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Suicide Risk Assessment and Intervention in Clinical Psychiatric Populations

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ABSTRACT

Suicide is a leading cause of death around the world. Although relatively uncommon in the general population, suicide rates in clinical psychiatric populations are much higher. Clinicians are frequently tasked with assessing and managing suicide risk. Risk assessment is challenging for a variety of reasons, not least because conventional risk assessment approaches rely on patient self-report and some suicidal patients may wish to conceal their plans. Accurate methods to predict suicide therefore remain elusive and an active area of investigation. Novel approaches to risk assessment have shown promise, including empirically derived tools and implicit association tests. Service provision for suicidal patients is often substandard, particularly at times of highest need such as the time after discharge from hospital or the emergency department. A number of medication and psychotherapy-based treatments exist, however it remains unclear what are the best approaches to reduce suicide risk. Some of the most compelling evidence supports long established treatments such as lithium and cognitive behavioral therapy. Emerging options include ketamine and internet-based psychotherapies. This review will summarize the current science in suicide risk assessment and will provide an overview of interventions shown to diminish suicide, focusing on the clinical management of people with mental disorders.

Key Words: Suicide, self-harm, risk assessment, intervention, pharmacotherapy, psychotherapy

Introduction

Suicide is a major international public health issue, claiming one life every 40 seconds.[1] It is the second leading cause of death of people aged 15-29 and was responsible for 39 million disability-adjusted life years in 2012.[1] There are at least 6 close relatives or friends bereaved by every suicide, who in turn suffer from increased risk of depression and suicide.[2-4] For each suicide death there are 30 individuals who attempt suicide; in the United States, this amounts to 1 million people each year.[5] The economic cost of suicide and self-harm is considerable. Direct and indirect costs of a single suicide are estimated at $850,000 in Canada,[6] and when combined with the costs of non-fatal self-harm the annual estimate is $41 billion in the United States.[7] Developing improved understanding of who is at risk for suicide, and interventions that reduce suicide in key high-risk groups, are priority targets of national research agendas and government suicide prevention strategies.[8]

There are several notable reviews that have examined suicide prevention, epidemiology, and risk factors.[9-12] This review will complement these by examining two facets of the clinical care of suicidal individuals: the assessment of suicide risk and interventions that may diminish that risk. This review focuses on clinical psychiatric populations, and therefore does not address broader public health strategies to prevent suicide. It will begin by describing the epidemiology of suicide and suicidal behavior in clinical populations, highlighting specific patient subgroups that are at higher risk. Risk assessment approaches will be discussed in detail, with a review of specific assessment tools and how the science of risk assessment is evolving. Interventions with evidence to reduce suicidal behavior or prevent suicide will be reviewed and include pharmacotherapy, psychotherapy, and follow-up care. Given the prominence of suicide as a substantial health problem and the demands on clinicians to manage this challenging issue, this review is important to provide an overview of evidence-based assessment and treatment approaches to help guide clinical work with this at-risk population.

Epidemiology

Suicide is currently the 15th leading cause of death across the world. In 2012 804,000 people died by suicide, accounting for 1.4% of deaths worldwide and an average population rate of 11.4 per 100,000.[13] In high income countries suicide rates are around three times higher in males than females and key risk factors include previous self-harm, depression, alcohol misuse, physical illness, low socioeconomic position and relationship breakdown. [10,11]

Clinical psychiatric populations have a substantially elevated risk of suicide and self-harm.[14,15] In a 40 year observational follow-up study of the Danish population, the cumulative risk of suicide amongst people who had clinical contact with specialized mental health services was 4% in men and 2% in women.[16] The rate varied across disorders and was elevated in people with comorbidity and histories of self-harm. This risk varies across different clinical realms, with psychiatric inpatients showing the highest risk of suicide within the following year.[14] The risk of suicide appears to be greatest within the immediate few months after first diagnosis, across all mental disorders.[17-19] Suicide risk is also influenced by treatment factors, which will be described later in the review.

Inpatients and Recent Discharge

Although admission to hospital is often an intervention to ensure a safe environment for the suicidal patient, the risk of suicide while an inpatient is alarmingly high. The rate of suicide has been reported at 5 per 1000 occupied beds.[20] A meta-analysis of 27 studies reported a rate of 147 suicides per 100,000 inpatient years, with individual studies reporting as high as 860/100,000.[21] Suicides among inpatients tend to happen early during the course of an admission, with 40% occurring within the first 3 days.[22] A suicide attempt preceding the admission significantly increases the risk of suicide.

