobson's model for use in patient's who has harmed themselves.
Other therapy, with direct therapeutic contact	Comtois 2011[131]	Collaborative Assessment and Management of Suicidality: Modified how clinicians engage, assess and treat suicidality. Creates opportunities for patient to identify "drivers"/causes of suicide ideation and the subsequent reduction in suicide ideation and behavior as a coping strategy. SSF guides assessment, treatment planning, risk tracking, and disposition of care; used to deconstruct suicidality. Each session (no prescribed session-by-session format or treatment strategies; all collaborative and suicide focused) started with SSF assessment and ends with treatment plan (always includes a crisis response plan).
	Kovac 2002[138]	IG1: Cognitive change: Writing included describing a difficult time(s) in their life (e.g., when a person felt suicidal, depressed, or upset) and focus on interpreting thoughts and feelings about difficult time; continuous reinterpretation of the event, thoughts and feelings. IG2: Exposure: Writing included describing a difficult time(s) in their life (e.g., when a person felt suicidal, depressed or upset) and to include more and more detail about event (no interpretation of thoughts and feelings).
Medication: Lithium	Lauterbach 2008[139]	Lithium Treatment. Dosage: Fixed schedule of dose augmentation (200 mg/week) until sufficient blood level attained (0.6 to 0.8 mmol/L; usually reached after 3-4 weeks of treatment); after 12 months, dosage halved for 1 month and discontinued at 13 months.
Practice-based interventions	Almeida 2012[152,180]	GPs received printed educational material about practice aspects of the assessment and management of depression and self-harm behavior in later life. Investigators conducted a practice audit of 20 consecutive, active patients with detailed personalized audit feedback that took place within the first 6 months of the study. These patients received a self-rating questionnaire at arrival that included the PHQ-9 and the DSI-SS. GPs asked to complete a 1 page summary sheet for each of the 20 patients received a detailed written audit feedback. In addition, GPs received newsletters at 6, 12, and 18 months (included information presented to CG, information about signs and symptoms of depression, screening tips for uncovering depression and suicide risk. and case studies that provided cross-referencing.
	Bennewith 2002[115]	General practitioner sent a letter notifying them that their patient had a new episode of DSH within the trial period (as identified by weekly screening of the patient registry). The letter included a letter to forward to the patient (at their discretion) inviting them to make an appointment for consultation. GP also received a copy of the guidelines for management of DSH developed for the trial that would be affixed to the patient's chart for the consultation. Guidelines included assessment questions and management strategies.
	Bruce 2004[114,181-187]	Treatment guidelines tailored for the elderly with care management. Two components: 1) physician knowledge addressed by a clinical algorithm for treating geriatric depression in primary care settings; 2) treatment management operationalized by depression care managers. Algorithm recommended first-line trial of SSRI (citalopram [preferred] or other antidepressants). If patient declined meds, physician recommended interpersonal psychotherapy from a care manager. Guidelines covered acute, continuation and maintenance phase treatment over the study period.

Appendix G Table 1. Detailed Intervention Descriptions Among Adult and Older Adult Studies

Intervention category	Study	Intervention description
	Clarke 2002[130]	Case management: Routine medical and psychiatric management enhanced by a nurse practitioner-led case management model of service delivery with five key elements (comprehensive assessment of individual need, development of individualized package of care, arrangement of access to services, monitoring of quality of services provided, and long-term, flexible support). As deployed: a psychosocial assessment, negotiated care plan and open access to the case manage via telephone (for crises). Case manager engaged patient and with the patient assessed needs and planned care. Assisted with finding therapy and other welfare services.
	Szanto 2007[151]	Annual education sessions: 1) epidemiology, recognition, and treatment of depression; depression and anxiety; depression and serious, terminal physical illness; depression in young and old individuals; suicide as a problem in the IG and the GP's role in suicide prevention; suicide risk recognition and appropriate response; 2) annual results of program bipolar depression and suicide; depression and suicide in medically ill; 3) annul results; antidepressants and anxiolytics; male depression; case discussion; 4) annual results; depression and alcoholism; case discussions; 5) annual results; anxiety disorders and suicide; depression and suicide in the elderly; case discussions. Initial was didactic lecture followed by booster sessions. Three times per year invited to a 1-hour lecture on topics related to suicide prevention. GPs encouraged to use BDI to detect patients with depression (with an added question on suicidality); GPs had access to free telephone consultation with local psychiatrists and could refer participants to a newly set-up depression clinic and could get cheaper antidepressants for participants. Two alternative times for each session provided since most GPs on-call.
Improving treatment adherence with direct person-to-person contact	Allard 1992[123]	Subject requiring admission were put under the care of the project team (two staff psychiatrists and a social worker); otherwise, immediately taken over by the project team to start intensive intervention. Intensive intervention consisted of 1) explicit treatment plan developed by project team, patient and family (if possible); 2) scheduling of visits (at least weekly visits for the first month; biweekly visits for the next 3 months; and monthly visits for the next 8 months); 3) at least one home visit by social worker; 4) written or telephone reminders, or home visits, in case of missed appointments; 5) referral to the usual psychiatric resources after 1 year of the intensive intervention. Support could include any combination of support or psychoanalytically-oriented psychotherapy, psychosocial, drug or behavioral therapy as well as free outside sources (e.g., AA).
	Cedereke 2002[129]	Two telephone contact at 4 and 8 months to increase motivation for professional treatment in addition to UC. Telephone contact was a semi-structured interview where participants asked about suicidal behavior, social situation, psychological distress, acute problems, physical ill health and satisfaction/disapproval of treatment received. Those in treatment encouraged to continue treatment; and those who discontinued encouraged to return to treatment. Interviewers offered advice (e.g., when to contact primary care physician), assist in seeking treatment, and in case of life-threatening situations, organize assistance (e.g., pay an immediate home visit).
	Crawford 2010[132]	Postcard: an appointment card asking the patient to re-attend the ED for an appointment with an ANS with an information leaflet on alcohol and health. Session with ANS included assessment and discussion of current/previous drinking habits. FRAMES framework: Feedback about AEs of excessive alcohol consumption; Responsibility for change; Advice on alcohol reduction; Menu of intervention options; Empathy; Self-efficacy enhancement. ANS had option for further referral to individual alcohol counseling or detoxification services.
	Currier 2010[133]	Mobile crisis team: Community-based clinical assessment conducted by the MCT within 48 hours of discharge at location of subject's choice.

Appendix G Table 1. Detailed Intervention Descriptions Among Adult and Older Adult Studies

Intervention category	Study	Intervention description
	Vaiva 2006[147]	IG1: One telephone call one month after discharge from ED IG2: One telephone call three months after discharge from ED Telephone contact only, no in-person meeting. Telephone contact was abandoned if unsuccessful after three attempts on three different days and at two difference times (midday or evening). Conversation revisited recommended treatment, determine if another one should be suggested or if participant was considered at high-risk for suicide attempt, an ED appointment was made. Used a psychotherapeutic approach (psychological support, empathy, reassurance, explanation, and suggestion) in an attempt to enhance compliance and provide brief crisis intervention if needed.
	van Heeringen 1995[149]	All participants referred to outpatient after-care (social or psychotherapeutical treatment at the Community Mental Health Services; case psychiatric treatment at the outpatient psychiatric department; a private psychiatrist or psychologist; general practitioner; all with or without a fixed appointment). Home visits among non-compliant patients (those who did not attend outpatient facility for subsequent treatment). During home visits, non-compliance assessed, needs for treatment evaluated and identified needs matched with supply of outpatient treatment. Compliance assessed by contacting treatment facility 2 weeks after discharge and/or 2 weeks after initial home visit.
	Welu 1977[150]	Special outreach program: Team member contacted suicide attempter as soon as possible after discharge by phone to set up an appropriate time for a home visits within the next few days. Initial home visit established relationship, determine type of treatment/service depending on patient's needs and services available (e.g., psychotherapy, crisis intervention, etc.). Special team member made weekly or bi-weekly contact throughout the 4-month period, either providing the treatment or monitoring the treatment received elsewhere. Therapy's objective was improvement in patient's condition.
Improving treatment adherence without direct person-to-person contact	Beautrais 2012[125]	Postcards sent by mail during the 12 months following the index presentation in addition to UC (crisis assessment and referral to inpatient community-based mental health services). Sent at 2 weeks, 6 weeks, 3, 6, 9, and 12 months. Postcard read "It has been a short time since you were here at PES, and we hope things are going well for you. If you wish to drop us a note we would be happy to hear from you). Included a return address for undeliverable mail; updated address sought and postcard resent unless no new address identified.
	Carter 2007[127, 188]	Postcards mailed in sealed envelopes at 1, 2, 3, 4, 6, 8, 10, and 12 months after discharge. Example "Dear FirstName, It has been a short time since you were here at the Newcastle Mater Hospital, and we hope things are going well for you. If you wish to drop us a note we would be happy to hear from you. Best wishes, Dr. XXX"
	Hassanian 2011[136]	Postcards + UC: Based on Postcards from the EDge study; each postcard had a difference message; variety of floral images as a four-page greeting card rather than a 2-sided postcard. Mailed 1,2,3,4,6,8,10 and 12 months after discharge. A ninth postcard was sent at each participants birthday (included in a mailing if within first 4 months, mailed on birthday if mailed during final 8 months). Included a SASE to make contact, change contact details or to withdraw.
	Motto 2001[143]	Schedule of regular communications, in the form of a short letter, from the research staff member who had interviewed them in the hospital. Each contact letter was simply an expression of concern that the person was getting along alright and invited a response if the patient wished to send one. All letters worded differently, typed, and included responses to individual's comments. Included a self-addressed, unstamped envelope. Monthly for 4 months, every 2 months for 8 months, and every 3 months for 4 years.

