

Virtual Doctor: Improving Global Healthcare for People Through Automated Depression Screening

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ABSTRACT

This article investigates the universal problem of depression that is never detected and, if left unattended, poses a leading global health problem among people belonging to all groups. Although depression is known to affect millions worldwide, many cases go unreported, and thus severe and harmful results follow, among which is a higher rate of suicide. The study accounts for the development of an electronic device that is meant to facilitate individuals' self-assessment for depression in the comfort of their own homes, privately, and, therefore, allow for early detection and intervention. The project integrates the PHQ-9 (Patient Health Questionnaire-9) standardized score employed to quantify the severity of depression as an online portal to return visitors their immediate, unclinched score and feedback regarding potential depressive symptoms. Through the avenue of demystified and accessible first-line assessment, this doctor app attempts to fill the crucial voids in access to mental health care and foster early professional intervention.

Problem

Mental illness has been a prevalent issue that has hit people from different backgrounds, including people of different ages, sexes, nationalities, economic classes, and races. One of the most prevalent mental illnesses is depression. It is estimated that in the entire world, 5% of the population is depressed, out of whom approximately 280 million are depressed in all age groups (World Health Organization [WHO], 2023). Depression is a dangerous threat to those who coexist with it, especially due to the high correlation of depression with suicidal ideation and behavior. The lifetime suicide risk in chronic depressive disorder patients is as much as 20% (DBS Alliance, n.d.). This cruel reality presents the huge, devastating impact depression has on individuals and society, and one experiences it is experienced more frequently in cities and

among young people and youth (DBS Alliance, n.d.; Healthline, 2023). The early onset of most depressed individuals, particularly with suicide risk, is a cause of concern (DBS Alliance, n.d.).

Furthermore, prevalence rates of depressed individuals may not be total in determining how extensive the problem is because it is such a high percentage that doesn't receive a diagnosis. Rates for undiagnosed depression vary considerably between 8.5% and almost 50% globally (Faisal-Cury et al., 2022; PMC, 2022). In a study of Brazilian adults, the prevalence was determined to be 11.2%, but underdiagnosis was found to be 63.6% (Faisal-Cury et al., 2022). This suggests a heavy hidden burden of illness that is untreated. Untreated depression has significant and irreversible effects. Depression, if not treated, can lead to deteriorating mental and physical health, poor focus, and increased participation in risk-taking activities like alcohol or drug misuse (Mindful Health Solutions, 2023; WebMD, n.d.). It can also lead to sleep disturbance, appetite and weight change, and result in hopelessness and irritability (WebMD, n.d.). In the long term, depression, if not treated, leads to increased risk of other chronic diseases developing, reduced cognitive functioning, and extensive impairment of the capacity to work and function in relationships (Neuro Wellness Spa, 2025; WebMD, n.d.). The net effect of this extremely prevalent, often subtle, and disabling disease is a compelling argument for designation as a significant public health problem in need of innovative solutions.

Proposed Solution

The staggering percentage of undiagnosed and untreated depression can be addressed only by inexpensive and unobtrusive early detection equipment. The goal of this project is to design one such device: a device that will allow people to quietly search for depression in their own lives, with early identification of the symptoms. One of the biggest hindrances to seeking mental health treatment is widespread mental illness stigma (Henry Ford Health, n.d.; Psychiatry.org, n.d.). People are generally fearful of freely announcing mental illness or attending a doctor's visit because they are worried about judgment, discrimination, or being perceived differently (Henry Ford Health, n.d.; PMC, 2023). If there is a means by which individuals can evaluate their mental health in isolation, online, and in the comfort of their own homes, then they may be more inclined to take that initial giant leap towards discovering what is wrong with them and seeking assistance.

The project offers a virtual doctor application and an online depression screening assessment. This online facility provides a convenient and confidential point of self-screening, helping to offset the stigma and geographical limitations. By providing an online facility, the tool can reach a broader audience, particularly those who would not otherwise use traditional health facilities for mental health issues.

Creation of Solution

This depression-screening virtual doctor application is built on the PHQ-9 (Patient Health Questionnaire-9) as its framework for depression screening. The PHQ-9 is standardized and validated as a scale to rate depressive symptoms severity and for the diagnosis of depressive disorders (Kroenke et al., 2001; American Psychological Association [APA], n.d.). It consists of nine items with a clear correlation to DSM-IV criteria for diagnosis of depressive disorder (Kroenke et al., 2001). The items are scored from 0 ("not at all") to 3 ("nearly every day"), and the total score, ranging from 0 to 27, indicates the degree of depression (Kroenke et al., 2001). The PHQ-9 has also been found to possess good psychometric properties, including high internal consistency and concurrent validity, and is therefore an efficient screening test for depression that can be applied to a wide range of settings (MDPI, 2023; APA, n.d.).

To disseminate this validated tool widely, the PHQ-9 questionnaire was converted into an online platform based on Dr. Kurt Kroenke's published work, which is also featured on MD+Calc. This computer version was designed to provide an easy-to-use and user-friendly platform that allows users to readily complete the questionnaire. Once completed, their responses are automatically scored by the computer, and a score is derived. This score is an objective assessment of the severity of potential depressive symptoms, informing the user immediately whether their responses indicate depression symptomatology. Through a computer-based website, users have the convenience of accessing and using this screening tool anywhere in the world with internet access, offering an easy and discreet means of self-screening without needing to visit a doctor. The immediate, personal feedback is a compelling motivation for individuals to screen their mental health and consider making informed choices about additional care.

Future Scope

The development of this virtual doctor app is one step closer to expanding access to mental health screening. The future of the project is great and full of chances for growth and development. One of the most emphasized aspects is the availability of resources and professional attention. Although the current system only provides a general suggestion, future systems could be designed to provide more specific suggestions depending on the user's score, such as referrals to local mental health centers, hotlines, or teletherapy websites. That would make the tool an actual step towards mental health, rather than just a screen. Possibly the greatest scope for future growth is in the addition of facilities for long-term monitoring of symptoms. Through the facility of being able to retake the questionnaire at intervals, the app enables individuals to observe how their mental health has changed and therefore, enables them and their physicians to more easily track the impact of interventions or detect declining symptoms early. In addition, its suitability for other common mental disorders, such as stress tests or anxiety

disorders, would make it more comprehensive and effective. Increasing the degree of interaction by incorporating interactive features, educational content on mental health, and secure messaging with mental health professionals (with adequate privacy precautions) would lead to greater user control over their mental well-being. The final product, therefore, is to create a robust, user-centered platform that more than screens for depression symptoms and actually makes it easier for people to access early and effective treatment by removing barriers that now keep millions of people from getting much-needed mental health care.

Role of Code in Healthcare

This virtual doctor app innovation is a prime example of the forward-looking role coding and technology are playing in contemporary medicine. Aside from administrative positions, coding enables the creation of accessible, scalable, and personalized healthcare solutions. For example, the PHQ-9, as an evidence-based instrument, would otherwise require a healthcare worker to administer and score. By coding it into a website, the survey is taken directly to a global population, transcending the spatial and temporal boundaries of accessibility. This places early mental health screening into the individual's hands, allowing people to take control over their own health.

Second, coding allows commentaries and scoring to be automatically done with immediate feedback, the missing component for allowing early intervention to take place. The ability of the system to read through answers and come up with an objective score immediately translates to the ailments associated with conventional appointments, including time wastage, being minimized to an absolute minimum. As healthcare delivery systems become increasingly strained and resources become scarcer, coding innovations will increasingly serve as the bulwarks to make healthcare delivery more efficient, equitable, and patient-focused, thereby improving the lives of millions.

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