The risk of suicide is high in the first week after discharge from psychiatric hospitalization, remains high for the first few months after discharge, and then slowly decreases.[23,24] In a UK national study of psychiatric patient suicides, one-quarter had occurred within 3 months of discharge.[25] Of patients who die by suicide within 3 months of discharge, almost half die within the first month, often before their first follow-up contact.[26] The risk of suicide is especially high for psychiatric patients who were admitted to hospital with a suicide attempt. In a Swedish observational study, roughly 1 in 5 men with schizophrenia or bipolar disorder will die by suicide within 1 year of the admission for suicide attempt.[27]

The Emergency Department

The emergency department (ED) is a frequent point of contact between suicidal individuals and treatment providers. Rates of future suicide among people presenting to the ED with self-harm are high: 2% of these people will kill themselves within 1 year, and the 5-year estimate of suicide is 4%.[28] This risk is almost 50 times greater than that in the general population and is associated with a 40 year reduction in life expectancy.[29-30] Rates of repeat self-harm after ED contact are 10% at 1 month and as high as 27% in 6 months.[31-32]

Higher suicide risk shortly after clinical contact

Recent discussions have cited the need to improve the prediction of suicide in much shorter time intervals (hours, days, and weeks).[33,34] This is especially important in the ED and other acute care settings. This line of reasoning corresponds with current dialogue on targeting prevention efforts in high-risk periods, in particular following clinical contact [35]. This places the clinician in a challenging position, since their patient is arguably most vulnerable in the phase after the interaction has ended. Future research is required to develop methods of more accurately assessing suicide risk using a lens of hours to days; this will allow informed delivery of treatment services to those at highest risk.[35]

Suicide Risk Assessment

The concept of suicide risk assessment is controversial and an area of considerable debate in suicide research. National guidelines provide recommendations for risk assessment, yet there is no widely accepted standard of care. What constitutes a risk assessment is also an important question. While risk assessment at times becomes synonymous with risk assessment tools or scales, at its most basic it represents a clinical encounter where a patient is asked about suicidal thoughts and plans. The ED and other specialty mental health settings represent locations where risk assessments are frequently conducted, however many occur in primary care offices. 30% of American adults who die by suicide have seen their primary care provider in the month prior to suicide.[36] Frameworks for suicide assessment approaches are generally consistent, suggesting collection of information on previous suicidal behavior, current suicidal thoughts and plans, hopelessness, stressors, the presence of mental disorder symptoms, themes of impulsivity and self-control, ready access to high-lethality methods (e.g. firearms), and protective factors.[37-39] The need for a collaborative, therapeutic alliance between clinician and patient when conducting the assessment is important.[40] Even a single mental health assessment in the ED setting has been associated with a diminished risk of repeat suicidal behavior that may be as high as 40% in the short-term.[41] The Collaborative Assessment and Management of Suicidality (CAMS) is one such approach that emphasizes the therapeutic relationship and has been shown to enhance treatment retention and reduce suicidal ideation initially and at 1-year follow-up.[42] CAMS involves a range of 4-12 sessions where the clinician and patient collaboratively engage in structured assessment of the patient's suicidal thoughts, as well as treatment planning.

Asking about Suicide: Does this make a patient more likely to act on it?

Both patients and general practitioners feel that depressed patients should be asked about suicidal thoughts, yet less than half of GPs receive formal training in suicide assessment.[43] A further barrier to

assessment is the belief held by some clinicians that asking about suicidal thoughts will induce them in the patient. A recent review examined all 13 papers that addressed this issue and found that none of them reported a significant increase in suicidal ideation among patients that were asked about suicide.[44] Of note, one RCT showed that asking about suicide did not increase distress or suicidal thoughts, both in a general group of students as well those with depression or previous self-harm.[45]

Challenges in risk assessment

There are considerable difficulties in obtaining an accurate suicide risk assessment. A fundamental challenge is determining which of the people determined to be "high risk" will later die by suicide [i.e. "true positives", or positive predictive value (PPV)]. The PPV of an event with a low-base rate in the population such as suicide is likely to be low, even when sensitivity and specificity values are high.[46]. As such, many individuals will be inappropriately labeled "high risk" by a risk tool and provided with resources that they may not have required (i.e. inpatient admission). Another challenge is the historical reliance on subjectively reported information as this can be misleading in the assessment of suicidal persons. One study revealed that almost 80% of people that eventually died by suicide denied suicidal thoughts in their last verbal communication.[47] This has prompted the search for alternate measures of assessment, including computer-based implicit association tests that are more sensitive than both patient self-report and clinician opinion.[48]

Guidelines for Risk Assessment

Several organizations have published clinical practice guidelines for suicide assessment and prevention. These include both national guidelines from various countries as well as practice guidelines from specific organizations. A selected list of guidelines available online is presented in Table 1. A recent review noted that while some components are similar across most guidelines, there are notable inconsistencies including how to stratify risk, recommendations for outpatient management and means

restriction, and guidelines for training.[49] Consistent aspects of suicide prevention guidelines stress the importance of assessing risk and protective factors, clarifying the degree of suicidal intent, and recommendations regarding interventions.

Shifts in the Science of Risk Assessment Scales

Historically, suicide risk scales have not been developed using empirical evidence. Numerous scales and tools have been created over the last several decades, but unfortunately very little statistical testing has accompanied their development.[50] In fact, several scales have never been tested on their predictive ability for suicidal behavior. This was reflected in a recent systematic review of risk assessment tools in the ED; only 12 studies qualified for inclusion.[51] This limitation has been addressed with current research that has shifted to statistical derivation and evaluation of risk assessment tools. Another important shift in the science underlying risk assessment scales has been the move from interview-dependent tools to interview-independent tools. Risk scales that have been evaluated in their ability to predict suicide with published psychometrics (specifically sensitivity, specificity, positive predictive values, negative predictive values) are presented in Table 2.