Abbreviations: AA = Alcoholics Anonymous; AE = adverse event; ANS = alcohol nurse specialist; BDI = Beck Depression Inventory; BPD = borderline personality disorder; CBT = cognitive behavioral therapy; DBT = dialectical behavior therapy; DSH = deliberate self-harm; ED = emergency department; GP = general practitioner; IG = intervention group; MACT = manual-assisted cognitive therapy; PES = psychiatric emergency services; PST = problem-solving therapy; SASE = self-addressed stamped envelope; SSF = Suicide Status Form; SSRI = selective serotonin reuptake inhibitors; UC = usual care.

Appendix G Table 2. Detailed Intervention Descriptions Among Adolescent Studies

Intervention category	Study	Intervention description
Cognitive behavioral therapy	Donaldson 2005[153]	Skills-based treatment: Focused on problem-solving and affect management skills. Each session included an assessment of suicidality, skill education, and skill practice (in-session and homework). Taught steps of effective problem-solving and cognitive/behavioral strategies for affect management (e.g., relaxation) and given homework assignments to assist skill acquisition and generalization. Individual-based approach including brief collateral contacts with parents at the onset of each session, active and maintenance treatment phases. Active phase included 6 individual sessions and 1 adjunct family session during first 3 months. Maintenance phase included 3 monthly sessions. At therapist's discretion, 2 additional family sessions (if family problems are interfering with treatment) and 2 crisis sessions (if participant reported significant suicidal ideation) were available.
	Esposito-Smythers 2011[163,189]	Cognitive behavioral therapy: Grounded in social cognitive learning theory; manual-based; relearn adaptive ways of relating to self and others and develop self-efficacy in the use of their new skills; skills-development for both individuals and parents (include individual, family, and parent training sessions). Menu of CBT training (e.g., problem-solving, refusal skills, communication, monitoring). Also included 1 motivational interviewing session. Treatment phase (6 months): individual attended weekly sessions; parents weekly to biweekly sessions. Continuation phase (3 months): individual attended biweekly sessions; parents weekly to monthly sessions. Maintenance phase (3 months): individual attended monthly sessions; parents attended monthly sessions as needed. Sessions could be repeated and practiced. Case management calls were made as needed.
	Greenfield 2002[156]	Rapid response outpatient model: Provide outpatient care immediately after assessment in the ED. Initiated telephone contact with every referred patient to plan a followup appointment. Assessment to identify the nature of the crisis, the precipitating events, and the strengths/weaknesses of the adolescent's support system. Interventions aimed at reframing any misconceptions, maladaptive behaviors, and communication patterns that contributed to stress. Medication and community resources used when available.
Developmental group therapy	Green 2011 ASSISST[155,190]	Development group psychotherapy with UC: manual-based treatment that integrated techniques applied to treat depressed or suicidal adolescents and their families, including CBT, DBT, and psychotherapy. Goal themes include peer relationships, bullying, and family problems. Participants learned strategies to deal with difficulties using group-based techniques (e.g., role playing). Rolling entry method, start after initial assessment and can stop attending whenever.
	Hazell 2009[157]	Group therapy intervention plus UC: CBT, social skills training, interpersonal psychotherapy, group psychotherapy. Taught problem-solving skills and cognitive strategies. Six sessions: 1) relationships, 2) school and peer relationships, 3) family problems, 4) anger management, 5) depression and self-harm, and 6) hopelessness and feelings about future. Routine care provided by adolescent mental health service such as individual counseling, family sessions, medication assessment, and other care coordination activities. Booster session available for up to 12 months after acute phase.
	Wood 2001[160]	Developmental group psychotherapy with routine care: Manual-based; designed for adolescents who harmed themselves to meet their needs and focused on the adolescent growing through difficulties by using positive corrective therapeutic relationships. Includes problem-solving, CBT, DBT, and psychodynamic group therapy. Initial 6 "acute" group sessions discussing relationships, school problems/peer relationships, family problems, anger management, depression/self-harm, and hopelessness/feelings about the future. Weekly "long-term" group therapy: emphasized group processes. Patient can continue with long-term therapy as long as they desire; and join at any time.
Psychodynamic or interpersonal therapy	Chanen 2008[164]	Cognitive analytic therapy: Time-limited, integrative psychotherapy based on a theoretical and practice integration of elements of psychoanalytic object relations theory and cognitive psychology, developing into an integrated model of development and psychopathology. Therapist summarized session for patient at end of each session.

Appendix G Table 2. Detailed Intervention Descriptions Among Adolescent Studies

Intervention category	Study	Intervention description
	Diamond 2010[108, 191]	Attachment-based family therapy: Process-oriented and emotion-focused. Begins w/ discussion of barriers to asking parents for help. Treatment through 5 specific tasks: 1) Relational Reframe: w/family members, aimed to strengthen relationships; 2) Adolescent Alliance: participant identifies family conflicts linked to suicide to discuss; 3) Parent Alliance: teach parenting skills to parents, amplify low and empathy; 4) Reattachment: discuss problems and practice communication, problem-solving and affect regulation skills; 5) Competency: promote adolescent autonomy. All participants had access to 24-hour crisis hotlines.
	Tang 2009[159]	Program of intensive interpersonal psychotherapy for depressed adolescents with suicidal risk (IPT-A-IN): Collected target symptoms related to current interpersonal problem domains (interpersonal conflict, interpersonal sensitivity, role transition, and grief). Treatment of interpersonal stress reduces depression and thoughts of self-injury (depression and suicidal ideation are connected interpersonal problems).
Other therapy, with direct therapeutic contact	Eggert 2002[154, 192-194]	C-CARE: 1) 2-hour, 1-to-1 computer-assisted MAPS suicide assessment, 2) brief motivational counseling session to enhance empathy and support, deliver personal information, reinforce coping skills and help-seeking behaviors, and increase access to help, and 3) social network connections to link youths to school-based case manager, a favorite teacher or both; to contact a parent/guardian of the youth's choice to enhance immediate support, access to help and community between youth, school personnel and parents.
	Hooven 2012[161]	IG1: C-CARE only: One 2-hour computerized interview and brief counseling session designed to facilitate motivation to access support (involves connection to school resources and parent phone call). IG2: P-CARE only: 30-minute interview addressing suicide risk factors, derived from C-CARE interview (involves connection to school resources and parent phone call). Two 2-hour parent sessions reviewing suicide risk, support and communication skills, conflict reduction and youth mood management. Followup parent booster call 2.5 months later. IG3: C-CARE + P-CARE: One 2-hour computerized interview and brief counseling session designed to facilitate motivation to access support (involves connection to school resources and parent phone call). Two 2-hour parent sessions reviewing suicide risk, support and communication skills, conflict reduction and youth mood management. Followup parent booster call 2.5 months later.
Other therapy, without direct therapeutic contact	King 2009[158]	Youth nominated a support person in addition to UC. Support person underwent psychoeducation sessions (individual or group sessions; mean length, 63.6 minutes [22.6]) and ongoing consultation for the parent-approved adult support persons nominated by adolescent (from family, school, neighborhood or community). They are informed of the adolescent's emotional and behavior problems/disorder, treatment plan and rationale, signs of increase suicide risk, availability of professional resources, and effective communication strategies. Maintain regular supportive contact for 3 months following hospitalization. Contacts with youth: Weekly contacts encouraged through any medium (in-person, telephone) to discuss youth's recent activities and support involvement in healthy activities, youth's concerns and engage in problem-solving, and support treatment adherence and hopefulness of possibility of positive change.
Improving treatment adherence without direct person-to-person contact	Robinson 2012[162,195]	Postcards + UC: Regular postcard in a sealed envelope, 1 sent per month over 12 months. Designed with a youth focus that inquires about the person's well-being, reminds them about the sources of help identified during the telephone interview with study coordinator (after baseline assessment), and promotes 1 of 6 evidence-based self-help strategies: 1) physical activity, 2) early morning light exposure, 3) self-help books based on CBT, 4) Web sites known to be effective such as BluePages and Mood GYM, 5) relaxation training, or 6) reducing alcohol and other substance use. Sources of help are rotated and each postcard individually signed/handwritten. Postcard includes a picture of the activity.

