

Review

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Historical analysis of suicide

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Abstract

Suicide is a dangerous clinical event causing 2% of human mortality. Due to its inherent danger to life and complexity, suicide studies are in high demand. Many resources have been allocated to the development of predicting suicides, its prevention and useful medical interventions so that biomedical and scientific study of the subject is indispensable. Historically, knowledge on suicide was largely based on mental illness studies. The diagnosis of suicide, mood disorders and the treatments have been reported since over 2000 years ago (Hippocrates in 460-377, BC). Despite a long history of association between suicide and mood disorder, the related terminology have evolved greatly. Yet, mortality reduction has been minimal despite many diagnostic and therapeutic studies and no effective therapeutic means have been developed. To improve on this scenario, we review the history and literature on suicide.

Keywords: Suicide, psychiatric disease, mood disorder, terminology, diagnostics, mental illness, suicide mortality

INTRODUCTION

Medical significance

Suicide is a dangerous and complex event causing 2% of human mortality^[1]. It remains an enigma and further studies on the topic are indispensable. Apart from mortality, huge resources have to be allocated towards the prediction, prevention and medical management of suicide. High-quality medical investigation of suicide is already underway^[2-4].



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Table 1. Historic order of knowledge of mood disorder discovery (suicide associated)^[8]

Timeline	Major discovery
Ancient Greece	Four elements and melancholy (excess of black bile)
Aretaeus of cappadocia	Clinical features of depression
Middle age	Patients with delusion
16th to 17th	Clinical diagnosis and abnormal behavior
18th	Nervous (animal spirits)
19th	Psychiatric symptoms
20th	Mood disorder, electroplexy and psychosurgery

Suicidal study scenario

Multiple different factors can lead to emergency situations with human suicide including environmental (external) and viral, drug or genetic factors (internal)^[5]. It has recently been discovered that mental health problems may be a useful avenue for further clinical study of suicide including mood disorders, affective diseases, depressive disorders, and schizophrenia^[6,7]. As a result, knowledge on suicide should be based both on scientific study and knowledge of mental illnesses.

EARLY HISTORY

Earliest knowledge of human mental disease

The diagnosis and treatment of suicide and mood disorders go back by more than 2000 years (Hippocrates in 460-377 BC)^[8,9]. From a long history of mood disorder studies, the diagnostic and therapeutic measures, especially terminology, have been gradually established. Yet, diagnostic and therapeutic controversies still remain. A great part of diagnosis and therapy in suicide and mood disorders is unsatisfactory. No targeted therapeutic drug is 100% effective although modern, supportive diagnostic systems have been established. To improve this scenario, the history and literature on suicide need to be carefully reviewed [Table 1].

Social science for human suicide

Human suicide has been reported for more than 3000 years for social knowledge. In ancient Greece, Egypt and Rome, suicide was not allowed and regarded as sinful. The victims' bodies would be abandoned in the wilderness and left to animals^[10]. Only in 1,642 in the UK was it then accepted as a human illness. In recent times, society has gradually recognized that it is social inequality and poverty that drives human beings to kill themselves; thus, many social reforms have begun^[10].

Statistics of suicide worldwide

Worldwide, the statistics on human suicide are highly varied between countries such as Latin America^[11], Greece^[12], Japan^[13,14], South Korea^[14], Europe^[15], Australia^[16,17] and the US^[17]. Depending on the author. Comparing suicides across the world is difficult otherwise as there are many economical and political reasons^[11-17]. There is also great variation in the age and gender of human beings who attempt suicides. Thus, a deep understanding of the subject is required.

MEDICAL KNOWLEDGE AND ADVANCES

Association between suicide and neuropsychiatry

The causal factors of human suicide are arguable and remain widely disagreed. Currently, neuropsychiatric factors are recognized as one of the main culprits for human suicide events and mortality^[6,7]. Table 2 shows a large clinical sample and data that display a strong association between risk of suicide and other mental health problems.

From a diagnostic aspect, the symptoms for risk of human suicide (feeling of hopelessness, self-blame and so on) are similar to those of mood disorders (hopelessness and helplessness). The external insults of the

Table 2. The associations between suicide and other diseases^[5,6]

Worldwide; total of 15,629 cases		UK; total of 4,859 cases	
Mood disorders	35%	Mood disorders	42%
Substance disorders	22%	Schizophrenia	20%
Personality disorders	12%	Personality disorders	11%
Schizophrenia	11%	Alcohol dependence	9%
Anxiety disorders	6%	Drug dependence	4%
		Anxiety disorders	3%
Other disorders	14%	Other disorders	11%

environment are also identical to factors behind mood disorders, including marriage problems and the loss of jobs or family members.