1. *Conventional risk assessment scales*

A conventional approach to the development of suicide risk assessment scales has been to collate likely risk factors for suicide based on concepts of face validity or content validity. The most commonly studied risk scales include the Beck Hopelessness Scale (BHS), the Beck Depression Inventory (BDI), the Beck Scale for Suicide Ideation (BSS), the Suicide Intent Scale (SIS), and the SAD PERSONS scale. The BHS has been studied in both psychiatric inpatients and outpatients, and these studies examined its ability to predict suicide over long follow-up periods (5-20 years).[52-55] While scale scores differentiated those who died by suicide from those who did not, and therefore reported the BHS to be a successful prediction tool in some studies, specificity has been poor and the PPV reported in one

American study was 1%.[55] The BDI and BSS in that study performed in similar fashion, with PPVs of 2% and 3%, respectively, for predicting future suicide. A subsequent meta-analysis of BHS studies included 10 studies, 4 of which examined suicide and 6 non-fatal self-harm.[56] The results for suicide and self-harm were similar: the BHS has fair sensitivity (78-80%) but poor specificity (42%). A review of the SIS revealed that it has been examined in 158 studies.[57] Of these, 13 examined its ability to predict later suicide and 17 studied its predictive capabilities for future self-harm. Regarding suicide prediction, the majority of studies reported nonsignificant associations between scale scores and later suicide, and only 2 reported predictive statistics. PPV values were low in one study (4%) but higher in the other study when examining individuals over 55 (23%).[58,59] In a subsequent Swedish study that examined the predictive ability of the SIS for future suicide over 10-15 years among outpatients with a history of suicide attempts, specificity was poor at 52% and the PPV was 17%.[60] Together, these studies illustrate the tendency for scales to have low prediction accuracy.

The SAD PERSONS scale is a mnemonic of 10 items where each letter corresponds to a potential risk factor for suicide.[61] It remains one of the most widely used tools for suicide assessment despite never being formally tested during its development. In a representative sample of hospitals in England, the SAD PERSONS was the most commonly used scale.[62] A recent systematic review revealed that only 3 studies have examined its ability to predict suicide outcomes, and none of these found it to be predictive.[63] The PPV of the scale to predict repeat self-harm among ED patients at 6-months was 5%, and sensitivity for suicide at 1 year follow-up was 23%.[64-65].

Other risk assessment scales that have been examined in the prediction of suicide include the Suicide Assessment Scale (SUAS) [66] and the Karolinska Interpersonal Violence Scale (KIVS).[67] The 20-item SUAS assesses a range of emotions, personal characteristics, and suicidal thoughts and behaviors. In the one study using it to predict suicide over 1 year, it demonstrated fair sensitivity (75%) and good

specificity (86%), but a PPV of 19%.[68] The KIVS features two subscales assessing exposure and expression of violence in childhood and adulthood. Its application as a risk assessment tool is based on observations that people attempting suicide often have higher levels of aggression and impulsivity. When administered to people who had attempted suicide, both subscales predicted suicide within 4 years with good sensitivity but poor specificity, with low PPV (range 7-14%).[67]

Newer suicide risk scales based on conventional approaches include the Columbia-Suicide Severity Rating Scale (C-SSRS), the Suicide Trigger Scale (STS), the Suicide Probability Scale (SPS), and others. The C-SSRS measures 4 domains of suicidal thoughts and behavior including the severity of ideation, intensity of ideation, type of suicidal behavior, and lethality of suicide attempts. [69] Two subsequent studies have shown that it predicts future suicidal behavior with limited sensitivity and fair specificity (67% and 76%, respectively).[70-71] In this mixed sample of 3776 individuals (some with major depression and PTSD and others with epilepsy and fibromyalgia), 201 (5.3%) reported suicidal behavior during the follow-up period. The likelihood of a positive baseline test predicting future suicidal behavior showed a PPV of 14% and NPV of 98%, during a mean follow-up period of 9 weeks. The STS scale is based on 5 areas linked to suicide: suicidality, mood symptoms, trauma, impulsivity, and attachment style. In study of psychiatric inpatients that compared the STS with the C-SSRS and BSS, only the STS was predictive of future suicide attempts within 6 months.[72] This study is one example of a limited number of studies directly comparing performance of risk assessment scales.

2. *Empirically-derived tools*

Several newer studies have used the more robust methodology of empirically deriving a prediction tool using a development dataset and then testing it in a separate validation dataset. The Manchester Self-Harm Rule is an example.[73] This tool was the end result of statistical selection from a list of 50 candidate variables assessed in almost 10,000 people presenting to the ED with self-harm. The

assessment of 4 clinical variables (with endorsement of 1 or more being classified as moderate/high risk) yielded excellent sensitivity (97%) for self-harm or suicide within 6 months. The rate of repeat self-harm (including suicide) in this population was 17%. The 4 items, which have the advantage of being interview-independent, include 1. History of self-harm, 2. Prior psychiatric treatment, 3. Presentation is a benzodiazepine overdose, 4. Current psychiatric treatment. Specificity was low 26%, as was the PPV at 22%. The Manchester Self-Harm Rule was also tested in a Swedish population and predicted repeat self-harm with similar psychometric scores.[74] A subsequent study from the same UK study group and data set yielded a slightly different predictive model named the ReACT Self-Harm Rule.[32] It was based on a larger number of presentations (almost 30,000), using the same list of candidate variables and using a derivation and validation dataset. Statistical-based selection of predictor variables identified 4: 1. Recent self-harm, 2. Alone or homeless, 3. Cutting as a method of self-harm, 4. Treatment for a current psychiatric disorder. High risk classification (based on presence of 1 or more of the above-four variables) predicted suicide within 6 months with good sensitivity (88%) and excellent NPV (almost 100%), but poor specificity (24%) and PPV (0.5%).