Abbreviations: CBT = cognitive behavioral therapy; DBT = dialectical behavior therapy; DSH = deliberate self-harm; ED = emergency department; IG = intervention group; MAPS = Measures of Adolescent Potential for Suicide.

Appendix H Table 1. Suicide Deaths: Adults and Older Adults

Intervention category	Study	Age range (mean age)	Data source of death	Followup time (m)	Intervention group	Control group	P-value
Cognitive behavior therapy	Hawton 1987[137]	≥16 (29)	NR	12	1/41 (2.4%)	0/39 (0%)	NR
	Slee 2008[145,170]	15-35 (24)	NR	3	0/40 (0%)	0/42 (0%)	NA
				6‡	0/40 (0%)	1/42 (2.4%)	NR
				9‡	0/40 (0%)	2/42 (4.8%)	NR
	Tyrer 2003[146, 171-174]	16-65 (32)	Coroner reports	12	2/239 (0.8%)	5/241 (2.1%)	NR
Dialectical behavior therapy	Linehan 2006[141, 175,176]	18-45 (29)	NR	24	0/52 (0%)	0/49 (0%)	NA
Problem-solving therapy	Fitzpatrick 2005[106]	18-24 (19)	NR	1	0/55 (0%)	0/55 (0%)	NA
Psychodynamic or interpersonal therapy	Guthrie 2001[135, 179]	18-65 (31)	NR	6	0/56 (0%)	0/61 (0%)	NA
Medication: lithium	Lauterbach 2008[139]	≥18 (39)	NR	12	0/84 (0%)	3/83 (3.6%)	0.049
Practice-based interventions	Bruce 2004[114, 181-187]	65-94 (70)	NR	24	1/320 (0.3%)	0/278 (0%)	NR
	Szanto 2007[151]	NR (NR)	Police department records, incident rate per 100,000	12	57.1/100,000	45.8/100,000	0.23‖
				24	45.3/100,000	42.6/100,000	NR
				36	56.2/100,000	39.2/100,000	NR
				48	50.0/100,000	50.7/100,000	NR
				60	40.7/100,000	47.1/100,000	NR
Improving treatment adherence with direct person-to-person contact	Allard 1992[123]	NR (NR)	Medical records, relatives and/or coroner report	24	3/63 (4.8%)	1/63 (1.6%)	NR
	Cedereke 2002[129]	NR (41)	Death registries	12	1/107 (0.9%)	1/109 (0.9%)	NR
	Vaiva 2006[147]	18-65 (36)	ED, provider, and medical records; registrar's office	13	1/293 (0.3%)*	2/312 (0.6%)	0.37†
	van Heeringen 1995[149]	≥15 (34)	Death registries	12	6/196 (3.1%)	7/195 (3.6%)	0.873
Improving treatment adherence without direct person-to-person contact	Motto 2001[143]	NR (33)	Coroner report, death certificates, clinical sources, state records, and family members or other individuals	24	7/389 (1.8%)	16/454 (3.5%)	0.043 (one-tailed)
				60	15/389 (3.8%)	21/454 (4.6%)	NR
				180	25/389 (6.4%)	26/454 (5.7%)	NR

*Number of deaths reported are the total among two separate intervention groups: telephone contact at 1 or 3 months after attempted suicide.
†For differences among all three interventions groups (treatment as usual, telephone contact at 1 or 3 months after attempted suicide).
‡Cumulative from baseline.
§Annual incidence rate per 100,000 individuals.
‖P-value for treatment by time interaction.

Abbreviations: ED = emergency department; NA = not applicable; NR = not reported.

Appendix H Table 2. Suicide Attempts or Episodes of Deliberate Self-Harm: Adults and Older Adults

Intervention category	Study	Age range (mean age)	Outcome	Followup time (m)	Intervention group	Control group	Risk (95% CI)	P-value
Cognitive behavioral therapy	Brown 2005[126, 168,169]	18-66 (35)	Participants with ≥1 suicide attempt per self-report	18	13/54 (24.1%)	23/55 (41.6%)	NR	0.05
	Evans 1999[134]	16-50 (NR)	Participants with a repeat self-harm episode per self-report and hospital records	6	10/18 (56%)	10/14 (71%)	NR	NR
	Hawton 1987[137]	≥16 (29)	Participants with repetition of self-poisoning per general practitioner and hospital records	12	3/41 (7.3%)	6/39 (15.4%)	NR	NR
	Slee 2008[145, 170]	15-35 (24)	Average number of DSH episodes per self-report, corroborated by hospital records and treatment chart notes, mean (SD)	BL‖	14.4 (10.5)	11.6 (1.4)	NA	NSD
				3‖	5.6 (9.0)	5.6 (9.2)	NR	NR
				6‖	5.3 (9.4)	4.0 (7.2)	NR	NR
				9‖	1.2 (4.2)	4.6 (8.4)	NR	<0.05
	Tyrer 2003[146, 171-174]	16-65 (32)	Participants with severe or high risk DSH episode per self-report, corroborated with general practitioner notes and medical records	6	64/213 (30%)	77/217 (36%)	OR 0.76 (0.51, 1.15)	0.19
				12	84/213 (39%)	99/217 (46%)	OR 0.76 (0.51, 1.13)*	0.17
Dialectical behavior therapy	Carter 2010¶[128]	18-65 (24)	Average number of DSH episodes per self-report, corroborated by hospital records, mean (SD)	BL	22.0 (28.6)	28.1 (40.7)	NR	NSD†
				3‖	5.7 (11.5)	6.1 (11.4)	NR	NSD
	Linehan 1991[140]	18-45 (NR)	Participants with parasuicidal acts requiring treatment per self-report	12	5/22 (22.7%)	10/22 (45.4%)	NR	NR
	Linehan 2006[141,175,176]	18-45 (29)	Participants with suicide attempts per self-report	24	12/52 (23.1%)	23/49 (46.7%)	HR 2.66	0.005
	van den Bosch 2005[148,177]	18-65 (35)	Participants with a parasuicidal act per self-report	12	2/27 (7%)	8/31 (26%)	NR	NSD
				18†	1/27 (4%)	6/31 (19%)	NR	NSD
Problem-solving therapy	Hatcher 2011[107]	≥16 (34)	Participants presenting to hospital for DSH per the National New Zealand database	12	36/253 (14.2%)	51/299 (17.1%)	RR 0.83 (0.56, 1.24)	0.43
Psychodynamic or interpersonal therapy	Bateman 1999[124,178]	16-65 (32)	Participants with suicide attempt per self-report, corroborated by medical and psychiatric records§	6	8/19 (42%)	13/19 (68%)	NR	<0.05
				12†	4/19 (21%)	11/19 (58%)	NR	<0.02
				18†	1/19 (5.3%)	12/19 (63%)	NR	<0.001
	Guthrie 2001[135,179]	18-65 (31)	Participants with repeat DSH episode per self-report or hospital records	6	5/58 (9%)	17/61 (28%)	NR	0.009
Other therapy, with direct therapeutic contact	Comtois 2011[131]	19-62 (37)	Average number of suicide attempts and/or self-inflicted injuries per self-report	BL	3 (9.3)	7.7 (24.5)	NR	NR
				2	NA	5.5 (7.8)	NR	NR
				4	0 (0)	0.8 (1.8)	NR	NR
				6	0.2 (0.4)	0.0 (0)	NR	NR
				12	1.2 (3.9)	3.3 (7.6)	NR	NR
Medication: lithium	Lauterbach 2008[139]	≥18 (39)	Participants with suicide attempts per self-report	1	2/74 (2.7%)	1/68 (2.9%)	NR	NR
				2‡	3/62 (4.8%)	6/60 (10.0%)	NR	NR
				3‡	5/56 (8.9%)	8/48 (16.7%)	NR	NR
Practice-based interventions	Almeida 2012[152,180]	60-101 (72)	Participants with self-harm behavior (suicide attempts and ideation) per self-report	24	508/11,402 (4.5%)	531/10,360 (5.1%)	OR: 0.80 (0.68, 0.94)	NR

Appendix H Table 2. Suicide Attempts or Episodes of Deliberate Self-Harm: Adults and Older Adults

