

Suicide Risk Assessment and Prevention: Challenges and Opportunities

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Despite increased access to mental health care for the previously uninsured and expanding evidence-based treatments for mood, anxiety, psychotic, and substance use disorders, suicide is on the rise in the United States. Since 1999, the age-adjusted suicide rate in the United States has increased 33%, from 10.5 per 100,000 standard population to 14.0. As of yet, there are no clinically available biomarkers, laboratory tests, or imaging to assist in diagnosis or the identification of the suicidal individual. Suicide risk assessment remains a high-stakes component of the psychiatric evaluation and can lead to overly restrictive management in the name of

prevention or to inadequate intervention because of poor appreciation of the severity of risk. This article focuses primarily on suicide risk assessment and management as a critical first step to prevention, given the fact that more research is needed to identify precision treatments and effective suicide prevention strategies. Suicide risk assessment provides the clinical psychiatrist with an opportunity for therapeutic engagement with the ultimate goals of relieving suffering and preventing suicide.

Focus 2020; 18:88–99; doi: 10.1176/appi.focus.20200011

In 2017, over 47,000 Americans age 10 or older died by suicide. Suicide is the second leading cause of death among individuals ages 15 to 34, the third leading cause of death among children in the age range of 10–14 years old, and the fourth leading cause of death in those aged 35 to 54 (1, 2). Since 1999, the age-adjusted suicide rate in the United States has increased 33%, from 10.5 per 100,000 standard population to 14.0. The suicide rate has increased 53% among women and 26% among men (3). However, the greatest increase in the suicide rate has been in those over the age of 45 (1). Several theories are postulated for the increase in deaths by suicide, including a rise in the prevalence of mental illness and decreased interpersonal connectivity related to social media use.

This article reviews the assessment and management of the suicidal patient, recognizing that assessment is not prediction. A prediction is a forecast about the future, and, as with the weather, 100% accuracy is impossible; also, predictions are less accurate as the period of time lengthens between assessment and the forecasted event. The farther ahead one looks, the more events there are in an individual's life that change the nature of their risk. The standard of care in medicine is the degree of prudence and caution required of a physician who has a duty of care to a patient. Although there is a standard of care for the assessment of suicide risk, there is no standard of care for the prediction of whether an individual will die by suicide. When evaluating a patient, it is impossible to predict whether that person will take his or her own life. The purpose of assessment is to do the best we can, armed with what we know and can discover about the patient in conjunction with what we know about risk factors and

warning signs for suicide to promote safety, decrease the risk of suicidal behavior, and promote health. Despite the disturbing increase in the suicide rate, death by suicide remains a statistically low base rate event. The search to understand factors to help differentiate individuals who die by suicide from those who do not remains ongoing, and developments in the neurobiology of suicide provide hope.

Suicidal behavior and suicide are as complex as the individuals who engage in them and are not the result of one single cause or stressor. Numerous factors contribute to suicide risk and can be divided into distal and proximal factors. Distal factors may include genetics, personality characteristics such as impulsivity and aggression, prenatal and perinatal circumstances, childhood trauma, and neurobiological disturbances. Proximal risk factors may include mental illness, physical illness, psychosocial crises, substance use, availability of lethal means, and exposure to suicidal behavior (4). The stress-diathesis model of suicide suggests that suicide is a complex interaction between environmental or internal stressors (e.g., life events or psychological pain) that are state dependent and trait-like biological susceptibility to suicidal behavior that is independent of psychiatric disorders (5). In this model, proximal risk factors act as triggers or precipitants when combined with distal risk factors, thereby increasing the risk for suicide (6).

NEUROBIOLOGY OF SUICIDE

Because suicidal individuals are a heterogeneous group, understanding more about subsets of suicidal individuals

may be the key to developing better ways of assessing risk and devising effective treatments. For example, studies have examined the role of dysfunction in the hypothalamic-pituitary-adrenal (HPA) axis, which is critical to the stress response and implicated in impulsivity and aggression. Studies of HPA axis dysfunction in suicidal individuals, typically including the measurement of cortisol, have yielded variable and contradictory results (7). However, a study that separated suicide attempters and nonattempters into subgroups related to levels of aggression and impulsivity found that suicide attempters in the subgroup of both high aggression and impulsivity had the most marked cortisol response, lending additional credence to the hypothesis that there is a stress-responsive subtype of suicide attempters (8). It would follow that treatment geared to suicidal individuals in this subgroup might need to be different from treatment modalities that are most effective for those without the impulsive aggression phenotype.

A review of studies of biological predictors of suicide divided discoveries into two major categories that included brain imaging findings and biochemical and genomic findings. They concluded that the biomarkers that appear to have the most clinical potential include indices of serotonergic function (decreased serotonin), inflammation, neuronal plasticity, and lipids (9). The serotonergic system has been implicated in the predisposition to suicidal behavior. A prospective longitudinal study of moderately depressed patients showed that higher serotonin-1A autoreceptor binding (resulting in less serotonin being released) was associated with more severe suicidal ideation and lethal attempts (10, 11). Another review of studies of neurobiological systems associated with suicide similarly concluded that the most compelling biomarkers for suicide are related to serotonergic abnormalities and altered stress responses and their downstream effects (12).

