



Using Human Centered Design for Technology-Enabled Behavioral Treatment of Depression in Urban and Rural Cancer Centers

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Project Overview

Depression is highly prevalent but under-treated in patients with cancer, despite being a major modifiable contributor to morbidity and early mortality. Integrating psychosocial care into cancer services through the team-based Collaborative Care Management (CoCM) model has been proven to be effective in improving patient outcomes in cancer centers. However, there is currently a gap in understanding the challenges that patients and their care team encounter in managing co-morbid cancer and depression in integrated psycho-oncology care settings. Our research goals are: 1) to **discover** contextual factors, challenges and needs in the depression care of patients with co-morbid cancer and depression and to identify technology design opportunities to improve access to behavioral activation (BA), an evidence-based treatment in the context of CoCM, and 2) to **design** an early prototype for the digital platform that addresses the challenges in implementation and technology support that were uncovered.

Population/Sample

Discover phase: contextual inquiries 8 providers and 26 patients. Semi-structured interviews with 11 patients (55% ethnic minorities, 45% rural), 15 social work, psychology, psychiatry, and oncology providers (27% rural), and 3 administrators in 3 cancer centers. Patient age ranged from 24 to 89 years old with mean of 47.0 and standard deviation of 18.0.

Design phase: Semi-structured interviews with 6 patients (1 ethnic minority, 1 rural). Patient age ranged from 21 to 72 years old with mean of 57.2 and standard deviation of 20.2. All patients in the study were diagnosed with clinically significant depression (PHQ-9 \geq 10).

Key Findings

In the **Discover** phase, we found that patients with co-morbid cancer and depression struggle to navigate between their cancer and psychosocial care journeys. Therefore, conceptualizing co-morbidities as separate and independent care journeys is insufficient for characterizing this complex care context. We developed and applied the parallel journeys framework as a conceptual design framework to analyzing our data and examining breakdowns and challenges to care that occur at the intersection of the parallel care journeys. For example, Patients normalized depression and hesitated to reach out, often falling into emotional crises where BHPs found themselves being pulled into crisis mode away from other responsibilities. Patients suffered from physical and cognitive side effects of cancer treatments as well as changing stressors that led to frequent adjustments or disruptions to depression treatment. Patients discharged from the cancer center discontinued depression care and were left to manage their own care. From these challenges, we identified technology design opportunities such as providing tools for self-assessment and population-based patient monitoring, providing access to digital psychosocial interventions and treatment modalities, documenting shared

understanding between patients and providers, supporting timely and appropriate communication, and improving access to online and community resources.

In the **Design** phase, our patient app prototype received an average usability score of 92 out of 100 and an average implementation measure of 4.6 out of 5. We identified additional design considerations. For example, patient engagement in technology systems must be motivated through collaboration with providers through appropriate care workflow integration. Technology design must accommodate the effects of cancer and depression. Lastly, technology design must allow setting clear expectations and boundaries around communication and sharing to give patients agency over when and where their information is sent to.

Figure 1. Overview of proposed system components and relationships. Mixed-method analyses will examine collected data in terms of system components and their usage within the illustrated care relationships.