Intervention category	Study	Age range (mean age)	Outcome	Followup time (m)	Intervention group	Control group	Risk (95% CI)	P-value
	Bennewith 2002[115]	16-95 (32)	Participants with a DSH episodes per self-report and general practitioner	12	211/964 (21.9%)	189/968 (16.5%)	OR 1.17 (0.94, 1.47)	0.16
	Clarke 2002[130]	≥20 (33)	Participants with readmission to Accident and Emergency Services due to self-harm	12	19/220 (9%)	25/247 (10%)	NR	NSD
	Bruce 2004[114, 181-187]	60-94 (70)	Participants with a suicide attempt (source NR)	12	1/221 (0.5%)	1/191 (0.5%)	NR	NR
				24	2/183 (1.1%)	3/177 (1.7%)	NR	NR
Improving treatment adherence with direct person-to-person contact	Allard 1992[123]	NR (NR)	Participants with ≥1 suicide attempt per self-report, corroborated by medical records, relatives and/or coroner's report	24	22/63 (34.9%)	19/63 (30.2%)	NR	0.57
	Cedereke 2002[129]	NR (41)	Participants with a suicide attempt per self-report, corroborated by medical records	1	6/107 (6%)	10/109 (9%)	NR	NR
				12	14/83 (17%)	15/89 (17%)	NR	NSD
	Crawford 2010[132]	18-65 (37)	Participants with an ED visit related to DSH episode, per hospital record	6	7/52 (13.7%)	1/51 (21.2%)	OR 0.59 (0.21, 1.67)	0.32
	Vaiva 2003[147]	18-65 (36)	Participants with suicide attempt per self-report, ED, medical or provider records	6	29/202 (14.4)	62/280 (22.1%)	NR	0.27
				13	44/293 (15.0%)	59/312 (18.9%)	NR	0.37
	van Heeringen 1995[149]	≥15 (34)	Participants with nonfatal suicide attempt per self-report, corroborated by medical records, provider and/or family	12	15/129 (11.6%)	27/195 (13.8%)	OR 1.17	0.73
	Welu 1977[150]	≥16 (29)	Participants with a suicide attempt per self-report, corroborated with medical records, provider and/or family	4	9/62 (14.5%)	13/57 (22.8%)	NR	0.12§
Improving treatment adherence without direct person-to-person contact	Beautrais 2012[125]	≥16 (34)	Participants presenting to the ED or emergency psychiatric service for self-harm	12	39/153 (25.5%)	49/174 (28.2%)	OR 0.87 (0.53, 1.43)	>0.58
	Carter 2007[127, 188]	≥16 (33)	Participants with admission for self-poisoning per toxicology service database	12	57/279 (15.1%)	68/394 (17.3%)	NR	0.41
				24	80/378 (21.2%)	90/394 (22.8%)	NR	0.57
	Hassanian 2011[136]	≥12 (24)	Participants with a suicide attempt per self-report, confirmed by hospital records if hospitalized	12	31/1,043 (3.0%)	55/1,070 (5.1%)	RR 0.42 (0.11, 0.63)	NR

*Adjusted.
†Group by time interaction.
‡‖Cumulative from baseline.
§One-tailed.
‖In previous 3 months.
¶Carter 2010: Only 3-month data reported; high attrition at other followup timepoints.

Abbreviations: BL = baseline; CI = confidence interval; DSH = deliberate self-harm; ED = emergency department; HR = hazard ratio; NSD = no significant difference; NR = not reported; OR = odds ratio; RR = risk ratio; SD = standard deviation.

Appendix H Table 3. Other Health Outcomes: Hospitalization or Emergency Department Use, Adults

Intervention category	Study	Age range (mean age)	Outcome	Followup time (m)	Intervention group	Control group	P-value
Cognitive behavioral therapy	Slee 2008[145]	15-35 (24)	% of participants with a psychiatric hospitalization	BL	0	0	NR
				3	2	14	NR
				6	6	16	NR
				9	2	21	<0.05
Dialectical behavior therapy	Linehan 1991[140]	18-45 (NR)	Inpatient psychiatric days, median	12	17	51	<0.05
	Linehan 2006[141,175,176]	18-45 (29)	% of participants with a psychiatric hospital admission	12	16.6	48.9	0.007
	Carter 2010[128]	18-65 (24)	% of participants with ≥1 psychiatric hospital admission	6	18.4	20.0	NSD
			Number of psychiatric hospital admissions	6	0.61	0.91	NSD
Psychodynamic or interpersonal therapy	Bateman 1999[124,178]	16-65 (32)	Duration (length of stay) of inpatient episodes, mean	18	4	22	<0.001
				36	1.7	15.8	<0.001
Other therapy, with direct therapeutic contact	Comtois 2011[131]	19-62 (37)	ED admissions, mean (SD)	BL	1.5 (1.2)	1.6 (0.8)	NR
				12	0.4 (0.8)	1.0 (2.4)	NR
			Inpatient days, mean (SD)	BL	5.5 (5.4)	1.4 (4.5)	NR
				12	7.0 (7.0)	3.2 (8.0)	NR
Practice-based interventions	Clarke 2002[130]	≥20 (33)	% of participants readmitted to the ED	12	9	10	0.7
Improving treatment adherence without direct person-to-person contact	Carter 2007[127,188]	≥16 (33)	% of participatns with ≥1 psychiatric hospital admission	6	18.4	20.0	NSD

Abbreviations: ED = emergency department; NR = not reported; NSD = no significant difference; SD = standard deviation.

Appendix H Table 4. Other Health Outcomes: Functioning, Quality of Life, and Other, Adults

Intervention category	Study	Age range (mean age)	Outcome, mean (SD)	Followup time (m)	Intervention group, mean (SD)	Control group, mean (SD)	P-value
Cognitive behavioral therapy	Evans 1999[134]	16-50 (NR)	SFQ	BL	11.9 (NR)	15.6 (NR)	NR
				6	9.8 (4.9)	13.1 (4.0)	0.58
	Hawton 1987[137]	≥16 (29)	SAS	BL	2.6 (NR)	2.5 (NR)	NR
				2	2.3 (NR)	2.3 (NR)	NSD
				4	2.1 (NR)	2.1 (NR)	NSD
				9	1.7 (NR)	2.1 (NR)	NSD
	Tyrer 2003[146, 171-174]	16-65 (32)	SFS	BL	13.3 (4.9)	13.3 (4.3)	NR
				6	10.6 (NR)	10.6 (NR)	NSD
				12	9.8 (NR)	10.3 (NR)	NSD
			EuroQoL index	BL	0.5 (03)	0.5 (0.3)	NR
				6	0.7 (NR)	0.7 (NR)	NR
				12	0.7 (NR)	0.7 (NR)	NR
Dialectical behavior therapy	Carter 2010[128]	18-65 (24)	BDQ, days out of role†	BL	12.6 (12.2)	12.5 (12.5)	NSD
				3	8.7 (9.8)	11.4 (11.4)	
				6	8.2 (11.5)	13.1 (11.6)	
Psychodynamic or interpersonal therapy	Bateman 1999[124,178]	16-65 (32)	SAS	18	NR	NR	<0.006
Other therapy, with direct therapeutic contact	Comtois 2011[131]	19-62 (37)	Outcomes Questionnaire-45 (symptoms, social functioning)	BL	85	93	NR
				2	64	73	NR
				4	60	72	NR
				6	63	78	NR
				12	54	83	NR*
Practice-based intervention	Bruce 2004[114, 181-187]	60-94 (70)	All-cause mortality per 1,000 person-years among patients with major depression‡	60	44.7	49.7	p<0.05 for hazard ratio
Improving treatment adherence with direct person-to-person contact	Cedereke 2002[129]	NR (41)	GAF	BL	NR	NR	NR
				1	50.5 (19.9)	50.3 (21.1)	NSD
				12	61.4 (20.4)	58.6 (20.2)	NSD
	Currier 2010[133]	18-69 (33)	Symptoms and functional health status (BASIS-32)	BL	50.0 (18.0)	49.8 (15.8)	NR
				0.5	38.2 (19.5)	40.5 (17.9)	NR
				3	33.6 (2.01)	33.7 (18.4)	0.65
	Motto 2001[143]	NR (33)	Number of nonsuicidal deaths	60	19 (4.9%)	21 (4.6%)	NR
				180	55 (14.1%)	61 (13.4%)	NR

*Statistically significant different between groups, p-value NR.
†Also reported QOL domains: physical (p<0.05), psychological (p<0.01), environmental (p<0.05), and social (NSD).
‡Hazard ratio for all-cause mortality among patients with major depression: 0.55 (95% CI, 0.36 to 0.84).

Abbreviations: BASIS-32 = Behavior and Symptom Identification Scale 32; BDQ = Brief Disability Questionnaire; BL = baseline; GAF = Global Assessment of Functioning; NR = not reported; NSD = no significant difference; SAS = Social Adjustment Scale; SD = standard deviation; SFQ = Social Functioning Questionnaire; SFS = Social Functioning Scale.