An increase in metabotropic glutamate receptor type 5, or mGluR5, in suicidal individuals with posttraumatic stress disorder (relative to normal controls and suicidal individuals with major depressive disorder) has been identified through positron emission tomography as a potential biomarker and treatment target (13). The potential role of lipids in suicidality is also under investigation; triglycerides, total cholesterol, high- and low-density lipoprotein cholesterol, polyunsaturated fatty acids, and apolipoproteins are biomarkers of interest. The mechanism linking suicidal behavior to dyslipidemia is unclear but may be due to the increase in proinflammatory cytokines and other inflammatory markers in the cerebrospinal fluid that have been linked to suicidal behavior, possibly through a connection to the HPA axis and serotonin precursors. Increased C-reactive protein (CRP) blood levels (which increase in acute inflammation) have been directly associated with increased risk of attempting and dying by suicide, suggesting that CRP may be a marker of suicidal behavior because of its proinflammatory effect, together with its growing levels

during acute inflammation; however, CRP does fluctuate, which may limit its utility (9, 14).

The genetic basis of suicidal behavior continues to be an important area of study. Twin studies have indicated a heritable component to suicidal behavior (15), as have other studies researching the environmental and genetic bases for suicide (16, 17). However, the genetic basis for suicidal behavior is believed to be polygenic, involving many genetic variants, each of which contributes a small proportion of risk (18). For example, a study of 43 high-risk Utah families identified 30 distinct shared genomic segments with genome-wide evidence of segregation with death by suicide. The researchers found specific variations in four genes (APH1B, AGBL2, SP110, and SUCLA2) that may raise the risk of death by suicide (19). Deciphering genetic vulnerability is only one part of understanding suicide risk; the ultimate hope is that by identifying high-risk individuals with a genetic susceptibility to suicide, more effective methods for identification and intervention may be developed. However, concerns around the use of biobanks and population databases for genetic suicide research abound (20).

SCREENING FOR SUICIDE RISK

The number and variety of instruments to assist in the identification of suicidal persons can be confusing. In suicide screening, a standardized instrument or protocol is administered to identify persons who may be at risk for suicide. Screening may be done universally or on specific populations. An example of universal screening is completion of the Emergency Department Safety Assessment and Follow-up Evaluation (ED-SAFE)-Patient Safety Screener on every patient who presents to a hospital emergency department (ED), regardless of the reason for presentation (21). A multicenter study of 1,376 adults who presented to eight U.S. EDs with a recent suicide attempt or suicidal ideation had three phases: a treatment-as-usual phase, a universal screening phase, and a universal screening plus intervention phase. The results indicated that a combination of brief interventions administered both during and after the ED visit (secondary suicide risk screening, providing discharge resources, and post-ED telephone calls) decreased post-ED suicidal behavior over the course of 52 weeks. A subsequent study indicated that the average per-patient cost to a participating ED of universal screening plus intervention was \$1,064 per month, about \$500 more than universal screening added to treatment as usual. Universal screening plus intervention was more effective in preventing suicides compared with universal screening added to treatment as usual and with treatment as usual alone. Intervention at ED discharge included the provision of a personal safety plan, mental health treatment information and resources, and information on how to contact a suicide hotline. After discharge, participants in the universal screening plus intervention phase were contacted through a series of telephone calls (22). Safety planning has been found to be associated with a

reduction in suicidal behavior and increased treatment engagement among suicidal patients after ED discharge and may be a valuable tool in a variety of clinical settings (23).

