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Adding science to the art of suicide prevention

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Over 800,000 people die due to suicide every year. If a comparison is allowed, it would be the equivalent to fatal myocardial infarction for cardiology, or perhaps a lethal stroke for neurology. Similarities go further: it is also potentially preventable. Indeed, psychiatry has occupied itself with interventions aimed to reduce suicide. Drugs such as lithium and clozapine are known to decrease its rates, while cognitive-behavior therapy has specific protocols targeting suicidal patients. At a populational level, public health campaigns aim at promoting awareness and help-seeking behavior. However, while a great reduction of cardiovascular mortality was achieved over the past decades, suicide trends did not change significantly.

Cardiology has tailored interventions according to risk stratification, which might have contributed to mortality reduction. Along these lines, it is possible that a universal intervention is impractical or ineffective for suicide prevention, and more promising results could be achieved if high-risk populations were targeted. In fact, several other medical fields have developed predictive models to forewarn prevention. For instance, the Framinghan score is a widely used calculator that estimates the risk of a cardiovascular event for an individual using variables such as blood pressure, smoking status, and age. Other examples are the CHADS-VASc score for thromboembolic events and the FRAX score for osteoporotic fracture. Risk factors for suicidality are increasingly known, and predictive models able to aggregate them into an individual level risk estimate have been proposed. For instance, biomarkers and clinical risk assessment predicted hospitalizations for suicidality in women reaching an area under the curve of 78%[1].

Machine-learning techniques have been applied to enhance the predictive value of such models. In those, artificial intelligence compounds algorithms able to learn from data and find hidden non-linear patterns in which variables are connected, thus uncovering associations between predictors and outcomes. This way, a model was able to identify suicide attempts with up to 72% accuracy using clinical variables from a limited sample of 144 patients with mood disorder[2], whilst another achieved a performance of 78.59% using sMRI data from only 66 adolescents with major depressive disorder[3].

The next phase in the development of predictive models for suicide is to leverage on larger datasets, therefore increasing validity and paving the way for external replication. In this sense, a step forward was taken this year, with two models being developed to predict suicide attempts using the data of 34,653 participants from the NESARC study, a nationally representative sample of the US population[4,5]. Albeit having distinct approaches in techniques of machine-learning, both models achieved similar performances, with areas under the curve of 0.86 and 0.89. Some predictors were common in both studies, as prior suicide attempts, major financial crisis, education level, and current marital status. Whilst promising, there is still a ways to go. Both studies had relatively high numbers of false positives, leading to low predictive positive values in the range of 4.55% to 10.48%. A few strategies could increase these rates. For instance,

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studies with longer duration could benefit prediction, as a suicide attempt might just be ahead of time in relation to the follow-up period and not be a truly false positive[6]. Other approaches would be including a greater array of predictors, such as early-life adversity or genetic information, and focusing on specific populations for which suicide attempts are high in frequency, such as patients with bipolar disorder or schizophrenia[7].

Other reasons can account for imperfections in detecting suicide, as suicidology is certainly a complex field. Since the foundational work by Durkheim, a social dimension was added in the understanding of the phenomenon, and factors extrapolating the individual level play an important role. For instance, economic crises are largely implied in suicide. On the individual level, qualitative research advanced in explaining the process of suicide, and the recent emergence of ideation-to-action models intend to delineate what turns suicidal ideation into behavior. There is also questioning on whether any suicide attempt is a viable proxy to assess suicide, and there are methodological arguments to only consider the so-called serious suicide attempts as epidemiological equivalents to suicides. Pondering all these aspects is crucial to advance the understanding of the phenomenon and could benefit risk scoring.

Indeed, evidence-based medicine is a probabilistic model, which informs health policies through rational decision-making using likelihood instead of certainty. For all means, preventive strategies rely on identifying individuals at risk so as to deliver adequate intervention. This is underway of being accomplished via suicide scores, which could then guide tailored interventions and optimize distribution of resources such as prompt access to mental health care. As a last comparison, the Framinghan score was developed with a discrimination of 0.76 to 0.78 and is currently broadly employed to determine preventive strategies such as the use of statin. The numbers for risk score tools in suicide do not fall behind, and their use in real-world practice could be in the horizon.

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