Appendix H Table 5. Intermediate Outcomes: Suicidal Ideation, Adults and Older Adults

Intervention category	Study	Age range (mean age)	Outcome	Followup (m)	Intervention group	Control group	P-value
Cognitive behavioral therapy	Brown 2005[126,168,169]	18-66 (35)	% of participants with suicidal ideation as measured by the SSI	BL	65.0	65.0	NR
				1	44.4	46.4	0.99
				3	38.5	44.4	0.66
				6	24.0	30.8	0.49
				12	20.4	24.5	0.63
				18	15.6	22.5	0.41
	Marasinghe 2012[142]	15-74 (31)	BSI, mean (SD)	BL	26.1	21.8	<0.05*
				6	3.6	7.6	<0.05*
				12	3.6	3.8	NSD
	Rudd 1996[144]	"Young adult" (22)	MSSI, mean (SD)	BL	23.0 (9.9)	22.9 (10.5)	NR
				1	5.6 (9.6)	4.7 (8.6)	NSD
	Samaraweera 2007[105]	15-64 (36)	BSI, mean (SD)	BL	11.2 (9.7)	14.5 (9.2)	0.62
				2	0.2 (0.5)	12.5 (6.2)	0.003
				3	0.2 (0.5)	12.3 (5.9)	0.002
Problem-solving therapy	Bannan 2012[109]	18-53 (29)	BSS, mean (SD)	BL	12.1 (6.3)	15.8 (8.8)	NSD*
				2	5.8 (8.3)	12.6 (9.0)	NR
				4	1.3 (3.0)	11.0 (10.2)	NR
	Fitzpatrick 2005[106]	18-24 (19)	BSS, mean (SD)	BL	13.0 (4.4)	12.8 (5.3)	<0.05*
				Posttest	10.4 (5.3)	10.7 (7.6)	
				0.25	8.0 (6.1)	9.1 (6.8)	
				0.5	8.9 (7.7)	9.6 (7.4)	
				1	8.2 (8.4)	9.5 (8.0)	
	Hatcher 2011[107]	≥16 (34)	BSI, mean (SD)	BL	11.3 (9.2)	10.9 (9.9)	NR
				3	3.7 (6.8)	7.1 (8.6)	<0.01
				12	3.7 (6.7)	4.8 (7.4)	0.02
Dialectical behavior therapy	Linehan 1991[140]	18-45 (NR)	SSI-Schotte, mean (SD)	12	NR	NR	NSD*
	Linehan 2006[141,175,176]	18-45 (29)	SBQ, mean (SD)	BL	51.7 (20.3)	59.9 (21.6)	0.31*
				12	29.8 (24.5)	32.8 (26.3)	
				24	24.1 (19.8)	31.9 (26.8)	
Psychodynamic or interpersonal therapy	Guthrie 2001[135,179]	18-65 (31)	SSI, mean (SD)	BL	15.9 (9.9)	14.3 (10.8)	0.027
				1	10.3 (8.6)	12.4 (9.9)	0.22
				6	7.9 (8.6)	12.8 (10.4)	0.005
Other therapy, with direct therapeutic contact	Comtois 2011[131]	19-62 (37)	SSI, mean (SD)	BL	24 (NR)	23 (NR)	NR
				2	8 (NR)	13 (NR)	NR
				4	6 (NR)	11 (NR)	NR
				6	8 (NR)	8 (NR)	NR
				12	2 (NR)	11 (NR)	NR†
Other therapy, without direct therapeutic contact	Kovac 2002[138]	18-42 (23)	ASIQ, mean (SD)	BL	28.9 (20.5)	28.0 (16.6)	NSD*
				Posttest	24.7 (17.7)	26.4 (15.4)	
				1.5	28.2 (21.2)	23.7 (14.8)	
Practice-based interventions	Hassanian 2011[136]	≥12 (24)	% of participants answering "yes" to: "Did you have any suicidal thoughts during the study period?"	12	29	41.7	<0.05
Improving treatment adherence with direct person-to-person contact	Cedereke 2002[129]	NR (41)	SSI, mean (SD)	BL	NR	NR	NR
				1	7.9 (8.4)	5.0 (6.8)	<0.10
				12	5.8 (7.8)	4.0 (6.2)	<0.05
	Currier 2010[133]	18-69 (33)	SSI, mean (SD)	BL	9.8 (7.3)	9.8 (8.3)	NR
				0.5	3.7 (6.2)	3.8 (6.5)	NR
				3	3.9 (6.9)	3.1 (5.9)	0.74

Appendix H Table 5. Intermediate Outcomes: Suicidal Ideation, Adults and Older Adults

Intervention category	Study	Age range (mean age)	Outcome	Followup (m)	Intervention group	Control group	P-value
Improving treatment adherence without direct person-to-person contact	Bruce 2004[114,181-187]	60-94 (70)	% of participants with suicidal ideation as measured by the HRSD	BL	29.4	20.1	0.01
				4	16.5	17.1	0.01
				8	17.2	18.6	0.003
				12	14.6	13.4	0.12
				18	12.5	9.9	0.43
				24	11.4	12.2	0.11

*Group by time interaction.
†Significant difference between groups, p-value NR.

Abbreviations: ASIQ = Adult Suicidal Ideation Questionnaire; BL = baseline; BSI = Beck Suicide Ideation Scale; BSS = Beck Suicide Scale; HRSD = Hamilton Psychiatric Rating Scale for Depression; MSSI = Modified Scale for Suicidal Ideation; NR = not reported; NSD = no significant difference; SBQ = Suicide Behavior Questionnaire; SD = standard deviation; SSI = Scale for Suicidal Ideation.

Appendix H Table 6. Intermediate Outcomes: Depression, Adults and Older Adults

Intervention category	Study	Age range (mean age)	Outcome	Followup time (m)	Intervention group, mean (SD)	Control group, mean (SD)	P-value
Cognitive behavioral therapy	Brown 2005[126,168,169]	18-66 (35)	BDI-II	BL	32.9 (12.0)	31.0 (15.7)	<0.001 (omnibus test)
				1	21.8 (15.5)	21.7 (15.1)	0.9
				3	20.0 (14.8)	21.2 (14.9)	0.37
				6	13.8 (12.3)	19.3 (15.6)	0.02
				12	13.6 (13.4)	18.7 (14.9)	0.009
				18	14.5 (12.9)	18.2 (13.8)	0.046
	Evans 1999[134]	16-50 (NR)	HADS	BL	NR	NR	NR
				6	5.7 (5.5)	10.1 (4.1)	0.03
	Hawton 1987[13]	≥16 (29)	BDI	BL	24.4 (12.4)	24.7 (11.7)	NSD
				2	13.7 (NR)	14.3 (NR)	NSD
				4	11.8 (NR)	10.8 (NR)	NSD
				9	6.5 (NR)	9.8 (NR)	NSD
	Marasinghe 2012[142]	15-74 (31)	BDI	BL	45.3 (NR)	42.8 (NR)	<0.05*
				6	7.0 (NR)	12.4 (NR)	<0.05*
				12	3.0 (NR)	4.8 (NR)	NSD
	Rudd 1996[144]	"Young Adult" (22)	BDI	BL	20.0 (11.4)	18.2 (12.5)	NR
				1	9.2 (9.2)	9.9 (10.4)	NSD
	Slee 2008[145,170]	15-35 (24)	BDI-II	BL	31.4 (12.8)	34.7 (14.0)	<0.05*
				3	21.1 (13.5)	30.1 (13.6)	<0.05
				6	16.6 (13.7)	28.6 (18.6)	<0.05
				9	11.6 (12.1)	29.6 (17.5)	<0.01
	Tyrer 2003[146,171-174]	16-65 (32)	HADS (depression items)	BL	11.3 (4.9)	11.2 (4.2)	NSD
				6	7.9 (NR)	7.5 (NR)	NSD
				12	7.0 (NR)	7.1 (NR)	NSD
Dialectical behavior therapy	Linehan 1991[140]	18-45 (NR)	BDI	12	NR	NR	NSD*
	Linehan 2006[141,175,176]	18-45 (29)	HRSD	BL	20.2 (5.9)	21.7 (7.3)	0.43*
				12	14.0 (7.3)	17.0 (8.2)	
				24	12.6 (6.8)	14.4 (9.1)	
Problem-solving therapy	Bannan 2012[109]	18-53 (29)	BDI	BL	25.8 (12.7)	34.6 (11.7)	<0.05*
				2	22.6 (12.6)	26.6 (14.3)	
				4	13 (9.9)	26 (14.8)	
	Fitzpatrick 2005[106]	18-24 (19)	BDI	BL	16.6 (9.5)	17.5 (10.7)	<0.05*
				Posttest	13.3 (8.6)	16.8 (11.2)	
				0.25	13.9 (9.3)	15.5 (11.5)	
				0.5	15.9 (10.0)	16.1 (13.4)	
				1	15.2 (10.6)	16.3 (12.8)	
	Hatcher 2011[107]	≥16 (34)	HADS (depression items)	BL	10.0 (4.3)	9.6 (4.8)	NR
				3	5.2 (4.3)	7.5 (5.1)	<0.01
				12	5.3 (4.7)	6.2 (4.8)	<0.01
Psychodynamic or interpersonal therapy	Bateman 1999[124,178]	16-65 (32)	BDI	BL	36.0 (7.6)	34.9 (7.4)	<0.001* (9-18 months)
				6	36.3 (8.9)	36.5 (10.1)	NR
				12	26.7 (8.7)	34.7 (9.1)	NR
				18	20.6 (7.0)	35.2 (7.4)	NR
				24	19.0 (7.4)	28.7 (7.4)	<0.001
				30	13.3 (6.0)	21.5 (8.0)	<0.001
				36	11.9 (3.3)	20.4 (10.4)	<0.001
	Guthrie 2001[135,179]	18-65 (31)	BDI	BL	30.2 (12.2)	28.5 (11.6)	0.11†
				1	21.3 (13.1)	22.8 (13.3)	0.55
				6	18.8 (13.5)	23.7 (12.6)	0.037
Other therapy, without direct therapeutic contact	Kovac 2002[138]	18-42 (33)	ZSDS	BL	44.1 (9.3)	42.5 (8.7)	NSD*
				Posttest	43.0 (10.4)	47.3 (41.7)	
				1.5	41.2 (11.0)	41.3 (9.1)	