The Joint Commission (TJC) mandated, effective July 1, 2019, the implementation of National Patient Safety Goal 15.01.01 (24) for the reduction of the risk for suicide for all Joint Commission–accredited psychiatric hospitals and general hospitals in which patients are being treated for the primary complaint of an “emotional or behavioral disorder” (25). The second element of performance states that all individuals being evaluated for a mental health concern must be screened for suicidal ideation with a validated screening tool. The third element of performance requires the use of an evidence-based suicide risk assessment of individuals screening positive for suicidal ideation. Although not specifying the actual evidence-based tool to be used, TJC specifically mentions the Suicide Assessment Five-Step Evaluation and Triage for Clinicians (SAFE-T) Pocket Card (26) and the Columbia–Suicide Severity Rating Scale (C-SSRS) (27, 28) as examples of an evidence-based assessment tool “in conjunction” with clinical evaluation (25) and requires that patients be classified as presenting high, medium, or low suicide risk, although little evidence supports this way of stratifying risk (29). The SAFE-T is based on data and recommendations from the American Psychiatric Association Practice Guidelines (30) and is designed for specialists, because specific training and clinical judgment are necessary to weigh the information obtained. It overcomes some of the limitations of focusing on single risk factors by including consideration of recent stressful life events, patterns of ideation, and motivation for suicide and by balancing risk factors with protective factors (31). The C-SSRS and the SAFE-T Pocket Card, as well as the ED-SAFE primary and secondary screening tools, can be downloaded free of charge (32–34). Instruments and tools have their limitations. Screening instruments for suicide risk are intended to classify individuals as being truly at risk for suicide (the sensitivity of the instrument) and truly not at risk (the specificity of the instrument). There is a tradeoff in any screening instrument between sensitivity (capturing all those individuals who are genuinely suicidal) and specificity (not identifying nonsuicidal individuals as suicidal and therefore potentially hospitalizing individuals unnecessarily or even against their will). Also important is the positive predictive value of an instrument, which is the proportion of individuals identified by the instrument as being at risk who go on to engage in suicidal behavior. There is a wide variety of tools available for suicide screening and to aid in risk assessment. Although screening and risk assessment instruments lack the precision we would hope for and require good clinical judgment, the consensus is that a structured and consistent way of evaluating and weighing risk and protective factors, regardless of whether one uses an actual screening or assessment instrument, is important in order to elicit critical information and assist in management. Unfortunately, a

systematic review of suicide risk assessment tools did not find strong evidence that any instrument had sufficient accuracy to predict suicide with 80% sensitivity and 50% specificity (35). The authors of that review concluded that suicide risk assessment instruments have been studied in research settings, and whether these tools improve suicide prediction or prevention when used as a complement to a clinical psychiatric evaluation remains unclear.

CLINICAL ASSESSMENT OF SUICIDE RISK

Without clinically practical biomarkers, laboratory tests, or imaging findings to point the way, evaluation of the suicidal patient remains the purview of the master clinician, who must combine clinical judgment with knowledge of empirically validated risk and protective factors and weigh those factors in the best interest of the individual patient. As Shea has noted, interviewing patients regarding suicidality is a “task that requires a gentle sensitivity and a tenacious persistence” (36). Suicide risk assessment is performed as part of the psychiatric evaluation (Box 1), because mental illness is one of the major risk factors for suicide. Sometimes, the decision regarding disposition (inpatient versus partial or intensive outpatient program versus outpatient) is obvious. Sometimes inpatient hospitalization is the ideal or safest choice and is the psychiatrist’s recommendation but is strongly opposed by the patient for legitimate reasons. How does one balance patient autonomy with the preservation of life? These are some of the toughest situations facing the clinical psychiatrist.

Systematic suicide risk assessment should identify acute and chronic, modifiable, and treatable risk factors and weigh them against protective factors in determining management. Risk factors also have limitations. For example, a history of a prior suicide attempt is a clear risk factor for death by suicide; however, a recent study of 73,490 suicides over an 8-year period revealed that 79% died on their first attempt and were more likely to be male, African American, and over age 64 and to have used highly lethal methods. They were also less likely to have had a known mental health problem or to have let others know of their intent. They were also more likely to die in the context of general medical or legal problems (37). Other studies have suggested that 50%–80% of individuals who die by suicide do so on their first attempt, which indicates that a large proportion of individuals at risk for suicide are more difficult to identify by our current means. However, given the rising rate of suicide in the United States, this is hardly the time for a nihilistic approach to suicide. Rather, we need to develop better methods for identifying those at risk for suicide and better strategies for managing risk in the quest to prevent suicide. Risk factors are statistically more common in individuals who have died by suicide than in the general population (38–64) (Box 2). Warning signs are those characteristics that might place that person at higher risk for suicide and may overlap with risk factors (Box 3). Warning signs (sometimes called risk

BOX 1. Suicidal risk assessment in the context of the psychiatric evaluation**Establish Chief Complaint and Fully Explore the Presence of Disorders With Special Attention to Those Associated With Suicide**

- Mood disorders, anxiety disorders, psychotic features and disorders, substance use disorders, personality disorders
- Self-injury (explore intent)

Explore Psychiatric History

- Psychiatric diagnoses, previous episodes of illness
- Psychiatric hospitalizations and outcome
- Prior treatment (medications, psychotherapies, electroconvulsive therapy, etc.)
- Substance use (current, past, and treatment)
- Trauma history

Suicide Risk—Use Earlier Information as a Segue Into Questioning About Suicidal Ideation

- Explore the continuum of suicidal thinking from passive death wishes (wishing one were dead) to suicidal thoughts without a plan, to suicidal thoughts with plans, to suicidal planning with preparatory behavior, to suicide attempts.
- Previous suicide attempts, interrupted and aborted attempts, self-injurious behavior (obtaining details on previous attempts

can be useful in determining the level of lethal intent of previous attempts and assist in questioning about current ideation and/or attempt)

Family History

- Family history of mental illness and substance use
- Family history of suicidal behavior and death by suicide

Psychosocial Stressors and Supports

- Family constellation and quality of family relationships
- Social supports within and outside of family
- Religious beliefs about suicide and life after death
- Cultural beliefs about suicide
- Loss of employment, legal or financial problems
- Any stressor that could result in significant humiliation for self or loved ones
- Recent significant losses

Potential Protective Factors

- Reasons for living, such as family, beloved pets, moral and religious beliefs
- Previous response to similar and dissimilar stresses

predictors) may be discovered by the clinician in the context of a psychiatric evaluation and often overlap with risk factors (e.g., in the case of a psychotic and intoxicated individual).

