

A systematic literature review of the use of mHealth apps to improve quality of life (QoL) in cancer patients

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Introduction

- Providing cancer patients with sufficient psychological treatment and care is becoming more valued as the burden of disease and effect of treatment can often have negative impacts on patients' quality of life (QoL).
- QoL is an important indicator for the quality of medical care and can provide important insights into the effectiveness of interventions that are not otherwise measured.
- There is evidence that cancer patients and their care providers are quite willing to use mobile applications to support their treatment^{1, 2}. However, the population targets of such mobile applications vary, with a wide range of data recorded from the applications.
- To our knowledge, the overall effect of such digital apps on the quality of life in cancer patients remains largely unknown and has not been extensively examined.

Objective

- To conduct a systematic literature review on the use of mHealth apps to improve QoL and various psychological outcomes in surviving cancer patients.

Methodology

- Randomized trials or observational studies that included the use of mHealth apps for cancer patients were identified in Pubmed. Studies were published between January 1, 2010 and March 1, 2020, included mHealth apps as an intervention, and adult (≥18) cancer (at any primary site) patients. Case studies and non-human studies were excluded.
- The target outcomes were quality of life measures, including broader psychological outcomes such as anxiety and depression.
- Titles and abstracts were firstly screened for the eligibility criteria listed above, and full text articles were subsequently assessed for final data extraction.

Results

- A total of 129 hits were included from the search terms. There were 70 studies were included after abstract review, and 42 studies were included in the extraction after full-text review. The majority (45.2%) were conducted in Asia; 38.1% in the United States; and 16.7% in Europe (Table 1).
- Most interventions (95.2%) used a mobile app; 6 (14.3%) also included a wearable device and 2 (4.8%) also included access by computer (Figure 1). Only 2 (4.8%) used the app via iPad only.
- Most apps (47.6%) focused on general support or education as part of the study objectives or intent; 7 (16.7%) on either physical activity or weight loss; 5 (11.9%) on rehabilitation (Table 2). A few studies focused on pain management or stress management (7.1%); two were specifically for individual tailored cognitive behavioral therapy (CBT) (4.8%), and one focused on palliative care (2.4%).
- Nearly half of all studies were on female cancers (breast, 42.9%; gynecological, 4.8%) and 23.8% included multiple sites (Table 3).

Table 1: mHealth studies included by country

By Country	N	%
Asia		
China	7	16.7%
South Korea	8	19.0%
Taiwan	2	4.8%
Japan	2	4.8%
Europe		
Ireland	1	2.4%
Sweden	2	4.8%
Norway	1	2.4%
Switzerland	1	2.4%
Spain	1	2.4%
UK	1	2.4%
US	16	38.1%

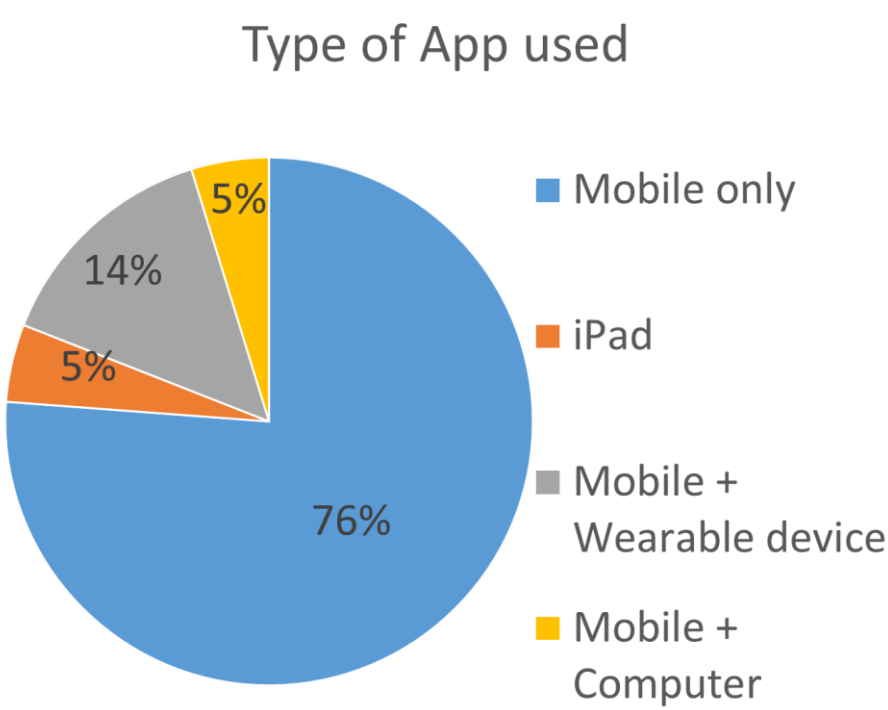


Figure 1: Type of mHealth app used by studies

Table 2: mHealth studies included by its app objectives

App focus	N	%
General support	20	47.6%
Rehabilitation	5	11.9%
Physical activity	6	14.3%
Pain management	2	4.8%
Stress management	1	2.4%
Weight loss	1	2.4%
Palliative care	1	2.4%
Tailored CBT	2	4.8%
Improving HRQoL	2	4.8%
Treatment adherence	1	2.4%
Reduce fear of cancer recurrence	1	2.4%