A statistically-derived tool was also developed in Australia using administrative databases.[75] The authors examined risk of repeat self-harm (including suicide) within 6 months among all people admitted to hospital with a baseline self-harm episode in two states. As opposed to the UK studies that involved ED presentations, this study was solely focused on self-harm incidents that involved admission to hospital. Using separate development and validation samples, a tool measuring 4 variables (number of prior self-harm episodes, time between episodes, past-year mental disorder diagnosis, past-year psychiatric admission) showed fair prediction. The tool possessed lower sensitivity than the UK tools but at higher scores (>16) it showed excellent specificity (98%) and good PPV (82%).

A statistically-derived tool also examining the prediction of future suicide attempt in the emergency setting was developed in a Canadian sample.[76] It used a baseline sample of all ED presentations at 2 hospitals over 4 years that received a psychiatric consultation, including both self-harm and non-self-harm presentations. The tool was developed based on the outcome of suicide attempts within 6 months. Of 16 candidate variables, only 2 significantly accounted for variance in future suicide attempt: suicidal ideation at presentation, and history of psychiatric care or suicide attempts. The presence of at least one of these variables showed excellent sensitivity (91%) and NPV (99%) but poor specificity (24%) and PPV (3%) for future attempts. An important consideration when interpreting the results of assessment tools completed in clinical situations is that the psychometric performance of the tools likely vary with availability and effectiveness of local mental health services and the response of clinicians to the assessment results.

3. Novel methods of risk assessment

Advances in suicide risk assessment include forays into the use of implicit thoughts and neurocognitive functioning. Implicit thoughts of suicide represent an appealing substrate for risk modeling as they overcome the inherent challenge of patients denying (or even being unaware of) their true suicide intent. The implicit association test (IAT) is an established psychological test that measures a person's unconscious beliefs on a subject, or motivations toward a specific behavior. A computer displays an image (in this case relative to suicidal behavior) or a neutral image, and the subject presses a key to indicate whether or not they view the image as related to self. The reaction time in this task provides the measure of their propensity to suicidal behavior. In a cohort of 157 patients in a psychiatric ED, Nock and colleagues [48] demonstrated that a specific death/life IAT test predicted future suicidal behavior within 6 months, independently of the person's voiced intention and the clinician's belief of future suicidal behavior. This finding was replicated in Canadian ED sample of 107 patients, which showed that the death/life IAT independently predicted suicidal behavior within 3 months.[77] Of note, the

accuracy of the IAT was improved when used with other variables (previous self-harm, education level, depression with psychosis, and non-poisoning self-harm).

Several neurocognitive tests have been examined in their ability to detect suicidal behavior. A recent meta-analysis revealed that only 3 significantly correlate with a history of suicidal behavior: the Stroop test, verbal fluency test, and Iowa Gambling Task.[78] Conceptually, these results match nicely with observations that suicidal individuals tend to fixate on suicidal thoughts (deficits in attentional shifting), they have difficulty communicating a need for help (deficits in verbal fluency), and they are prone to impulsive and risky behavior (poor decision-making). Of note, almost all studies in this area have tested subjects in cross-section, therefore at this point the predictive accuracy for future suicidal behavior is unknown. The one exception is a prospective US study that administered the Stroop test to 124 subjects in a psychiatric ED.[79] Attentional bias towards suicidal themes independently predicted suicide attempts within 6 months, even after controlling for a variety of factors including history of suicidal behavior, severity of suicidal ideation, and both the clinician and patient prediction of suicidal behavior.

Is suicide risk assessment worthwhile?

The WHO has recommended that all individuals over the age of 10 with mental disorder or other risk factors be asked about thoughts or plans of self-harm within the last month.[80] The use of scales or tools is more controversial. The NICE guidelines encourage both risk assessment and needs assessment of patients but oppose the use of risk assessment tools to determine patient disposition and treatment.[81] Similarly, a review for the United States Preventative Services Task Force found insufficient evidence to support screening tools in primary care.[82] Opponents of tools argue that the low precision of assessment tools renders them useless. They are consistent in their low specificity and PPV,[83] which limits their predictive utility and can result in the inappropriate allocation of sparse resources. Furthermore, one of the most consistent predictive variables for future self-harm is a history

of prior self-harm, identifying a subgroup that may already be in treatment. Predicting incident self-harm is a high clinical priority but extremely challenging given low prevalence rates. Optimizing NPV in risk assessment may be a worthwhile approach, as successfully identifying true negatives could help preserve health resources. One observational UK study found that the process of assessment itself correlated with a lower likelihood of future suicidal behavior.[84] This speaks to an often overlooked aspect in risk assessment: that the doctor-patient contact can provide an important therapeutic effect. Education of trainees in the assessment of suicidal risk is needed yet difficult to achieve when assessment practices are highly variable. Determining a consistent standard of care across and within regions is imperative, and in an effort to achieve this the National Action Alliance for Suicide Prevention recently published training guidelines for clinicians.[85]

Interventions to Reduce Suicide in Clinical Psychiatric Populations

Mental health care can reduce suicide rates.[86] Unfortunately, the majority of suicidal people receive no treatment.[87] Studies from England and the United States show that only 60% of people presenting with self-harm receive such an assessment in the ED.[88-89] This section will highlight specific areas of clinical interventions for suicide. While not a single comprehensive review, it will complement other reviews that have examined interventions to prevent suicidal behavior.[90-93].