Some evidence indicates that standardized instruments that elicit valid information regarding an individual's suicidal thinking, planning, behavior, and intent may be valuable adjuncts to assessment (27). For example, the C-SSRS, which was developed to elicit suicidal ideation in research subjects, also has evidence of clinical utility. Findings from a multisite study suggested that the C-SSRS is suitable for assessment of suicidal ideation and behavior in both clinical and research settings for adults and adolescents (27). The C-SSRS was developed with support from the National Institute of Mental Health, is evidence based, and is utilized in many settings, including schools, EDs, primary care settings, and the justice system. The C-SSRS characterizes current thoughts of suicide and past suicidal behaviors. Studies have shown the C-SSRS to be sensitive, specific, and reflective of changes in patients' conditions (27). Another instrument, the Scale for Suicide Ideation is a 19-item clinician-administered scale that asks about the patient's wish to die, wish to live, and the duration and intensity of thoughts of suicide and can be administered at the initial evaluation and at repeated intervals to assess improvement, making it potentially useful for inpatients and outpatients (65). However, the merits of one tool over another is open for debate (66). A 2017 review of suicide risk instruments concluded that there were too few studies of most instruments to allow evaluation of

accuracy, and among those instruments that could be evaluated by meta-analysis, none had sufficient diagnostic accuracy, which the others defined as instruments with a sensitivity >80% and a specificity >50% (35). A more recent study comparing the predictive accuracy of the Suicide Intent Scale (SIS), the Suicide Assessment Scale, the Karolinska Interpersonal Violence Scale, and the Columbia-Suicide Severity Rating Scale (C-SSRS) for suicide attempts and suicides within 3 and 12 months of an episode of self-harm in a Swedish cohort of 804 patients presenting to a hospital ED with self-harm found that instruments that predicted nonfatal repeat suicide attempts did not predict suicide and vice versa. Except for the prediction of suicide by the SIS in a short time frame, the specificity of these instruments was low, with poor prediction of suicidal behaviors (67).

The nine-item Patient Health Questionnaire (PHQ-9) for depression is frequently used as a screening tool, particularly in primary care settings, and has been shown to be an effective tool for evaluating major depressive disorder and depression symptom severity (68). The utility of item 9 ("Over the past two weeks, have you been bothered by thoughts that you would be better off dead, or of hurting yourself?") as a screen for suicidal ideation has been studied. Electronic health records of 84,414 outpatients ages 13 and older completing 207,265 questionnaires between 2007 and 2011 showed that response to item 9 of the PHQ-9 identified those at increased risk for suicide or death (69). Another study of 509,945 adult outpatients (including primary care

BOX 2. Risk factors for suicide

Previous suicide attempt (38)
 Family history of suicidal behavior, especially death by suicide (39, 40)
 Mental illness, especially a mood disorder or schizophrenia (41, 42)
 Impulsivity (43–45)
 Agitation (46, 47)
 Anxiety disorder (48)
 Traumatic brain injury (49)
 Recent major stressor or impending crisis such as marital loss, death of a loved one, financial loss, or legal involvement (50–52)
 Abuse trauma history, especially in childhood (53)
 Male and over age 60 (but the rate of suicide in women is growing) (50, 54)
 Alcohol or opioid use and misuse, especially when comorbid with other disorders (55–58)
 Attention-deficit hyperactivity disorder, especially in combination with disorder or other comorbidities (59)
 Chronic pain (60)
 Access to lethal means (e.g., guns, poisons, tricyclic antidepressants) (61)
 Self-injurious behavior (51, 62)
 Lesbian, gay, bisexual, or transgender (for suicidal behavior and ideation, not necessarily suicide) (63, 64)