Appendix H Table 6. Intermediate Outcomes: Depression, Adults and Older Adults

Intervention category	Study	Age range (mean age)	Outcome	Followup time (m)	Intervention group, mean (SD)	Control group, mean (SD)	P-value
Practice-based interventions	Almeida 2012[152,180]	60-101 (72)	% of participants with a PHQ-9 score ≥10	BL	7.9	8.1	NR
				12 or 24	8.2	8.7	NR
Improving treatment adherence with direct person-to-person contact	Currier 2010[133]	18-69 (33)	HRSD	BL	43.2 (9.7)	45.6 (7.9)	NR
				0.5	38.4 (8.8)	41.1 (8.6)	NR
				3	37.5 (9.4)	40.4 (10.3)	0.93
Improving treatment adherence without direct person-to-person contact	Bruce 2004[114,181-187]	60-94 (70)	HRSD	BL	18.6 (6.1)	17.6 (5.8)	<0.001*
				4	11.2 (7.5)	13.6 (8.4)	<0.001
				8	10.4 (7.4)	11.4 (7.5)	<0.001
				12	9.8 (7.3)	10.4 (6.8)	0.006
				18	9.7 (7.9)	9.8 (6.8)	0.06
				24	8.8 (7.5)	9.3 (6.5)	0.007

*Group by time interaction.
†Overall adjusted difference between groups.

Abbreviations: BDI = Beck Depression Inventory; BL = baseline; HADS = Hospital Anxiety and Depression Scale; HRSD = Hamilton Psychiatric Rating Scale for Depression; NR = not reported; NSD = no significant difference; PHQ = Patient Health Questionnaire; SD = standard deviation; ZSDS = Zung Self-Rating Depression Scale.

Appendix H Table 7. Intermediate Outcomes: Hopelessness, Adults

Intervention category	Study	Age range (mean age)	Outcome	Followup time (m)	Intervention group, mean (SD)	Control group, mean (SD)	P-value
Cognitive behavioral therapy	Brown 2005[126, 168,169]	18-66 (35)	BHS	BL	11.5 (5.4)	11.8 (6.2)	NR
				1	9.1 (5.9)	8.7 (6.6)	0.4
				3	7.4 (5.0)	9.1 (7.0)	0.24
				6	5.6 (4.5)	8.2 (7.0)	0.045
				12	6.6 (5.8)	8.2 (6.8)	0.13
				18	6.1 (5.3)	7.2 (6.4)	0.25
	Rudd 1996[144]	"Young Adult" (22)	BHS	BL	8.9 (6.5)	8.2 (6.3)	NR
				1	4.8 (4.7)	5.2 (5.4)	NSD
Dialectical behavior therapy	Linehan 1991[140]	18-45 (NR)	BHS	12	NR	NR	NSD*
Problem-solving therapy	Bannan 2012[109]	18-53 (29)	BHS	BL	13.7 (4.4)	13.3 (3.4)	<0.05*
				2	10.8 (3.3)	12.8 (3.5)	
				4	7.7 (3.0)	12.8 (4.0)	
	Fitzpatrick 2005[106]	18-24 (19)	BHS	BL	9.0 (5.8)	8.8 (5.1)	NSD*
				Posttest	8.5 (6.1)	8.7 (5.6)	
				0.25	8.9 (5.8)	8.5 (5.8)	
				0.5	8.7 (6.0)	8.9 (6.5)	
				1	8.0 (6.7)	9.0 (6.1)	
	Hatcher 2001[107]	≥16 (34)	BHS	BL	11.5 (5.8)	10.2 (6.5)	NR
				3	5.7 (5.5)	8.9 (6.6)	<0.01
				12	5.8 (5.8)	7.2 (6.4)	<0.01

*Group by time interaction.

Abbreviations: BHS = Beck Hopelessness Scale; BL = baseline; NR = not reported; NSD = no significant difference; SD = standard deviation.

Appendix H Table 8. Suicide Deaths: Adolescents

Intervention category	Study	Age range (mean age)	Data source of death	Followup time (m)	Intervention group	Control group	P-value
Cognitive behavioral therapy	Greenfield 2002[156]	12-17 (14)	Coroner report	6	0/158 (0%)	0/128 (0%)	NA
Developmental group therapy	Green 2011[155,190]	12-17 (NR)	NR	6	0/180 (0%)	0/179 (0%)	NA
Other therapy, without direct therapeutic contact	King 2009[158]	13-17 (16)	NR	12	0/223 (0%)	1/225 (0.4%)	NR

Abbreviations: NA = not applicable; NR = not reported.

Appendix H Table 9. Suicide Attempts or Episodes of Deliberate Self-Harm: Adolescents

Intervention category	Study	Age range (mean age)	Outcome	Followup time (m)	Intervention group	Control group	Risk (95% CI)	P-value
Cognitive behavioral therapy	Donaldson 2005[153]	12-17 (15)	Participants with a suicide attempt per self- and parent-report	3	4/15 (27%)	1/16 (6%)	NR	NSD
				6†	4/15 (27%)	2/16 (12.5%)	NR	NSD
	Esposito-Smythers 2011[163,189]	13-17 (16)	Participants with a suicide attempt per self- or parent-report	18	1/19 (5%)	6/17 (35%)	NR	0.023
	Greenfield 2002[156]	12-17 (14)	Participants with suicide attempts per self-report	6	23/158 (14.6%)	14/128 (10.9%)	NR	NSD
Developmental group therapy	Green 2011[155,190]	12-17 (NR)	Participants with any DSH episodes per self-report, corroborated by family-report	6	145/181 (80.1%)	142/181 (78.4%)	NR	NR
				12*	104/179 (58.1%)	110/180 (61.1%)	NR	NR
	Hazell 2009[157]	12-16 (15)	Participants with DSH repetition per self- and clinician-report	6	22/34 (65%)	18/34 (53%)	NR	0.32
				12*	26/34 (76%)	19/34 (56%)	NR	0.07
	Wood 2001[160]	12-16 (14)	Participants with self-harm per self-report, corroborated by "other sources"	7	2/32 (6%)	10/31 (32%)	OR 6.3 (1.4, 28.7)	NR
Psychodynamic or interpersonal therapy	Chanen 2008[164]	15-18 (16)	Participants with parasuicidal behavior (suicide attempts and nonsuicidal self-injury) per self-report	6	15/35 (42%)	16/34 (47%)	NR	NSD§
				12	13/36 (36%)	7/34 (21%)	NR	NR
				24	11/35 (31%)	11/33 (33%)	NR	NSD
	Diamond 2010[108,191]	12-17 (15)	Participants with suicide attempts per self-report	6	4/35 (11%)	7/31 (22%)	NR	NR
Other therapy, with direct therapeutic contact	Eggert 2002[154,192-194]	14-19 (16)	Number of suicide attempts in last month per self-report	BL	0.18 (0.75)	0.24 (0.83)	NR	NR
				1	0.04	0.14	NR	NR
				2.5	0.10	0.11	NR	NR
				9	NR	NR	NR	NR
	Hooven 2012[161]	14-19 (16)	Number of suicide attempts in last month per self-report	1	NR	NR	NR	NSD
Other therapy, without direct therapeutic contact	King 2009[158]	13-17 (16)	Participants with suicide attempts per self-report	12	29/175 (16.6%)	35/174 (20.1%)	NR	NSD
Improving treatment adherence without direct person-to-person contact	Robinson 2012[162,195]	15-24 (19)	Participants with an episode of self-harm with the intent to die per self-report	BL†	23/81 (28.7%)	13/83 (8.5%)	NR	NR
				12‡	5/60 (15.7%)	3/52 (5.9%)	NR	0.906

*In previous 6 months.
†Lifetime.
‡In previous 12 months.
§Group by time interaction.