Pharmacotherapy

Evidence supports specific psychotropic medications as agents that reduce the risk of suicide.[94] However, it is important to recognize that research in this area has not rigorously pursued RCTs that aim to prevent suicide death associated with psychiatric illness. Psychological autopsy studies in high income countries suggest over 90% of suicide decedents have a mental disorder at the time of their death,[95] implicating mental illness as an important and potentially modifiable risk factor. This

provides foundation for pharmacological treatment of mental disorders as an important approach to preventing suicide.

Antidepressants

Treatment of major depression is a recognized approach that reduces suicide.[10] Antidepressant medications have been shown in several studies to reduce suicidal thoughts, behavior and prevent suicide.[96] Studies have demonstrated that when compared to people taking an antidepressant, the risk of suicide attempt is higher in the month prior to starting an antidepressant and likewise after discontinuation.[97-98] When interpreting these findings, it is also important to consider regression to the mean as an explanatory mechanism, as the natural history of depression may result in its improvement (and consequent decrease in suicidal behavior) irrespective of the effects of treatment. A challenge with using psychotropic medications is that self-poisoning is a common method of suicide and the agents used to self-harm are often the same drugs prescribed with therapeutic intent. Antidepressant medications are involved in 20% of self-poisoning suicides in the UK.[99] Among antidepressants, tricyclic antidepressants (TCAs) have the greatest lethality. This differential risk was evidenced in a UK study showing that TCAs have a twenty times greater case-fatality in overdose than do SSRIs.[100] Venlafaxine possesses an intermediary risk in overdose, and among SSRIs the risk of poisoning death appears greatest with citalopram. The clinician can attempt to mitigate this risk by choosing less toxic agents when treating patients potentially at higher risk (those with recurrent self-poisonings), and by prescribing limited supplies of the medicine on a single prescription at least in the early stages of treatment when risk is greatest.

The issue becomes even more complex when considering the major controversy over the last 12 years regarding the FDA-imposed black-box warnings regarding suicidal behavior in antidepressants. The controversy persists today, with opponents highlighting reduced rates of antidepressant use, a reluctance

of physicians in the US to diagnose depression, and increased youth suicides in those same regions.[101-102] Some studies have demonstrated that antidepressant medication treatment does not increase suicidal behavior in youth [103] whereas others have shown the opposite.[104] These studies are consistent in that older adults who take antidepressants have a reduced risk of suicidal behavior. Active monitoring of suicidal thoughts in people taking antidepressants, particularly among young patients, and frequent follow-up in the short term are sound clinical decisions that may help to mitigate the risk of suicide during early phases of treatment.

Other psychotropic medications

Strong evidence exists for the antisuicidal properties of lithium.[96] Meta-analyses of RCTs in both unipolar and bipolar disorders show that lithium significantly reduces suicide when compared to placebo.[105-106] Interestingly, observational studies of naturally-occurring lithium in drinking water show an inverse relationship with suicide; regions with higher concentrations (albeit subtherapeutic) have lower rates of suicide.[107-109] In a Danish observational study, outpatients who continued to fill prescriptions for lithium had a lower risk of suicide than do those who filled only one script.[110] Taken together, this consistent line of evidence underscores lithium as an important intervention against suicide in patients with mood disorders.

Evidence also supports other mood stabilizers as reducing suicide risk, although most data comes from observational studies.[111] As a class, antiepileptic drugs reduce suicide attempts among patients with bipolar disorder.[112] This protective effect is not only observed when compared to bipolar patients not on antiepileptic drugs, but also when compared to patient's own history prior to starting the drug. As with lithium, continuous use of antiepileptic medications correlates with lower suicide rates when contrasted to patients who only fill a single prescription.[113] A large US cohort study, however, found that risk of suicide was lower with lithium treatment when compared to divlaproex.[114]

Clozapine has an approved indication for the reduction of suicidal behavior in patients with schizophrenia,[115] but tends to be reserved as a late option in the treatment algorithm.[116] A meta-analysis demonstrated that compared to other antipsychotic medications, clozapine has a three-fold reduction in suicide.[117]

Emerging Treatments: Ketamine

Early evidence suggests ketamine may be an effective intervention for suicidal individuals.[118] Ketamine appears to possess unique antidepressant effects that are rapid in onset (hours) with consequent neurogenesis mediated through the NMDA neurotransmitter system.[119] In similar fashion it reduces suicidal thoughts within hours, largely but not entirely related to reductions in depressive symptoms.[120] These reductions in suicidal thoughts are expressed subjectively by the patient but also observed unconsciously through IAT testing.[121] Interestingly, the anti-suicidal effect from a single dose of ketamine can be sustained for several days.[122] Despite these compelling findings, the data on ketamine in suicide is limited at this point and there have not been studies examining its effect on suicidal behavior and suicide. As research progresses it will hopefully address important questions regarding optimal dosing, frequency of administration, safety, and long-term effects. Until then, ketamine remains investigational (and unapproved for this indication) but is nevertheless an exciting potential option to help suicidal individuals.