and mental health outpatients) who completed over one million PHQ-9s found response to item 9 to be a strong predictor of suicide attempt or completed suicide over the following 2 years (70). However, there was a high false-negative rate, with over a third of suicide attempts or deaths occurring in patients who answered “not at all” to item 9 (69, 70). Another study utilizing electronic health records drilled down on 48 false-negative cases and found that 31% of suspected false-negative suicide attempts were clearly self-inflicted poisonings or injuries, indicating that the false-negative rate for item 9 on the PHQ-9 may not be as high as originally thought (71). A recent study analyzed data for 841 patients in the National Network of Depression Centers Clinical Care Registry comparing item 9 of the PHQ-9 with a brief electronic version of the C-SSRS and found that PHQ-9 item 9 was an insufficient assessment tool for suicide risk and suicide ideation. The authors concluded that, if used to screen patients, item 9 of the PHQ-9 should be paired with a validated suicide risk assessment instrument followed by clinical assessment of suicide risk (69, 72). There are no hard-and-fast rules regarding the use of these instruments (except the need to use one in a hospital setting for patients who express suicidal ideation), but there is consensus that clinicians should utilize a consistent and process-oriented framework for the assessment of suicidality that emphasizes the integration of risk and protective factors to aid in the development of a consistent risk management strategy. The addition of a structured assessment tool can be helpful in that process. For suicide screening and assessment instruments to be put to best use, interviewing and diagnostic skills

BOX 3. Warning signs for suicide

Suicidal thoughts or plans
 Talking or writing about suicide
 Increasing alcohol or substance use
 Clinical depression
 Anxiety, especially in combination with a mood disorder
 Hopelessness
 Agitation
 Withdrawing from others
 Psychotic thinking
 Feeling trapped or desperate
 Talking about feeling like a burden to others
 No purpose for living
 Impulsive or reckless behavior
 Rage or anger
 Significant mood changes
 Inability to sleep

are required. For the clinician on the front lines, diagnostic proficiency and the ability to empathically elicit suicidal ideation and planning from a reluctant patient are important assets that enhance data collected by a screening or assessment instrument.

Assessment of the patient’s credibility (an important and understudied phenomenon) is a critical feature of suicide assessment, as are the overall clinical impressions elicited over the course of an evaluation, which rely, in part, on nonverbal cues. A study of psychiatrists’ experiences of suicide assessment found that the psychiatrists studied acknowledged concern that reliance on overall clinical impression might be unprofessional (73). This fear is valid if the psychiatrist is relying on a “gut feeling,” (sometimes labeled unguided clinical assessment), but diagnostic expertise and awareness of risk factors and warning signs for suicide (guided clinical assessment), in combination with judgment formed from clinical experience, remains the quintessential model of suicide risk assessment for the clinical psychiatrist.

The importance of obtaining collateral information from family and friends, particularly when patients present to the ED or when issues of lethality arise on an inpatient or outpatient basis, cannot be underestimated. Sometimes confusion arises regarding constraints placed by the Health Insurance Portability and Accountability Act Privacy Rule (74). However, the Privacy Rule allows a health care provider to disclose information if the provider “perceives a serious and imminent threat to the health or safety of the patient or others and the family members are in a position to lessen the threat” (75). Consider the situation of a man with moderate to severe major depressive disorder and anxiety who presents with suicidal ideation by firearm and various risk factors but then, upon hearing about potential inpatient hospitalization, insists on leaving, claims he would never kill himself, and states that the guns he mentioned earlier are no longer in the home and that he has not been drinking for

over a month. One way to proceed would be to immediately insist on hospitalizing him—against his will, if necessary. A call to the patient’s wife or other close relative may assist the psychiatrist in making the critical decision regarding hospitalization versus continued outpatient treatment and safety planning. Also, the Privacy Rule does not prevent mental health clinicians from listening to family members or friends who want to provide information about the patient and then factoring that information into decision making. If one is making disclosures about the patient’s mental health over his or her objection, then the disclosure is limited to the protected health information directly relevant to the person’s involvement in the patient’s care (74). In the situation in which a patient adamantly refuses to provide contact information for collateral information and the psychiatrist’s good-faith opinion is that the patient is at acute risk for suicide, it is best to err on the side of caution and hospitalize the patient.

Many clinicians feel overwhelmed by the volume of information on suicide assessment, as well as the often contradictory information provided. For example, a widely disseminated report (*Vital Signs*) from the Centers for Disease Control and Prevention (CDC) described a retrospective examination of data from large databases and found that 54% of people who die by suicide did not have a known mental health condition (50, 76). However, psychological autopsy studies indicate that at least 90% of those who died by suicide had a mental illness, which may have included alcohol and substance use disorders, at the time of their deaths, regardless of whether they were actually diagnosed or receiving treatment (77, 78). Joiner and colleagues reviewed findings of 130 case studies of community suicides originally described in a psychological autopsy study by Robins in 1981 (79, 80). They found that all of the decedents displayed evidence of a diagnosable mental disorder (regardless of whether they were diagnosed) or displayed evidence of significant but subclinical psychiatric symptoms. Those with diagnosed versus undiagnosed psychiatric disorders did not differ significantly with respect to demographic characteristics, violence of suicide method, suicide attempt history, the number and intensity of stressful life events preceding death, or whether their death was part of a murder-suicide (81).