Genetic and epigenetic factors

As there have yet to be any conclusive outcome on the pathogenesis of suicide, high-quality biomedical studies (genetic, molecular and cerebral imaging) are currently utilized for suicide prediction, prevention and therapeutics^[1,18-26]. It therefore supported the previous, hypothetical link between suicide and mental health problems through genetic and molecular analysis. As a result, more information associated with the diagnosis of mental diseases can be used for suicide risk prediction, prevention and treatment.

Mental illness pathology and evolution of diagnostics from history

Mood disorders are an old and serious type of disease. In an ancient discovery, it was first noticed and described by ancient Greek physicians more than 2000 years ago (Hippocrates, 460-377 BC)^[8,9]. As a main symptom of mental disorder, suicide has a high mortality rate throughout the world. During Hippocrates' time, he found a symptom of "melancholia", known today as "depression", and associated the disease with human "brain dysfunction". A thousand years have passed and these statements have not been seriously challenged. We believe that this observation is still the core of future scientific and medical investigations.

The quest for a relationship between suicide and mental illness has lasted from ancient times to the modern era. Despite the long history of suicide and mental illness studies, diagnostics are especially limited - act and symptoms (suicide attempts and repeats) and is a current area of research emphasis^[1,18-26]. Human suicides were previously treated and controlled with relevant chemical drugs, such as antidepressants^[26-31]. However, these drug therapies work like a double-edged sword that has both strengths and weaknesses. To overcome this setback, new therapeutics must be made.

CURRENT ACHIEVEMENTS IN DIAGNOSTICS AND TREATMENT

Current routine in neuropsychiatric diagnostics

Formally, diagnostic guidelines have been established and widely applied worldwide. Detailed diagnostic information can be found in the Diagnostic and Statistical Manual of Mental Disorders (DSM) from DSM-I to DSM-V of mental problems and the Hamilton Depression Rating Scale (HAM-D) of suicide risk.

Progress in genetic and molecular technology for diagnosis

Psychiatric analysis is currently used as diagnostic means by clinicians and psychiatrists. Medications are prescribed after analyzing the patient's psychiatric condition (different types of psychiatric illness scoring systems for depressive or manic symptoms) rather than the patient's genetic predisposition such as pharmacogenetics (PG), genomic sequencing, bioinformatic profiling or brain image/visual comparisons. They analyze patients through disease symptoms (suicide episodes) that mask the most important parts of disease origination and progress (genetic/molecular-based causalities) in a series of pathogenesis stages or suicide-induced mortality. Over the long history of suicide and mental illness studies, quick and proper diagnosis is key. More recently, the morphological or visual scan of human brains of patients at

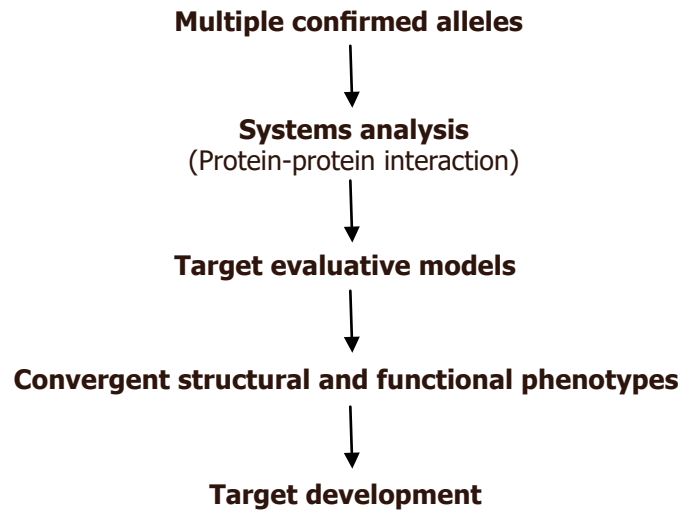


Figure 1. Therapeutic and drug design development

high suicide risk have begun to emerge for determining disease progression or multi-factorial etiological identification^[18-26].