Electroconvulsive Therapy

Electroconvulsive therapy has long been recognized as a highly efficacious treatment for depressed individuals. It is often used in severe and treatment-resistant cases, and is recommended for patients with intractable suicidal thoughts.[123] ECT rapidly relieves suicidal thoughts in depressed patients.[124-126] A population-based study of all suicides in Finland revealed that the rate of ECT use within 3

months of suicide was extremely low, which could indirectly infer a protective effect or conversely low utilization of ECT.[127] While ECT appears to reduce suicidal thoughts and behavior in the short term, there is a lack of evidence supporting a long-term reduction in suicide, although it is important to consider the potentially higher risk of patients selected to receive ECT.[128-129]

Psychotherapy

A recent review by Brown and Jager-Hyman provides a summary of psychotherapies with evidence of efficacy reducing suicidal behavior, focusing on those with RCT-level evidence.[130] Cognitive behavioral therapy, dialectical behavior therapy, problem-solving therapy, mentalization-based treatment, and psychodynamic interpersonal therapy all have RCT evidence demonstrating reduction in suicide attempts. Meta-analysis of these psychotherapy trials yields a pooled effect of 32% reduction in likelihood of future self-harm when compared to usual care.[82] RCTs have demonstrated cognitive therapy to reduce future suicide attempts among people with recent self-harm [131] and in ED patients presenting with suicide attempt.[132] Both CBT and DBT have shown reductions in suicide attempts in patients with borderline personality disorder.[133-134] In a large New Zealand follow-up study over 1 year, problem-solving therapy was found to reduce repeat episodes of self-harm among people who had a previous history of repeated self-harm, but not among those who entered the study with only a single episode of self-harm.[135] However several limitations exist in the knowledge base of this intervention area. Specifically, there are no RCT studies of psychotherapy that have demonstrated a reduction in suicide. This is likely in part related to statistical power; in a large observational study in Denmark, psychosocial therapy following self-harm reduced suicide over longer time frames, with an absolute risk reduction of 0.5%.[136] In addition, the length of follow-up in psychotherapy trials is limited to short-duration; a meta-analysis focusing on interventions in the ED specifically found only 2 trials that examined repeat suicidal behavior over 12 months, and the pooled results were non-significant.[137]

Online methods of delivering psychotherapy to suicidal individuals represent an appealing option for a variety of reasons, including access, health care system costs, and stigma. In a Dutch RCT of an online suicide-specific intervention that featured an unguided self-help approach based in CBT, DBT, mindfulness, and PST, individuals showed a small but significant reduction in suicidal thinking.[138] This finding was more pronounced among people with a history of suicidal behavior. However, among people calling a suicide help-line, augmenting treatment with internet CBT directed at depression did not reduce suicidal ideation when compared to usual treatment.[139] This raises an interesting question of whether psychotherapy directed toward the underlying mental disorder is sufficient to reduce suicidal ideation in the individual. A meta-analysis showed that psychotherapy for depressive symptoms did not significantly reduce suicidal thoughts,[140] suggesting that psychotherapeutic approaches specifically directed at suicidal symptoms may be required. This analysis was limited to only 3 studies, noting again that many depression treatment trials exclude suicidal participants.

Follow-up Care

Follow-up care for suicidal persons includes a variety of approaches including telephone calls, repeat assessments, case management, and caring letters/postcards.[141] Patients themselves often request a need for care in the period following mental health contact, preferring telephone contact initially followed later by letters.[142] A recent review suggested that most trials of follow-up care have reduced future suicidal behavior.[92] However a meta-analysis of enhanced usual care (defined as augmenting treatment or adherence with little or no direct therapeutic contact) included many of the same studies and did not find a significant reduction in suicide attempts.[82]

Community mental health care has been shown in many countries to be important in preventing suicide. In a national study that examined suicide rates after guideline implementations in the UK, several forms of community care reduced suicide rates in different clinical populations, including 24-hour crisis teams

and assertive outreach for people who missed health care appointments.[86] National policy changes enhancing care in 12 weeks after discharge have shown significant reductions in non-fatal self-harm.[143] In Finland, an ecological study revealed lower suicide rates in municipalities that had a higher outpatient to inpatient service type ratio.[144]

In another meta-analysis that pooled several methods of follow-up care (phone calls, postcards, letters, and green cards), rate of repetitions of self-harm was reduced but not the likelihood of any future self-harm.[145] That study also specifically examined suicide as an outcome and although there was a trend towards reducing suicide the finding was non-significant. One study included in the meta-analysis was a multi-country RCT of almost 2000 people who had presented to the ED with a suicide attempt, comparing treatment as usual to an intervention that included a one-hour information session followed by 9 follow-up contacts over 18 months (telephone calls or in-person visits).[146] The intervention group had significantly less suicides at study end (0.2%) compared to the usual treatment group (2.2%). An RCT of 2 telephone calls over 1 year to people after suicide attempt in Sweden showed no difference in repeat attempts compared to those without the intervention.[147] In a controlled study in Spain of ED patients presenting with suicide attempt, 6 calls over the following year resulted in reduced rates of repeat attempt and delayed time to attempt.[148]

A Danish RCT study examined the effect of assertive outreach for people who had attempted suicide within the last 2 weeks, using a case management approach that featured 8-20 follow-up meetings, telephone calls and text messages, and meetings outside the hospital.[149] The findings did not support the outreach approach over usual treatment, and in fact there were more admissions to hospital for repeat suicide attempts in the intervention group.