Abbreviations: BL = baseline; CI = confidence interval; DSH = deliberate self-harm; NR = not reported; NSD = no significant difference; OR = odds ratio.

Table 10. Other Health Outcomes: Hospitalization or Emergency Department Use, Adolescents

Intervention category	Study	Age range (mean age)	Outcome	Followup time (m)	Intervention group	Control group	P-value
Cognitive behavioral therapy	Esposito-Smythers 2011[163,189]	13-17 (16)	% of participants with an ED visit	18	16	59	0.007
			% of participants with a psychiatric hospitalization	18	16	53	0.18
	Greenfield 2002[156]	12-17 (14)	% of participants with hospitalization related to suicidality since baseline	2	17	40	<0.001
				6	18	43	<0.001
		12-17 (14)	% of participants with ED visit	6	9	9	NSD
Developmental group therapy	Green 2011[155,190]	12-17 (NR)	Inpatient psychiatric days, mean (SD)	12	11.6 (42.0)	9.0 (29.1)	NR
	Hazell 2009[157]	12-16 (15)	% of participants with ≥1 psychiatric hospital admission	6	18.4	21.1	NR
				12	29	30	NR
Other therapy, without direct therapeutic contact	King 2009[158]	13-17 (16)	% of participants with psychiatric hospitalization since the last followup period	1.5	14	15	NSD
				3	12	11	NSD
				3	9	10	NSD
				12	17	13	NSD

Abbreviations: NR = not reported; NSD = no significant difference; SD = standard deviation.

Appendix H Table 11. Other Health Outcomes: Functioning, Adolescents

Intervention category	Study	Age range (mean age)	Outcome	Followup time (m)	Intervention group, mean (SD)	Control group, mean (SD)	P-value
Cognitive behavioral therapy	Greenfield 2002[156]	12-17 (14)	CGAS	BL	39 (10.6)	40 (12.1)	NSD
				2	52 (NR)	54 (NR)	NSD
				6	54 (NR)	53 (NR)	NSD
Developmental group therapy	Green 2011[155,190]	12-17 (NR)	Global functioning (HoNOSCA)	BL	17.5 (5.7)	16.8 (5.8)	NR
				6	12.2 (6.3)	12.6 (6.1)	0.32
				12	10.9 (5.9)	11.7 (6.7)	0.19
	Hazell 2009[157]	12-16 (15)	Global functioning (HoNOSCA)	BL	16.5 (7.6)	15.4 (6.6)	NR
				2	16.8 (7.1)	15.0 (9.3)	NR
				6	13.4 (6.4)	14.8 (8.5)	NR
				12	13.8 (6.8)	15.4 (8.8)	0.06
	Wood 2001[160]	12-16 (14)	Global outcome included symptoms and functioning (HoNOSCA)	BL	18.0 (4.3)	18.6 (6.2)	NR
				7	9.6 (6.8)	11.7 (8.6)	NSD
Psychodynamic or interpersonal therapy	Chanen 2008[164]	15-18 (16)	SOFAS	BL	60.37 (8.4)	61.2 (10.5)	NSD*
				6	67.3 (9.8)	65.1 (11.4)	NR
				12	67.4 (11.6)	67.7 (11.7)	NR
				24	71.7 (11.6)	75.3 (12.2)	NSD
Other therapy, without direct therapeutic contact	King 2009[158]	13-17 (16)	CAFAS	BL	46.6 (21.7)	45.8 (21.2)	NR
				1.5	25.6 (NR)	29.7 (NR)	0.04
				3	23.6 (NR)	21.6 (NR)	0.26
				6	20.8 (NR)	19.8 (NR)	0.60
				12	16.7 (NR)	17.1 (NR)	0.77
Improving treatment adherence without direct person-to-person contact	Robinson 2012[162,195]	15-24 (19)	CGAS/GAF	BL	54.6 (10.6)	54.2 (10.8)	NR
				12	62.9 (13.9)	62.5 (11.6)	0.724

*Group by time interaction.

Abbreviations: BL = baseline; CAFAS = Child and Adolescent Functional Assessment Scale; CGAS = Children's Global Assessment Scale; GAF = Global Assessment of Functioning; HoNOSCA = Health of the Nation Outcome Scales for Children and Adolescents; NR = not reported; NSD = no significant difference; SD = standard deviation; SOFAS = Social and Occupational Functioning Assessment Scale.

Appendix H Table 12. Intermediate Outcomes: Suicidal Ideation, Adolescents

Intervention category	Study	Age range (mean age)	Outcome	Followup (m)	Intervention group	Control group	P-value
Cognitive behavioral therapy	Donaldson 2005[153]	12-17 (15)	SIQ, mean (SD)	BL	52.5 (48.6)	50.3	NSD*
				3	24.6 (24.0)	32.1 (19.4)	NSD
				6	27.1 (39.8)	32.2 (30.4)	NSD
	Esposito 2012[163,189]	13-17 (16)	SIQ	18	NR	NR	0.90*
	Greenfield 2002[156]	12-17 (14)	SSBS, mean (SD)‡	BL	2.5 (1.2)	2.7 (1.2)	NR
			SSBS, mean change from baseline (SD)‡	2	-1.3 (1.3)	-1.6 (1.3)	NSD
				6	-1.4 (1.3)	-1.5 (1.3)	NSD
Developmental group therapy	Green 2011[155, 190]	12-17 (NR)	SIQ, mean (SD)	BL	91.3 (42.8)	88.2 (45.5)	NSD
				6	61.5 (45.5)	59.9 (48.4)	0.99
				12	48.3 (42.7)	49.2 (46.8)	0.59
	Hazell 2009[157]	12-16 (15)	SIQ, mean (SD)	BL	85.3 (36.6)	85.9 (50.8)	NR
				2	74.1 (41.8)	76.4 (54.3)	NR
				6	68.9 (44.9)	69.4 (51.4)	NR
				12	59.8 (42.1)	61.7 (49.6)	0.8
	Wood 2001[160]	12-16 (14)	SIQ, mean (SD)	BL	89.1 (44.4)	83.9 (51.1)	NR
				7	41.3 (39.6)	46.0 (48.9)	NSD
Psychodynamic or interpersonal therapy	Diamond 2010[108,191]	12-17 (15)	SIQ-JR, mean (SD)	BL	52.1 (13.9)	49.9 (14.2)	NR
				1.5	15.0 (22.0)	22.2 (19.4)	NR
				3	5.2 (10.2)	16.2 (16.6)	0.001†
				6	10.4 (13.6)	23.0 (19.2)	NSD†
	Tang 2009[159]	12-18 (15)	BSI, mean (SD)	BL	17.8 (6.9)	16.8 (4.6)	NR
				1.5	9.0 (10.8)	16.3 (8.0)	<0.01
Other therapy, with direct therapeutic contact	Eggert 2002[154, 192-194]	14-19 (16)	HSQ (2 items), mean (SD)	BL	1.6 (NR)	1.5 (NR)	<0.05*
				1	0.7 (NR)	1.0 (NR)	
				2.5	0.6 (NR)	1.0 (NR)	
				9	0.6 (NR)	0.9 (NR)	
	Hooven 2012[161]	14-19 (16)	HSQ, rate of change coefficients	1	IG1: -1.131 IG2: -1.033 IG3: -1.451	-0.917	IG1: NSD IG2: NSD IG3: <0.001
				9	NR	NR	IG1: NSD IG2: NSD IG3: <0.005
Other therapy, without direct therapeutic contact	King 2009[158]	13-17 (16)	SIQ-JR, mean (SD)	BL	46.6 (21.7)	45.8 (21.2)	NR
				1.5	25.6 (NR)	29.7 (NR)	0.04
				3	23.6 (NR)	21.6 (NR)	0.26
				6	20.8 (NR)	19.8 (NR)	0.6
				12	16.7 (NR)	17.1 (NR)	0.77
Improving treatment adherence without direct person-to-person contact	Robinson 2012[162,195]	15-24 (19)	% of participants with serious suicidal ideation in past	BL§	74.1	62.7	NR
				12‖	23.3	23.5	0.591

*Group by time interaction.
†Over last 3 months.
‡Scale reflects suicidal ideation and behavior.
§Lifetime.
‖In previous 12 months.

Abbreviations: BL = baseline; BSI = Beck Suicide Ideation Scale; HSQ = High School Questionnaire; NR = not reported; NSD = no significant difference; SBQ = Suicide Behavior Questionnaire; SD = standard deviation; SIQ = Suicide Ideation Questionnaire; SIQ-JR = Suicide Ideation Questionnaire-Junior; SSBS = Spectrum for Suicide Behavior Scale.

