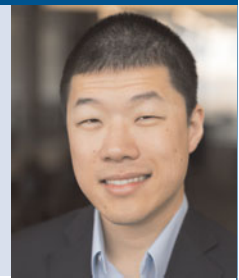


Editorial

Proposed directions for suicide research: incorporating successful approaches from other disciplines

David Mou, Evan M. Kleiman and Matthew K. Nock



Summary

Despite decades of suicide research, our ability to predict suicide has not changed. Why is this the case? We outline the unique challenges facing suicide research. Borrowing successful strategies from other medical fields, we propose specific research directions that aim to translate scientific findings into meaningful clinical impact.

Keywords

Suicide; risk assessment; information technologies; rating scales; phenomenology.

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David Mou (pictured) is an instructor at Harvard Medical School and he studies how novel types of patient data (social media use, movement patterns, etc.) can help better predict clinically meaningful outcomes. **Evan M. Kleiman** is an Assistant Professor at Rutgers and he focuses on using new technologies, such as smartphone-based real-time monitoring and wearable devices, to better understand behaviours. **Matthew K. Nock** is Edgar Pierce Professor of Psychology and Chair, Harvard Department of Psychology, where he studies why people behave in ways that are harmful to themselves, with an emphasis on suicide and other forms of self-harm.

Suicide claims nearly 800 000 lives every year and it remains the second leading cause of death among 15- to 29-year-olds globally. Whereas the mortality rates for many leading causes of death (e.g. heart disease, stroke, accidents) have declined precipitously over the past 100 years, the suicide rate has not changed. We believe that suicide researchers can make significant advances by incorporating three approaches from these other fields of medical research that have helped to bend the curve on other causes of early mortality. First, these fields carefully observed and characterised the clinical outcomes of interest *before* developing effective interventions. Second, risk-assessments were designed to be easily interpretable and clinically actionable. Third, these disciplines reduced complexity in the clinical outcome of interest by subtyping illnesses into meaningful groups. We review each approach in turn and describe ways in which similar approaches could facilitate advances in the understanding, prediction and prevention of suicidal thoughts and behaviours (STBs).

Observation and description of the fundamental characteristics of the problem

Before we begin designing interventions for a given illness, we should understand how that illness unfolds naturally. For instance, oncologists characterise cancers by culturing cells, identifying associated genes and recording patients' symptoms. Psychiatrists describe mental illnesses such as first-episode psychosis or the progression of manic episodes with similar attention to detail. Establishing a clear baseline allows researchers to define thresholds for treatment effectiveness. However, there has been far less phenomenological characterisation of STBs. STBs are relatively low-incidence behaviours and their onset is difficult to predict and unethical to promote. Therefore, most studies rely on retrospective patient report, which is subject to recall bias. Furthermore, sampling frequency is often low. Fewer than 1% of studies sample patients

more than once a month, which results in a failure to capture the dynamic nature of STBs.¹

With the recent advent of smartphones and wearable devices, higher-frequency and higher-fidelity sampling methods can facilitate major advances in our understanding of STBs. We advocate the use of methods that better capture the phenomenon of interest. Real-time monitoring techniques reduce recall biases and help us better understand how STBs change dynamically over time. Importantly, researchers have been able to demonstrate that even the most high-risk psychiatric in-patients are willing and able to engage in wearing biosensors and answering smartphone-based questions multiple times per day.² Once we develop an understanding of the phenomenology of STBs, we also may better understand how treatments affect patients. Careful, real-time, dynamic modelling of the changes in STBs and related symptoms during treatment can help advance understanding of how and for whom our treatments (e.g. medication, electroconvulsive therapy/transcranial magnetic stimulation, psychological interventions) work best.