The intervention of mailing postcards or letters to individuals after their presentation to hospital with self-harm is compelling given its low cost and intrinsic feasibility. Findings are mixed. In an RCT in Australia, mailing postcards over a period of 12 months after an incident of deliberate self-poisoning did not reduce the likelihood of any repeat self-harm, but it did reduce the number of self-harm events.[150] Examinations at the 24-month and 5-year marks revealed similar findings.[151-152] Importantly, these findings suggested a sustained effect of the postcards beyond the end of the intervention. An RCT of postcards mailed over 12 months in Iran showed significant reductions in suicidal ideation, any suicide attempt, and number of attempts at one year.[153] The reduction in suicidal ideation and any suicide attempt were sustained at 24 months.[154] Another RCT showed that among people who initially refused psychiatric follow-up, the group who received letters regularly over 5 years had lower suicide rates than those who did not.[155] These findings are contrasted with postcard studies in New Zealand, Taiwan and England that showed no effect on reducing self-harm or number of self-harm events.[156-158]

Conclusions

The clinician is in a uniquely challenging role given the high rates of suicide in patient populations. Assessing and managing suicidal patients is further complicated by a limited number of efficacious approaches. This will hopefully be ameliorated as the science of suicide prevention progresses and the number and quality of studies increases. Nevertheless the current state of science identifies several clinical practices that can improve our management of suicidal persons. Given that risk assessment tools to date are limited in their predictive ability, a direction may be to focus efforts on developing effective low resource-intensity interventions that acknowledge a high false-positive rate. Appreciating the heightened risk in specific clinical populations, and the temporal relationship between suicide and service discharge is an important first step. Gaining familiarity with established risk factors such as self-

harm history is critical in risk assessment. Finally, when determining a treatment approach, clinicians should consider suicidal thoughts and behavior as an important therapeutic target.

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Summary Points

1. Clinical populations with mental illness are at substantially elevated risk of suicide when compared to the general population
2. Current risk assessment tools have limited clinical utility given their low predictive accuracy for suicide
3. Follow-up care within a short interval should be considered for patients discharged from psychiatric wards or emergency departments
4. Previous self-harm behavior is one of the most consistent risk factors for future self-harm and suicide
5. Clinicians should consider suicidal behavior as a treatment target when managing patients with mental illness

Future Research Questions

1. What constitutes a reasonable standard of care in suicide risk assessment given the challenges in behavior prediction?
2. Can large-scale, longitudinal studies testing multiple assessment methods in short-term intervals improve the prediction of suicide?
3. Which treatment approaches for which patients reduce the risk of suicide during inpatient admissions and in the weeks and months following discharge from the ED and other psychiatric services?
4. How will neurocognitive tests be incorporated into clinical practice and will there be challenges engaging patients in treatment who may not be consciously aware of their intention to self-harm?
5. Can effective assessment and treatment practices be adequately scaled up given the constraint on psychiatric resources?

Sources and Selection Criteria

This review included material compiled from a comprehensive literature review of PubMed, as well as papers selected from reference lists of the articles obtained. A broader search with Google was performed to identify relevant articles and guidelines not listed on PubMed. Systematic reviews and meta-analyses were prioritized. We limited searches to English language studies published between January 1, 1990 and February 1, 2015. Search terms included suicide, self-harm, risk assessment, guidelines, intervention, outreach, follow-up, medication (and specific types), pharmacotherapy, electroconvulsive therapy, psychotherapy (and specific types) as well as specific terms to identify clinical populations (emergency department, inpatients, discharge). Searches were conducted by the authors and three research associates. The collection of articles and guidelines were reviewed and summarized, and the three authors determined the most clinically relevant articles to be included in the review.

Definitions and Parameters of Statistical Tests as they pertain to Suicide Prediction

Sensitivity: The proportion of suicidal people who are identified by an assessment tool as being suicidal. Sensitivity is inversely related to the false-negative rate.

Specificity: The proportion of non-suicidal people who are identified as non-suicidal. Specificity is inversely related to the false-positive rate.

Positive Predictive Value (PPV): The PPV statistic measures "true positives": people with a positive test result who truly have the disease. Regarding suicide risk assessment tools that attempt to predict future suicide, PPV measures the proportion of people who later die by suicide to people who are both correctly and falsely identified by a test as a positive risk for suicide (Suicides/Positive test results). High false-positive rates, and/or low prevalence of suicide will lower the PPV.