Research on protective factors is sparse, and findings are somewhat equivocal. For example, religious belief has long been noted to be a protective factor against suicide. However, a review of studies on the subject found that, after adjustment for social support measures, attending religious services is not particularly protective against suicidal ideation but does protect against suicide attempts (82). Another study noted that an individual’s representation of God as active and supportive was negatively correlated with suicidal ideation, whereas a passive-distressing God representation was positively correlated with suicidal ideation (83). This highlights the importance of probing during a suicide assessment for the meaning of potential

protective factors in that individual’s life, given that protective factors for one individual may not be protective for another. Reasons for living (e.g., family, loved ones, beloved pets, religious faith) that the individual is able to harness in positive and supportive ways, mental health care, and social connectedness may be protective factors for individuals, but the significance of particular risk and protective factors in a specific individual may shift over time.

SUICIDE PREVENTION

Because suicide is a relatively low base rate event, studies of suicide prevention interventions often require prohibitively large sample sizes. A 2016 analysis of 1,797 studies with various populations and methodologies (84) found that restricting lethal means and using effective pharmacological and psychological treatments for depression had the most evidence for preventing suicide. However, the authors concluded that no single strategy stood out as clearly superior (71).

The zero-suicide model is a basic component of the National Strategy for Suicide Prevention released in 2012 by the U.S. Action Alliance, with the foundational belief that death by suicide for those receiving care with health systems, including behavioral health systems, is preventable. Zero suicide is an aspirational goal and not meant to imply legal liability in the event of a suicide. Seven essential elements of suicide care for health systems to adopt are as follows (85, 86):

1. Lead system-wide culture change committed to suicide reduction. This requires engagement of administrators, clinicians, and staff.
2. Train a competent, engaged, confident workforce.
3. Identify individuals at risk with evidence-based screening and comprehensive assessment.
4. Engage individuals at risk using a suicide care management or safety plan.
5. Treat individuals with suicidal ideation and behaviors with evidence-based treatments.
6. Transition through levels of care with warm hand-offs and supportive contacts.
7. Improve policies and procedures on a continuous basis.

Given the current gaps in our knowledge base in understanding the science and prevention of suicide, caution around adopting a zero-suicide stance has been urged, given the fact that, currently, the goal of zero suicide is not attainable, and the more aspirational “en-vision zero suicide” stance has been recommended (87). The Group for the Advancement of Psychiatry Committee on Psychopathology has urged a commitment to post-vention resources to support survivors and clinicians who have lost patients to suicide, as well as continued efforts to enhance our understanding of the science of suicide and prevention (88).

Treating a Comorbid Psychiatric Disorder

Because mental illness is a major risk factor for suicide, recognition and effective treatment are critical in suicide prevention (89–91). Adequate treatment requires accurate diagnosis, which, in turn, drives appropriate treatment. Unfortunately, in many areas, inpatient hospitalization is difficult to achieve, and even when inpatient beds are available, short lengths of stay and other factors make hospitalization impractical beyond acute stabilization and the initiation of treatment that will require transition in the community.

Pharmacologic treatment of mental illness is a powerful suicide prevention strategy. Although randomized clinical trials have indicated that antidepressants are associated with a slightly increased risk of suicidal ideation and behavior among youths, four to 11 times more youths benefit from antidepressant treatment than experience a suicidal event (mostly suicidal ideation) (92–94). Pharmacoepidemiologic studies find a relationship between greater number of sales or prescriptions of antidepressants and a lower suicide rate. An inverse relationship between sales of selective serotonin reuptake inhibitors (SSRIs) and suicide has been found in 24 countries, including the United States, especially among those younger than age 25 (95, 96). It is recommended that clinicians educate patients younger than age 25, and the parents or guardians of children and adolescents, about the possible adverse effects of agitation, such as mania, agitation, sleep problems, akathisia, and possible withdrawal symptoms, which might increase the risk of suicidal ideation and behavior (92).

There have been studies (mostly observational studies) indicating that lithium effectively reduces suicidal behavior of individuals with mood disorders, perhaps by reducing impulsivity (97–99). However, no randomized control studies have demonstrated an antisuicide effect on the primary outcome. Clozapine is the only antipsychotic medication shown to exhibit an antisuicidal effect among patients with schizophrenia (100, 101). Electroconvulsive therapy may have rapid effects on suicidal ideation (102, 103). Ketamine, an intravenous anesthetic, has emerged as a potentially powerful treatment for treatment-resistant depression and suicidal ideation and may also assist in exploring the neurobiological nature of suicidality (104–106). The recently approved nasally administered esketamine has also been shown to transiently decrease suicide in a randomized placebo-controlled phase-2 trial for patients rated to be at imminent risk of suicide and needing hospitalization (107). However, the abuse potential of ketamine has raised important concerns regarding patients at risk for the development of ketamine use disorder, especially because studies have focused only on acute safety and efficacy and not on long-term effects (108).

Suicide-Specific Treatments

Despite the development of various suicide-specific treatments, the suicide rate has continued to rise annually (109).

