Psychological Aspects and Potential Screening of Depression Among Cancer Patients

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Psychological aspects are as important as physical health, even more so for people suffering from chronic diseases like cancer. A malignant patient passes through various stages of emotional distress among which depression is a very prominent one. Depression has numerous impacts on the patient's mental health and treatment outcomes and can be linked to a soaring mortality rate in cancer patients [Sperner-Unterweger 2015]. In countries with low patient-psychiatrist and psychologist ratios like Bangladesh, it inevitably becomes attending oncologists' responsibility to screen for depression among cancer patients. However, as patients themselves and their caregivers are reluctant to mention the psychological aspects to the attending physicians, busy professional oncologists can not properly emphasize and often overlook those because of being continuously under huge pressure of maintaining the cancer patients' ever-deteriorating physical stability. To address these issues and create a bridge between the psychiatrist, psychologist, and oncologists, we present standardized and easily applicable tools to screen for depression based on the features of EEG data and free-hand sketches.

KeyWords: Oncology, Psychiatry, Depression, Free-hand Sketches, EEG, PHQ-9

1 INTRODUCTION AND OBJECTIVE

Awareness regarding the importance of mental health is still not sufficient enough in many countries in the world, especially in developing countries. Also, for patients with chronic conditions in those areas, access to mental health care is severely limited by a lack of resources, inadequate service distribution, obstacles in the way of the current healthcare system, societal stigma, etc. As a result of all the mentioned points, the psychological aspects of oncology patients, a very vulnerable group of people, remains somehow neglected. There have been researches on the importance and systems of screening depression in cancer patients, on the use of non-verbal measures in other cognitive dysfunctions, and how the technology is being used in mental healthcare for cancer patients.

1.1 Importance of Screening Depression among Cancer Patients

One of the relevant studies shows that only 15 to 50 percent of oncologists recognize depression in their patients, and even fewer patients receive appropriate treatment. [Sperner-Unterweger 2015] In another study, Hospital Anxiety and Depression Scale (HADS) [Stern 2014] is used to compare the prevalence of anxiety and depression in cancer patients compared to the normal people [Spinhoven et al. 1997]. They discovered that the risk of psychological distress in malignant patients is approximately twice than that of healthy general individuals. In one survey on the palliative medicine doctors, half said that they had never utilized a screening tool [Newell et al. 1998].

	Number	Rate per 100,000 population
Psychiatrist	270	0.16
Psychologist	565	0.34
Psychiatric Nurse	700	0.4

Table 1. Human Resources for Mental Health in Bangladesh [Organization et al. 2010]

1.2 Present Systems for Screening Depression Among Cancer Patients

Many technological interventions are present for screening depression among cancer patients. For example, in a study, the strategy of screening for depression among cancer patients from a smartphone application is researched. The experiment also demonstrated the effect of reporting adherence while using a mobile mental state tracker and the accuracy of depression screening. [Ana et al. 2020] In another research pre-proof, the advancement of mobile technology to look at the health conditions of oncology patients is leveraged. The study outcomes show that using this app can help detect various severe syndromes of cancer [Ana et al. 2020].

1.3 Uses of Free-hand Sketches in Other Cognitive Dysfunctions

Free-hand sketches are deployed in clinical trials for the evaluation of a variety of cognitive dysfunctions, including amnesia, Alzheimer's disease, dementia, and post-traumatic stress disorder. The research showed CDT (Clock Drawing Test) [Konstam and Lehmann 2011] as a good alternative screening tool to the MINI scale [Reserach 2010]. Another study presents an automated machine-learning method for distinguishing Parkinson's disease patients from control groups based on the spirals and meanders drawn by the patients. Next, a paper demonstrated the feasibility of free-hand sketching as a screening tool for probable PTSD in underrepresented communities, hoping to enhance future research into affordable and accessible PTSD clinical evaluation methods.