Negative Predictive Value (NPV): The NPV statistic measures "true negatives": people with a negative test who truly do not have the disease. For suicide risk assessment tools, NPV measures the proportion of people who do not die by suicide to people who are both correctly and falsely identified by a test as a negative risk for suicide (Non-suicides/Negative test results). High false-negative rates will lower the NPV. NPV rates tend to be high given the low prevalence rates of suicide (and therefore high prevalence of non-suicide outcomes).

Categorization of statistical test scores[a]:

<70%	Poor
70-79%	Fair
80-89%	Good
>90%	Excellent

[a]Based on clinical criteria proposed by Cicchetti et al. (1995)

Table 1. Selected clinical guidelines for suicide prevention available online

Organization	Weblink
World Health Organization (WHO)	http://www.who.int/mental_health/mhgap/evidence/suicide/en/
International Association for Suicide Prevention (IASP)	https://www.iasp.info/suicide_guidelines.php
National Institute for Health and Care Excellence (NICE)	http://www.nice.org.uk/guidance/cg16/chapter/1-recommendations
National Institute for Health and Care Excellence (NICE)	https://www.nice.org.uk/guidance/cg133/resources/new-nice-guidance-for-the-longerterm-management-of-selfharm
American Psychiatric Association (APA)	http://psychiatryonline.org/pb/assets/raw/sitewide/practice_guidelines/guidelines/suicide.pdf
Royal Australian and New Zealand College of Psychiatrists (RANZCP)	https://www.ranzcp.org/Files/Resources/Publications/CPG/Clinician/CPG_Clinician_Full_DSH-pdf.aspx
Substance Abuse and Mental Health Services Administration (SAMHSA)	http://www.integration.samhsa.gov/clinical-practice/safe-t_card.pdf

Table 2. Studies evaluating risk assessment tools in the prediction of suicide

Scale	Article	Population Sample	Number (%) of Suicides	Scale Cut-off Score	Relevant Statistics	Time of Follow-Up
Beck's Hopelessness Scale (BHS)	Beck et al. (1985)	Psychiatric inpatients with suicidal ideation N=207	11 (6.7)	9	Sensitivity: 0.91 Specificity: 0.51	10 years
	Beck (1990)	Psychiatric outpatients N=1958	17 (0.9)	8	Sensitivity: 0.94 Specificity: 0.41	7.5 years
	Nimeus et al (1997)	Psychiatric inpatients with suicide attempts N=212	13 (6.1)	13	Sensitivity: 0.77 Specificity: 0.61 PPV: 0.13	8 years
	Brown et al (2000)	Psychiatric outpatients N=6891	49 (0.7)	8	PPV: 0.01 NPV: 1.00	20 years
	Suominen et al (2004)	Patients with suicide attempts N=212	17 (7.6)	n/a	Sensitivity: 0.60 Specificity: 0.52	12 years
	McMillan et al (2007)*	Meta-analysis	N/A	9	Sensitivity: 0.80 Specificity: 0.42	5-12 years
Beck's Depression Inventory (BDI)	Beck (1990)	Psychiatric outpatients N=1958	17 (0.9)	22	Sensitivity: 0.77 Specificity: 0.64	7.5 years
	Brown et al (2000)	Psychiatric outpatients N=6891	49 (0.7)	22	PPV: 0.02 NPV: 1.00	20 years
Beck's Scale for Suicide Ideation (BSS)	Brown et al (2000)	Psychiatric outpatients, N=6891	49 (0.7)	2	PPV: 0.03 NPV: 1.00	20 years
Suicide Intent Scale (SIS)	Nimeus et al (2002)	Patients presenting with self-harm N=555	22 (4.0)	19	Sensitivity: 0.59 Specificity: 0.77 PPV: 0.23	1 year
	Hariss & Hawton (2005)	Patients presenting with self-harm N=2489	54 (2.2)	10 (men) 14 (women)	Men: Sensitivity: 0.77 Specificity: 0.49 PPV: 0.04 Women: Sensitivity: 0.67 Specificity: 0.75 PPV: 0.04	5.2 years
	Stefansson et al. (2012)	Psychiatric outpatients with suicide attempts N=81	7 (8.6)	16	Sensitivity: 1.00 Specificity: 0.52 PPV: 0.17	10-15 years
SAD PERSONS Scale	Kurz et al. (1988)	Inpatients with self-harm N=485	13 (2.7)	5	Sensitivity: 0.23 Specificity: 0.89	1 year
Suicide Assessment Scale (SUAS)	Nimeus et al (2000)	Inpatients with suicide attempts N=191	8 (4.2)	39	Sensitivity: 0.75 Specificity: 0.86 PPV: 0.19	1 year

Karolinska Interpersonal Violence Scale (KIVS)	Jokinen J et al (2010)	Patients with suicide attempts N=161	5 (3.1)	Childhood violence subscale: 3 Adult violence subscale: 3	Childhood violence subscale: Sensitivity: 0.80 Specificity: 0.65 PPV: 0.07 Adult violence subscale: Sensitivity: 0.88 Specificity: 0.60 PPV: 0.14	4 years
ReACT Self-Harm Rule	Steeg et al (2012)	ED patients with self-harm N=18,680	92 (0.49)	1	Sensitivity: 0.88-0.91 Specificity: 0.15-0.24 PPV: 0.004-0.005 NPV: 1.0	6 months

PPV=positive predictive value; NPV=negative predictive value

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