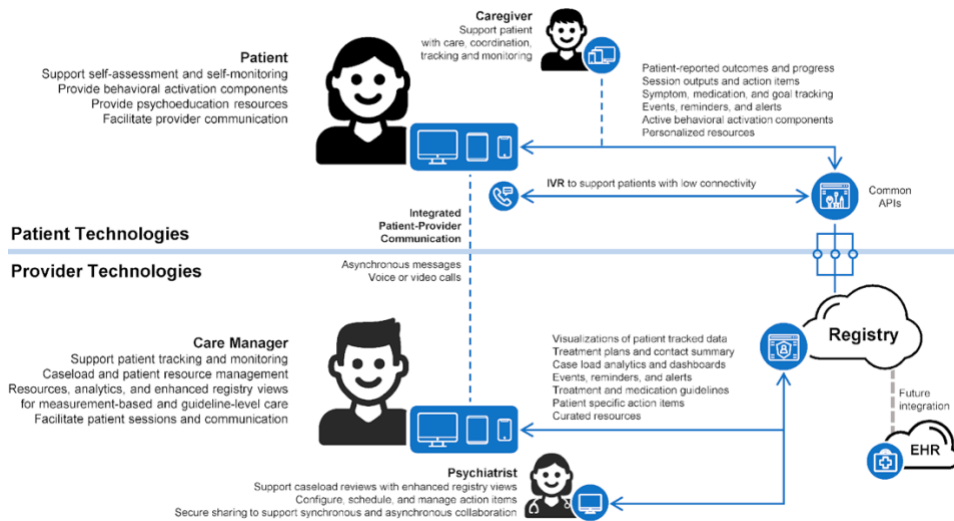
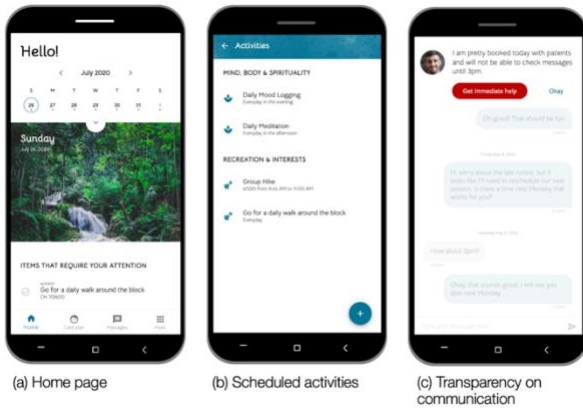


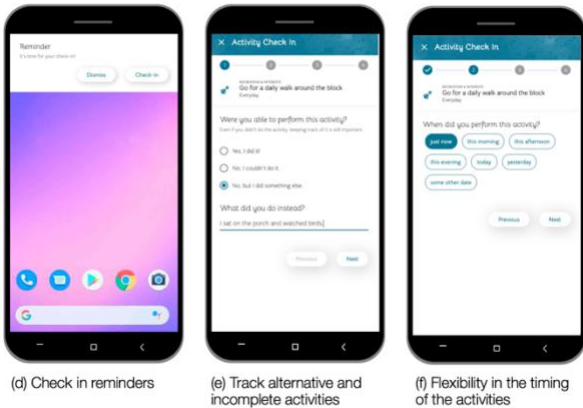
Figure 1

Figure 2. Highlighted screenshots from design prototypes. (a) Home page of the app shows an easily accessible calendar and action items for today. (b) Patients can schedule activities that align with important life areas. (c) Care managers can provide a brief message to share their communication availability with patients. (d) In-app reminders help patients complete self-assessments of patient-reported outcomes. (e) Patients can track alternative or incomplete activities to discuss with care managers. (f) Logging the timing of the activities is flexible to improve ease of use.



Measures used

- Patients' depression were assessed with [PHQ-9](#).
- We assessed the usability of the design prototypes using the [System Usability Scale \(SUS\)](#).
- We assessed the implementation outcomes using modified, single-item versions of the [Acceptability of Intervention Measure \(AIM\)](#), [Intervention Appropriateness Measure \(IAM\)](#), and [Feasibility of Intervention Measure \(FIM\)](#).



Methods

In the **Discover** phase, we used a combination of semi-structured interviews and contextual inquiries. In the **Design** phase, we used semi-structured interviews. Our analysis included inductive thematic analysis with multiple researchers independently and collaboratively coding the qualitative data to extract salient themes from the data.

Figure 2

Next steps

We have conducted two additional iterations of the **Design** phase to refine our system prototypes. We designed and developed both provider-facing registry and patient-facing app that facilitate BA and CoCM. We are currently conducting a randomized control trial comparing technology-enhanced CoCM to usual CoCM with over 390 patients across 5 cancer centers.

Recommended readings

Suh, J., Williams, S., Fann, J. R., Fogarty, J., Hsieh, G., & Bauer, A. M. [Parallel Journeys of Patients with Cancer and Depression: Challenges and Opportunities for Technology-Enabled Collaborative Care](#). CSCW 2020:

Suh, J., Williams, S., Fann, J. R., Fogarty, J., Hsieh, G., & Bauer, A. M. [Human-Centered Methods to Inform the Design of Information Technologies for Team-Based Depression Care](#). AMIA CIC 2020:

Suh, J., Williams, S., Fann, J.R., Fogarty, J., Bauer, A.M., and Hsieh, G. [A Parallel Journeys Perspective on Technology-Supported Depression Care for Patients with Cancer](#). CHI 2020, Workshop on Technology Ecosystems & Mental Health.