Suicide-specific psychosocial treatments, such as safety planning intervention (SPI), dialectical behavior therapy (110, 111), brief cognitive-behavioral therapy (112, 113), and the Collaborative Assessment of Management of Suicidality (114), have been studied and are promising, but sustained and consistent improvements have thus far not been realized (2).

School-based suicide awareness programs also were shown to be effective in reducing suicide attempts and suicidal ideation. An earlier review of published studies between 1996 and 2005 about suicide prevention strategies found that physician education on recognizing and treating depression and restriction of access to lethal means were found to be effective in the prevention of suicide, with other methods such as screening and educating the public and media requiring more evidence of efficacy (89). Unfortunately, not much has changed with respect to the evidence base for suicide prevention, despite a plethora of interventions and increased public awareness of suicide.

Restricting Access to Lethal Means

There is clear evidence that the restriction of potentially lethal means of suicide is associated with a decrease in suicide (115). This is a difficult issue in the United States, as the discussion often moves to the debate on gun control. Although firearms are used in only a small minority of suicide attempts, given their lethality, they account for half of all U.S. suicides (2). Studies on the effectiveness of gun control legislation in reducing suicides in the United States have produced mixed results. Many studies did not focus on suicide, per se, but rather firearm violence. A recent study showed that the presence of specific laws related to handgun ownership (e.g., universal background checks, mandatory waiting periods) were associated with an attenuated trajectory in suicide rates across the study period of 1999 to 2015 relative to states without such laws. In states without such laws, both suicide by firearm and the overall suicide rates showed a sharper increase over the study period, as opposed to the more modest slope of increase in states with the laws and regulations. A decrease in the trajectory of firearm suicides was not offset by suicides utilizing other methods, and the authors noted that their findings should mitigate concerns that suicidal individuals will kill themselves by merely substituting another method when they do not have access to a firearm (116). In another study, a strong relationship was found between state-level firearm ownership and firearm suicide rates in both genders, as well as a relationship between firearm ownership and suicide among men but not women (117).

Suicide, which has always been more prevalent in rural areas, has become even more common in rural counties compared with urban areas. The suicide rate in the most rural counties has risen by 53% since 1999, according to the CDC (54). Clearly, more attention and research need to be directed to understanding and developing effective interventions in rural areas, given the alarming increase in suicide. A recent study found that, from 1999 to 2016, the rate of

suicide among Americans ages 25 to 64 rose by 41%, with suicides in rural counties 25% higher than those in major metropolitan areas (118). The authors posited that rural counties may be more sensitive to the effects of social deprivation than more urban counties and noted that high social fragmentation, an increasing percentage of the population without health insurance, and an increasing percentage of veterans in a county were associated with higher suicide rates. Interestingly, the study found that the presence of more gun shops was associated with an increase in county-level suicide rates in all county types except the most rural. Rural areas also tend to have less access to mental health services. Although suicide rates in other countries have decreased with the restriction of availability and access to firearms generally, in the United States, the most feasible approach may be enhanced educational efforts to inform and engage the public about the risks of suicide for those with firearm availability and to highlight the importance of restricting firearm access to at-risk individuals (119).

Restrictions of other lethal means of suicide have been successfully utilized. A study of suicide at 4-year colleges and universities in the United States from 2004–2005 through 2008–2009 found a suicide rate of 7 per 100,000 students and found a significantly lower risk for suicide than that in a matched national sample (120). The decrease in the availability of firearms on campus (versus homes) and other features of the campus environment were noted to be the basis for lower suicide rates for college students relative to their same-age peers. Of note in the study was the finding that although the rates of suicide by firearm and hanging for college students were less than those in the general population, the rates of suicide by jumping and poison for college students were not significantly different from those in the general population. Several institutions have taken tangible steps to prevent suicides by means of jumping. Cornell University erected fences, which were replaced by netting around campus bridges that were the sites of several suicides; New York University installed barriers in Bobst Library to prevent students from jumping into the atrium below (121). The Ohio State University installed fencing on the roofs of campus parking garages after several deaths. Efforts to prevent jumping deaths in the general population by the erection of barriers and nets have had positive results, as found in several studies, and these actions have not been followed by method substitution (122–124). Reductions in deaths were noted with the detoxification of domestic gas and the introduction of automobile catalytic converters (84, 89) and in the United Kingdom with changes to the packaging of analgesics and the withdrawal of particularly toxic analgesics (89, 115). Pesticides account for one out of seven suicides globally, and restrictions on lethal pesticides in countries where this method of suicide is prevalent has resulted in decreased suicides (125–127). Restricting access to medications that are potentially lethal in overdose has resulted in decreased suicides. The decline in the national suicide rate between 1985 and 1999 appears to have been

associated with the increased prescription of nontricyclic antidepressants versus tricyclic antidepressants (128). SSRIs are associated with a lower risk of death in overdose, compared with tricyclic antidepressants.