Appendix H Table 13. Intermediate Outcomes: Depression, Adolescents

Intervention category	Study	Age range (mean age)	Outcome	Followup time (m)	Intervention group, mean (SD)	Control group, mean (SD)	P-value
Cognitive behavioral therapy	Donaldson 2005[153]	12-17 (15)	CES-D	BL	25.8 (20.5)	24.6 (14.3)	NSD*
				3	12.2 (14.1)	14.4 (12.1)	
				6	10.9 (15.2)	16.8 (15.1)	
Developmental group therapy	Green 2011[155, 190]	12-17 (NR)	MFQ	BL	41.0 (12.7)	38.6 (13.7)	NR
				6	28.5 (16.1)	27.6 (16.5)	0.78
				12	24.4 (16.6)	24.6 (17.6)	0.41
	Hazell 2009[157]	12-16 (15)	MFQ	BL	35.2 (13.7)	37.0 (17.5)	NR
				2	30.9 (17.2)	32.3 (19.9)	NR
				6	31.6 (17.4)	34.0 (17.5)	NR
				12	37.4 (17.2)	31.8 (18.9)	0.6
	Wood 2001[160]	12-16 (14)	MFQ	BL	40.6 (10.6)	39.8 (14.2)	NSD
				7	21.9 (15.6)	23.4 (18.0)	NSD
Psychodynamic or interpersonal therapy	Diamond 2010[108,191]	12-17 (15)	BDI-II	BL	33.0 (9.7)	33.0 (9.2)	NR
				1.5	16.6 (15.1)	24.5 (14.8)	0.09
				3	12.6 (13.1)	18.5 (15.2)	0.09†
				6	12.4 (12.9)	16.2 (15.0)	0.57†
	Tang 2009[159]	12-18 (15)	BDI-II (Chinese version)	BL	32.7 (10.1)	32.3 (8.7)	NR
				1.5	20.0 (14.7)	31.6 (1.0)	<0.001
Other therapy, with direct therapeutic contact	Eggert 2002[154, 192-194]	14-19 (16)	HSQ	BL	2.7 (NR)	2.7 (NR)	<0.001*
				1	2.1 (NR)	2.1 (NR)	
				2.5	2.0 (NR)	2.2 (NR)	
				9	1.8 (NR)	2.2 (NR)	
	Hooven 2012[161]	14-19 (16)	HSQ, rate of change coefficients	1	IG1: -0.951 IG2: -0.815 IG3: -1.021	-0.685	IG1: <0.01 IG2: NS IG3: <0.01
				15	NR	NR	NSD
Other therapy, without direct therapeutic contact	King 2009[158]	13-17 (16)	CDRS-R	BL	60.8 (13.8)	61.0 (12.6)	NR
				1.5	39.7 (NR)	40.8 (NR)	0.4
				3	38.3 (NR)	38.6 (NR)	0.84
				6	34.8 (NR)	34.0 (NR)	0.55
				12	33.2 (NR)	34.0 (NR)	0.52
Improving treatment adherence without direct person-to-person contract	Robinson 2012[162,195]	15-24 (19)	CES-D	BL	28.7 (14.0)	30.9 (13.5)	NR
				12	18.7 (12.9)	18.9 (12.2)	0.917

*Group by time interaction.
†Over last 3 months.

Abbreviations: BDI-II = Beck Depression Inventory II; BL = baseline; CDRS-R = Children's Depression Rating Scale-Revised; CES-D = Center for Epidemiologist Studies Depression Scale; HSQ = High School Questionnaire; MFQ = Mood and Feelings Questionnaire; NR = not reported; NSD = no significant difference; SD = standard deviation.

Appendix H Table 14. Intermediate Outcomes: Hopelessness, Adolescents

Intervention category	Study	Age range (mean age)	Outcome	Followup time (m)	Intervention group, mean (SD)	Control group, mean (SD)	P-value
Other therapy, with direct therapeutic contact	Eggert 2002[154, 192-194]	14-19 (16)	HSQ	BL	3.1 (NR)	2.8 (NR)	<0.01*
				1	2.4 (NR)	2.4 (NR)	
				2.5	2.3 (NR)	2.6 (NR)	
				9	2.0 (NR)	2.2 (NR)	
	Hooven 2012[161]	14-19 (16)	HSQ, rate of change coefficients	1	IG1: -0.819 IG2: -0.666 IG3: -0.968	-0.663	IG1: NS IG2: NS IG3: <0.01
				15	NR	NR	NSD
Other therapy, without direct therapeutic contact	King 2009[158]	13-17 (16)	BHS	BL	9.1 (5.7)	8.5 (5.9)	NR
				1.5	6.8 (NR)	7.8 (NR)	0.3
				3	6.7 (NR)	6.5 (NR)	0.99
				6	5.1 (NR)	5.4 (NR)	0.62
				12	4.4 (NR)	5.1 (NR)	0.14
Improving treatment adherence without direct person-to-person contact	Robinson 2012[162,195]	15-24 (19)	BHS	BL	8.6 (5.8)	8.4 (5.6)	NR
				12	6.4 (5.8)	5.5 (44)	0.539

*Group by time interaction.

Abbreviations: BHS = Beck Hopelessness Scale; BL = baseline; HSQ = High School Questionnaire; NR = not reported; SD = standard deviation.

Appendix I. Ongoing Studies and Trials Pending Assessment

Study	Design	Aim	Location	Number of subjects	Intervention description	Relevant outcomes	2012 status
Asarnow 2005[239]	RCT	Evaluate effectiveness of an individually-tailored suicide prevention treatment program	United States	NR	Family-based cognitive behavioral therapy (SAFETY)	Hospitalization, repeat suicide attempts	Unknown, last verified March 2009
de Klerk 2011[240]	RCT	Evaluate costs and effects of two components of a suicide treatment package	The Netherlands	NR	Cognitive behavioral therapy or mindfulness-based cognitive therapy	Suicidal ideation, depression	Recruiting participants, estimated completion date: October 2012
Goldston 2010[241]	RCT	Pilot test of an augmenting cognitive behavior relapse prevention intervention for suicidal, depression, and alcohol/substance abusing adolescents	United States	NR	Cognitive behavioral therapy	Suicidal ideation, suicidal behavior, depression	Ongoing, no further details provided
Hatcher 2011 (ACCESS study)[242]	RCT	Evaluate effectiveness of a treatment package in patients with DSH	New Zealand	NR	Six element care package (postcards, patient support, improved access, problem-solving therapy, cultural assessment, and a risk management strategy)	Self-harm, hopelessness, depression, quality of life, social function, hospital use	Protocol only
Hatcher 2011 (Te Ira Tangata study)[243]	RCT	Evaluate effectiveness of a treatment package in Maori with DSH	New Zealand	NR	Six element care package (postcards, patient support, improved access, problem-solving therapy, cultural assessment, and a risk management strategy)	Self-harm, hopelessness, depression, quality of life, social function, hospital use	Protocol only
Husain 2011[244]	RCT	Evaluate effectiveness of a culturally appropriate psychological treatment for adult British South Asian women with DSH	United Kingdom	NR, at least 10 per group	Culturally Adapted Manualized Problem Solving Training (C-MAPS)	Suicidal ideation, hopelessness, depression, quality of life, time to repetition of self-harm	Protocol only
Mehlum 2010[245]	RCT	Evaluate the efficiency of dialectical behavior therapy in treatment of adolescents with DSH	Norway	NR	Dialectical behavior therapy	Self-harm, suicidal ideation, hospitalizations	Recruiting participants, estimated completion date: December 2012
Pearson 2011[246]	Cluster RCT	Evaluate effectiveness of safe storage boxes to reduce the burden of pesticide poisoning	Sri Lanka	200,000	Safe storage device	Incidence of pesticide self-poisoning	Methods paper only

Appendix I. Ongoing Studies and Trials Pending Assessment

Study	Design	Aim	Location	Number of subjects	Intervention description	Relevant outcomes	2012 status
van Beek 2009[247]	RCT	Evaluate effectiveness of future oriented group training in patients with suicidal ideation	The Netherlands	75	future oriented group training (cognitive behavioral approach) versus treatment as usual	Suicidal ideation	Methods paper only
van Spijker 2010[248]	RCT	Determine effectiveness of a recently developed Web-based self-help intervention in patients with suicidal thoughts	The Netherlands	260	Cognitive behavioral therapy (Web-based self-help intervention) versus waitlist control	Suicidal ideation, depressive symptoms, hopelessness, quality of life, costs related to health care use	Methods paper only
Wasserman 2010 (Saving and Empowering Young Lives in Europe [SEYLE] study)[249]	RCT	Evaluate three suicide prevention interventions	11 European countries (Austria, Estonia, France, Germany, Hungary, Ireland, Israel, Italy, Romania, Slovenia, and Spain)	11,000	Gatekeeper training, awareness training, and professional screening	Suicidal ideation and behavior, deliberate self-harm behavior, depression, quality of life,	Methods paper only

Abbreivations: DSH = deliberate self-harm; RCT = randomized controlled trial.