Increased clinical utility of risk assessments

One of our most pressing clinical needs is the development of a reliable and clinically actionable risk assessment tool for STBs. A recent meta-analysis revealed that the predictive power of individual risk factors for STBs is low and has not increased over the past 50 years.¹ This meta-analysis also showed that research has been reporting on these same individual risk factors for STBs (e.g. mental disorders, stressful life events) for decades. Recent studies using machine learning applied to patient electronic health records to build suicide prediction models have provided a long-needed step forward, although here too additional progress is needed.

Current approaches in neurology provide some guidance on potential next steps for suicide research. Using clinical outcomes data, neurologists have derived a widely used risk assessment for ischaemic stroke in patients with atrial fibrillation. To quantify this risk, researchers created the CHADS₂ calculator, an easy-to-administer scoring system that categorises patients into meaningful risk groups. The lowest score of 0 confers a stroke risk of 1.9 stroke events per 100 patient-years, whereas the highest score of 6 carries a meaningfully higher risk of 18.2.³ This assessment tool assists clinicians in assessing the costs and benefits of prescribing an anti-coagulant medication.

What can we learn from such advances? To the extent possible, risk assessments should include items that can be objectively verified. The CHADS₂ stroke risk score includes verifiable items such as age, gender and other medical diagnoses. Many suicide risk factors are based on more subjective self-reports rather than objective ones (e.g. normal blood sugar levels) and therefore are less reliable. Suicide researchers recently have showed that objective behavioural tests such as the Implicit Association Test can effectively predict future suicidal behaviour. Incorporating more objective approaches can bring psychiatry more in line with other branches of medicine. Last, it is important to acknowledge that, despite the low positive predictive value (PPV) of the current suicide prediction models derived from large-scale data sources, they can still provide valuable information for clinical decision-making.^{4,5}

Using subtyping to reduce complexity


Until the 20th century, cancer was considered a diagnosis with few meaningful categories and even fewer treatment options. With advances in science, such as the advent of gene sequencing, oncologists began to discern more subtypes of cancers. With clearer categorisation, researchers now can better target the right combination of chemotherapy, radiation and/or medications for each subtype.

Like the process of cancer growth, the processes leading to STBs are similarly complex and heterogeneous. Suicide can be intricately planned, result from an act of impulse or fall somewhere in between. Consequently, the predictors of STBs for a person with schizophrenia likely differ significantly from those for a person with no discernible mental disorder. Instead of conceptualising STBs as a monolithic syndrome, we advocate studying STBs on the basis of meaningful clinical subcategories beyond clinical diagnoses using multiple data streams. By doing so, researchers can better design tailored interventions for each subpopulation. Recent research has shown that people experiencing suicidal ideation can be reliably classified into one of five different subtypes.² This is just one example of how subtyping of people experiencing STBs can be used to reduce the complexity and heterogeneity of those suffering from these conditions, perhaps providing much-needed traction in understanding, predicting and preventing these outcomes.

Conclusions

Suicide research and clinical practice can learn from the adjacent fields of medical research. We advocate the careful characterisation of STBs on the order of hours, the development of a clinically useful risk assessment derived from objective and independently verifiable metrics, and the identification of meaningful subpopulations. Underlying all these recommendations is the theme that novel technologies have allowed us to measure more and measure better. To be sure, multiple challenges remain. Recruitment for prospective studies may introduce selection biases against participants with

greater clinical severity or lower technological literacy. The factors leading to STBs are myriad and the dynamics between them are complex. Furthermore, many of these variables will not be captured. Success will depend on affordable technology, sustained patient engagement and thoughtful analyses. Social media companies have already taken action. For example, Facebook uses artificial intelligence to detect risk of suicidal behaviours among its users and contacts emergency services when it perceives that risk is imminent. However, important questions remain regarding both the accuracy of such prediction models and the ethics of intervening without explicit consent. Although challenging, conducting transparent prospective studies will add significantly to our understanding of suicidal thoughts and behaviours.

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D.M., E.M.K. and M.K.N. contributed equally to the conception of this work. D.M. drafted the article, and E.M.K. and M.K.N. provided critical revision.

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Declaration of interest

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