
Mobile Technology to Detect and Modify Depression and Sedentary Behavior During Cancer Treatment

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Abstract

Approximately 30% of patients living with cancer develop clinical depression, with many more reporting subthreshold symptoms of depression and anxiety. My research focuses on depression and health behavior in the context of cancer and the role of technology in detecting and changing mental risk states during cancer treatment.

Author Keywords

Depression; sedentary behavior; physical activity; passive sensing; cancer; patient-generated data.

ACM Classification Keywords

H.5.m [Information interfaces and presentation (e.g., HCI)]: Miscellaneous;

Introduction

After a cancer diagnosis, approximately 30% of patients develop clinically significant depression, with many others developing subclinical depressive symptoms. Depressive symptoms impair quality of life and relationships, reduce adherence to recommended medical treatments, sap motivation to engage in previously valued activities, and exacerbate physical symptoms. My research aims to answer two related questions: (1) What impact do depressive symptoms and related unhealthy behaviors have on clinical cancer outcomes? and (2) How can technology be leveraged to detect and intervene on depression and related behaviors during cancer treatment so that patient quality of life and outcomes can be optimized? Trained as a clinical psychologist, I am an assistant professor of Medicine and Psychology at the University of Pittsburgh, adjunct faculty in Human-Computer Interaction Institute at Carnegie Mellon University,

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member of the UPMC Hillman Cancer Center, and core faculty of the University of Pittsburgh Center for Behavioral Health and Smart Technology. Our research has demonstrated that patients reporting clinically significant depressive symptoms are nearly six times more likely to be readmitted after cancer surgery than those who are not depressed [2]. Depressed patients are also likely to engage in more sedentary behavior, and we have found that both sedentary behavior patterns [1] and step counts [3] also predict readmission risk after cancer surgery. We have also reported that models relying only on passive smartphone sensors can accurately estimate daily fluctuations patient-reported symptoms during chemotherapy [4], and we are completing data collection for a study testing whether an approach using smartphone sensors and machine learning can also estimate readmission risk after surgery. We are embarking on several new lines of research, including a randomized controlled trial of a technology-supported sedentary behavior intervention which we hypothesize will reduce psychological and physical symptoms as well as readmission risk after surgery. Finally, we are committed to future work aimed at integrating patient-generated smartphone, wearable, and other data into clinical care. With an estimated 39% of U.S. adults facing a cancer diagnosis in their lifetime, harnessing technology to allow scalable remote monitoring of cancer patients for depression and other risk states could have tremendous public health impact, but it will be essential to work collaboratively with both patients and providers to ensure that our risk stratification models and behavioral interventions can be implemented into the clinical workflows as well as patients' daily lives.

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