Safety Planning

The SPI developed by Stanley and Brown (129) has been identified by the Suicide Prevention Resource Center as a best practice for suicide prevention (86). This brief intervention includes a prioritized written list of coping strategies and sources of support for suicidal individuals. Clinicians and suicidal individuals develop the safety plan together. It appears useful in a variety of settings and populations, including in EDs (21, 23), among veterans (130), and with crisis hotlines (131) and university counseling centers (132). However, the safety plan should be individualized and its potential utility carefully considered for each patient. If utilized in a rote fashion, it is likely to be as useless as “no-suicide contracts,” which have not been shown to be efficacious in suicide prevention (133). Practical information on the development of a safety plan can be found on the Suicide Prevention Resource Center website (134).

ON THE HORIZON

Despite increased awareness of and attention to suicide, the results have been disappointing, as noted by the recent increase in suicide. Clearly, improved methods of identifying suicidal individuals and those at risk for suicidality, as well as mitigating risk, are needed. Although the majority of individuals who die by suicide had a mental illness—including substance use disorders—albeit unrecognized and untreated, there remains a sizable minority of individuals with no known psychiatric disorder at the time of their suicide. Risk factors for suicide, such as mood disorder, are typically studied in isolation, which decreases their accuracy. A focus on mental illness may limit our ability to understand and intervene with suicidal patients as well as those at risk to become suicidal in the future.

Suicide-specific diagnoses have been proposed to enhance research efforts as well as clinical care (135–138). A suicide crisis syndrome (SCS) diagnosis has been proposed, with research focusing on determining the acute mental state preceding a suicide attempt. A key feature of this mental state is an overwhelming feeling of “hopelessness or entrapment” and an urge to escape or avoid an unbearable situation from which escape is perceived as impossible (135). Components of SCS include affective disturbance (manifested by depressive turmoil, frantic anxiety, acute anhedonia or emotional pain); loss of cognitive control (manifested by ruminations, cognitive rigidity, thought suppression, or ruminative flooding); hyperarousal (manifested by agitation, hypervigilance, irritability, or insomnia); and social withdrawal (manifested by social isolation or evasive communication) (139). Biological underpinnings have been proposed, including dysregulated corticotropin-releasing hormone

and cortisol levels (entrapment), dysregulated dopaminergic circuits and endogenous opioids (affective disturbance), altered neurocognitive functioning in those areas of the brain linked to executive control, attention, and decision making (loss of cognitive control), autonomic dysfunction (hyperarousal), and decreased oxytocin availability (social withdrawal) (139). Research focusing on neural, neuroendocrine, genetic, and physiological mechanisms could move the needle in our ability to identify and treat patients at risk for suicide (140).

A diagnosis of suicide behavior disorder has also been proposed, which would identify individuals with a history of suicidal behavior and, it is hoped, improve continuity of care for at-risk individuals and enable identification in large databases such as claims data or electronic medical records, facilitating research (138). Critics have raised concerns regarding stigma, confidentiality, and liability (141).

The potential of machine learning to augment the prediction of suicide through the consideration of tens or hundreds of risk factors has also been studied (142). Machine learning is a method to uncover relationships between variables in large data sets and is typically utilized absent a specific hypothesis. Classification of data routinely available (e.g., through electronic health records) by means of algorithm development could increase the accuracy of suicide prediction. One recent study applied machine learning to electronic health records and was able to accurately determine which adolescent was a case (i.e., had attempted suicide) in the data set and which was a control (143). However, given the low prevalence of suicide, prediction will always be challenging. Additionally, most health care settings do not have the data infrastructure to make machine learning algorithms feasible. There is also enthusiasm for harnessing the technology of smartphones, including apps and sensors for suicide prevention, but this area is also in its infancy (144).

CONCLUSIONS

Suicide has received increased attention in the media and has drawn the attention of regulatory agencies, resulting in increasing scrutiny and directives around the screening, assessment, and treatment management of patients with suicidal ideation or behavior. Scientific advances in uncovering the neurobiology of suicide continue, but as yet, there is no clinically practical biomarker for suicide. Therefore, suicide prevention strategies focus on identifying high-risk individuals and developing population-based strategies (e.g., means restriction, media influences). Given our current limitations in identifying individuals who will die by suicide, universal suicide prevention strategies combined with expertise in psychiatric evaluation and risk assessment remain the mainstays of suicide prevention.

Psychiatric evaluation and suicide risk assessment, and the management and treatment of the suicidal patient, remain as much of an art as a science for the clinical psychiatrist. The combination of empathic, tenacious interviewing;

diagnostic acumen; and awareness of risk factors for suicide and how they may converge in an individual patient remains paramount in identifying and managing the suicidal patient.

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Dr. Ryan receives royalties from Oxford University Press and honoraria from the American Physicians Institute and Northwestern University (Grand Rounds). Dr. Oquendo receives royalties for the commercial use of the Columbia Suicide Severity Rating Scale and owns shares in Mantra, Inc. Her family owns stock in Bristol-Myers Squibb.

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