As the use of depression screening tools is not that much in the case of patients and physicians associated with cancer, the research aims to examine the alternative usage of EEG and free-hand sketches for the potential screening of depression by performing a mixed research method of study among various groups of cancer patients. The objectives of this research are:

- To deeply understand the psychological aspects of cancer patients and minimize the challenges of depression screening.
- To utilize the EEG signal data for neurological measures of depression among cancer patients.
- To develop a non-verbal measure of depression among cancer patients using free-hand sketches and analyze them.

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- To build an ingenious and low-cost method of screening depression to deal with the communication barriers along with the resource constraints.

2 MATERIALS AND METHODOLOGY

As biological data is highly confidential and there is no existing dataset of research on cancer patients' mental health using both EEG and non-verbal measures like free-hand sketching, we chose to collect the data on our own. Our intended data collection process involves several stages, including free-hand sketching, EEG data collection, and cancer patients' depression screening using PHQ-9 which will later be used a validation factor of our findings.

2.1 Screening Tool

Many screening tools are currently available to evaluate the severity of depression and monitor the depressive symptoms of people. Among those, we selected the translated and validated PHQ-9 scale because of the concise and brief questionnaire, lower administration time of around 5 minutes, perfect for handling the cancer patient's tendency to overlook lengthy psychological counseling sessions [Chaturvedi 2012], and compatibility with DSM-IV criteria [Löwe et al. 2004]. The scale is translated in Bengali maintaining the conceptual and contextual equivalency, keeping various educational qualifications and level of English proficiency in mind.

2.2 EEG Headset

A low-cost, consumer-grade, and portable EEG headset called the Neurosky Mindwave Mobile Headset is acquired which generates EEG power values for eight well-recognized brainwaves [NeuroSky 2018]. Using these values, we can get ideas about the participants' mental states like concentration, relaxation, body-mind integrity, etc.

For our research, we have recorded background EEG data from cancer patients and healthy individuals during different activities. For cancer patients, we collected the EEG signals while - (i) Sharing their journey and experiences of cancer (ii) Free-hand sketching. As for the healthy individuals, we will take the data while - (i) answering the PHQ-9 data and (ii) Free-hand sketching. These two different comparison groups will help us evaluate the neurobiological abnormalities of depression among cancer patients.

2.3 Free-hand sketches

With the goal of introducing a form of non-verbal measures, we have picked free-hand sketching because of its originality, portability, ease of creation, inexpensive overhead (needs only a pencil and paper) and appropriateness for uneducated and underprivileged community who may lack literacy and technical skills. We have chosen 'appearance' as the theme of the drawing. As cancer have negative effects on appearance and body functions, every types of patients tend to feel depressed, face communication challenges and social rejection. Sketching can express emotions and perspectives that might denied and kept suppressed by the conscious mind. Because of it being a nonverbal measure, people do not feel extremely self-conscious like they used to be in verbal interactions.

In our research, we provided each participant with a piece of paper and a pencil. And, they were asked to draw their self-reflection before and after the diagnosis. Significant amount of time was allocated to make the participants clear about the idea, and we reassured them that their sketches won't be used to evaluate their drawing ability or educational level.

3 RESULT AND DISCUSSION

We will extract useful features such as the number of strokes, edges, the required time to complete the sketch, etc., and analyze the correlation between those with the psychological perspective of the participant. The collected EEG data during sketching sessions will give us the relaxation and focus levels of the participants. Lastly, we will train machine learning models with these and demographic data and come to a conclusion on the depression level of the participant. The PHQ-9 depression level will work as a validation factor. As the data collection procedure of the research is still ongoing, the number of sketches and EEG data is limited. As a result, obtaining the intended conclusion and accuracy was not possible yet.

4 CONCLUSION

Depression experienced among cancer patients is a common response, and it needs to be taken care of too. Since depression may affect the patients' treatment procedure and overall recovery if not dealt with, we hope that we will be able to screen the potential causes of depression among cancer patients and reduce their suffering. We also hope the outcome of the study will eradicate the communication barrier and the pressure of in-person clinical diagnosis.

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