CBT; Cognitive behavior therapy
HRQoL; Health-related quality of life

Table 3: Primary cancer site of patients targeted by mHealth app

Type of cancer	N	%
Breast	18	42.9%
Colon	1	2.4%
Colorectal	2	4.8%
Gynecological	2	4.8%
Hepatocellular carcinoma	1	2.4%
Lung	4	9.5%
Myeloproliferative	1	2.4%
Neuroendocrine	1	2.4%
Pancreatic	1	2.4%
Prostate	1	2.4%
Multiple sites*	10	23.8%

* 4 out of 10 reported the sites of primary cancer for the patients included; all 4 included breast and 2 also included hematological malignancies.

QoL Outcomes of mHealth App Users

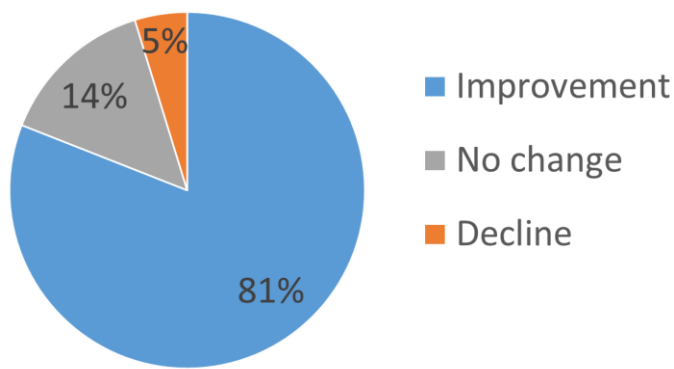


Figure 2: Outcomes of main QoL measures for mHealth app users

Results (cont.)

- The most common instrument used was the Hospital Anxiety and Depression Scale (HADS) (N=12; 28.6%), followed by the European Organization for Research and Treatment of Cancer quality of life questionnaire (EORTC QLQ-C30) (N=11; 26.2%) and Functional Assessment of Cancer Therapy - General (FACT-G) (N=8; 19.0%). Cancer-specific instruments were considered in 9 (21.4%) studies, which included FACT for colorectal cancer (FACT-C), FACT for breast cancer (FACT-B), EORTC QLQ for pancreatic cancer (QLQ-PAN26), EORTC QLQ for breast cancer (QLQ-BR23), and EORTC QLQ for prostate cancer (QLQ-PR25). In 26 studies (61.9%), two or more QoL instruments were evaluated.
- For mHealth users, the majority of studies (81.0%) showed improvement in key psychological measures across time, 11.9% showed no change, and 7.1% reported a decline (potentially due to their cancer) (Figure 2). Nearly half of all studies (47.6%) reported significant improvement for at least one psychological measure evaluated across time.
- Over one-third of studies (35.7%) used a pre-post study design without a comparison group. Among the studies with a comparison control arm, 12 (44%) of studies reported at least one significantly better key outcome favoring the intervention group.

Limitation

- Due to several subscales and instruments used by the included studies, it is likely that at least one subscale would show improvement by chance. Thus more rigorous evaluation methods would provide more insight in future analyses

Conclusion

- The majority of studies showed improvement for at least one key domain evaluated, and nearly half of them were statistically significant.
- The focus on mHealth interventions currently lies in East Asian countries and for female oncology patients.
- Given these promising results, a meta-analysis further evaluating the magnitude of the effect of mHealth interventions would be imperative in further understanding and maximizing its benefits.

Reference

1. Kessel KA, Vogel MM, Schmidt-Graf F, Combs SE. Mobile Apps in Oncology: A Survey on Health Care Professionals' Attitude Toward Telemedicine, mHealth, and Oncological Apps. J Med Internet Res 2016;18(11):e312. DOI: [10.2196/jmir.6399](https://doi.org/10.2196/jmir.6399)
2. Kessel KA, Vogel MM, Kessel C, et al. Mobile Health in Oncology: A Patient Survey About App-Assisted Cancer Care. JMIR Mhealth Uhealth. 2017;5(6):e81. Published 2017 Jun 14. doi:10.2196/mhealth.7689