The genetic changes in psychiatric diseases are enormous, such as *UNC13A*, *NFASC*, *PTPRG*, *ERBB2*, *GR1N2A*, *HTR2A*, *DLG*, *ACTN*, *MYH9* and many others^[32,33]. So far, at least 400 human genes are involved in neuropsychiatric disorders and much more scientific research is needed.

Toxicity of antidepressants

Antidepressants have been implicated as inducers of human suicide and has been reported with mechanistic investigation. We have previously studied and discussed drug toxicity from a genetics perspective. Our proposition is that some patients with genetic deficiencies may develop an over-reaction to antidepressants and induce human suicide^[26]. This can explain the clinical suicides that are evidenced in only a small number of patients receiving antidepressants. Most patients are otherwise safe with antidepressant medication.

Neuropathy

To provide a high-quality platform for human suicide study, neuropathic processes may be understood^[34-36]. These complex processes have been explored over the past two decades due to technical updating (genetic or morphology). Many specific neural structural or functional elements or areas have been studied. This interesting topic may be a fruitful discipline in the upcoming decades worldwide.

Therapeutic study and drug development

Therapeutic studies for neuropsychiatric diseases have increased greatly. Possible therapeutic and drug design pathways are given in [Figure 1](#). In this stage, antidepressants (selective serotonin reuptake inhibitor, SSRI) are widely utilized in clinical trials and show therapeutic outcomes and benefits clinically^[30].

Apart from drug treatment, other types of therapies, such as light therapy (physical treatment) are also useful for mood disorders or suicidal patients^[37]. In Scandinavia, there is a seasonal shift in human suicides or rates of mood disorders every year. Light therapy could help these special types of patients in the winter of each country in Scandinavia.

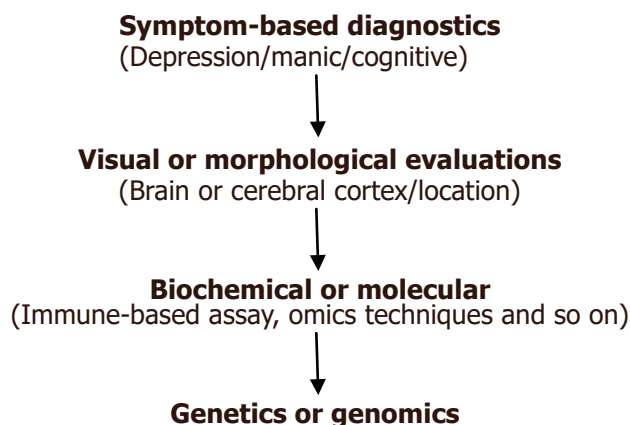


Figure 2. Evolution of diagnostics in suicide and mental disorders^[2]

FUTURE DIRECTIONS

There are several future directions for optimizing genetic/molecular-based diagnostics for suicide prediction and prevention. From these efforts, a patient's suicide risk may be quickly understood via high throughput and low cost diagnostics. Targeted drug therapeutics or other types of specific, highly effective interventions can then be clinical implemented [Figure 2].

- (1) Scientific testing, scoring and computational networks for clinical data relationship buildup between disease causalities, progression, mortality and possible drug targeting;
- (2) Comparisons of different scoring algorithms or calculation systems and customization of several workable paradigms for future clinical personalized medicine application;
- (3) Establishment of the relationship between clinical diagnosis and treatment via modern technique-based ways (from genetic to molecular to visual or from visual to molecular or genetics);
- (4) Increasing the accumulation of clinical genetic or molecular data (>5000 clinical cases between patients at high suicide risk and normal persons);
- (5) Collecting and evaluating data from the diagnostic relationship between genetic polymorphisms, chemical and environmental factors of multiple disciplines^[32-41].

CONCLUSION

The prediction and prevention of human suicide, especially in diagnostics, must be greatly promoted and improved. Much work is still needed in the clinic, including clinical diagnosis and effective, targeted drugs for the safeguarding of patients at high suicide risk.

DECLARATIONS

Authors' contributions

Article writing: Lu DY, Cao S

Data collection and analysis: Wu HY, Che JY

Availability of data and materials

Not applicable.

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Conflicts of interest

All authors declared that there are no conflicts of interest.

Ethical approval and consent to participate

Not applicable.

Consent for publication

Not applicable.

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