Mobile Phone Apps for Quality of Life and Well-being Assessment in Breast and Prostate Cancer Patients: Systematic Review

doi:10.2196/mhealth.8741

Authors:
Esther Rincon, Ph.D.; Francisco Monteiro-Guerra, MS; Octavio Rivera-Romero, Ph.D.; Enrique Dorronzoro-Zubiete, Ph.D.; Carlos Luis Sanchez-Bocanegra, Ph.D.; Ella Gabarron, Ph.D.

Editor:
Gunther Eysenbach
INTRODUCTION

• The number of new cancer cases diagnosed every year worldwide is rapidly rising:
  14.1 M in 2012 to over 20 M predicted by 2030
• Breast and prostate cancers are the most prevalent diagnosed in women and men, respectively
• 30% to 40% of cancer patients suffer from psychological distress – anxiety and depression
• This associates with a poorer quality of life (QoL)

• Mobile phone health apps are increasingly gaining attention in oncologic care
• Useful for monitoring patients and provide valuable data for both patients and healthcare professionals
• These apps have the potential to empower cancer patients and improve their QoL and well-being
• The number of studies concerning the use of these technologies to support breast and prostate cancer patients is rising

• However, there are only a few apps that are designed for these individuals
• There are still important concerns regarding the quality of available apps and satisfaction of use

There is a need to properly review mobile health apps focused on QoL and well-being in breast and prostate cancer patients
The objectives of this study

To identify evidence-based mobile phone health apps focused on QoL and well-being (anxiety and depression symptoms) and targeting breast and/or prostate cancer patients

To recognize their clinical and technological characteristics

To categorize their clinical and technological strengths and weaknesses

To determine patients’ user experience
METHODS LITERATURE REVIEW

Selection Criteria

- Trials; peer-reviewed studies; published between January 1, 2000 and July 12, 2017
- Studies including a mobile phone app focused on QoL and/or well-being and used by breast and/or prostate cancer patients
- Excluded articles: not involving a mobile phone app; medical studies; systematic reviews and meta-analyses; abstract or congress papers; qualitative studies; study protocols; and studies not including QoL or well-being assessment
- No language restrictions were applied

Search strategy

- PRISMA guidelines
- Search done on July 12, 2017
- Extracted trials from: the Cochrane Library; EMBASE; PsycINFO (via ProQuest); PubMed; Scopus; and MEDLINE (via OvidSP)
- Keywords: “breast cancer + app”; “breast cancer + mHealth”; “breast cancer + mobile application”; “prostate cancer + app”; “prostate cancer + mHealth”; and “prostate cancer + mobile application”

Note: The systematic research protocol is registered at PROSPERO [CRD42017073069]
METHODS
LITERATURE REVIEW

Data Extraction

General patient and study characteristics

Clinical characteristics

Clinical strengths and weaknesses

Technological characteristics *

Technological strengths and weaknesses *

Patients’ user experience *

* Information complemented with market review of apps identified
METHODS MARKET REVIEW

Data Extraction

- Mobile phone apps identified in literature downloaded from online store
- Further detailing technological characteristics
- Further examining technological strengths and weaknesses
- Identifying user experience (satisfaction level and comments regarding the app used)
Based on titles and abstracts, 18 records were selected for full text screening.

5 publications were finally included among the three reviewers (ER, EG and FG).

Inter-rater agreement of kappa was found in the first review round (kappa=.561).

All the chosen studies were deemed to be of sufficient quality to contribute equally to the thematic synthesis.
There were 5 studies included, with a total of 644 patients, mean age 52.16 years. The majority of the studies targeted breast cancer patients, with only 1 focused on prostate cancer.

<table>
<thead>
<tr>
<th>STUDY</th>
<th>PUBLICATION YEAR</th>
<th>COUNTRY / LANGUAGE</th>
<th>PARTICIPANT NUMBER</th>
<th>MEAN AGE</th>
<th>CANCER TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kim et al [42]</td>
<td>2016</td>
<td>Korea / Korean</td>
<td>78</td>
<td>44.35</td>
<td>Breast</td>
</tr>
<tr>
<td>McCarroll et al [43]</td>
<td>2015</td>
<td>US / English</td>
<td>50</td>
<td>58.4</td>
<td>Breast</td>
</tr>
<tr>
<td>Min et al [44]</td>
<td>2014</td>
<td>Korea / Korean</td>
<td>30</td>
<td>45</td>
<td>Breast</td>
</tr>
<tr>
<td>Sundberg et al [45]</td>
<td>2017</td>
<td>Sweden / Swedish</td>
<td>130</td>
<td>69</td>
<td>Prostate</td>
</tr>
<tr>
<td>Uhm et al [46]</td>
<td>2017</td>
<td>Korea / Korean</td>
<td>356</td>
<td>50.3</td>
<td>Breast</td>
</tr>
</tbody>
</table>
### RESULTS CLINICAL APPROACH

<table>
<thead>
<tr>
<th>STUDY</th>
<th>QOL ASSESSMENT</th>
<th>FUNCTIONALITIES</th>
<th>VALIDATED QUESTIONNAIRE/TIMING</th>
<th>TREATMENT OFFERED</th>
<th>QUALITY OF STUDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kim et al [42]</td>
<td>No</td>
<td>PRO: daily mental health ratings over a 48-week period</td>
<td>PHQ-9 via app biweekly</td>
<td>No</td>
<td>Low-Medium</td>
</tr>
<tr>
<td>McCarroll et al [43]</td>
<td>Yes</td>
<td>PRO: daily, real-time, and motivational feedback + intervention</td>
<td>FACT-G, WEL at baseline and at 4-week follow-up</td>
<td>Comprehensive lifestyle program</td>
<td>Low-Medium</td>
</tr>
<tr>
<td>Min et al [44]</td>
<td>Yes</td>
<td>PRO: daily basis over a 90-day period</td>
<td>BDI, EQ-5D-3L via app on a daily basis for 90-days</td>
<td>No</td>
<td>Low-Medium</td>
</tr>
<tr>
<td>Sundberg et al [45]</td>
<td>Yes</td>
<td>PRO: daily, real-time assessment of symptoms and concerns during radiotherapy</td>
<td>EORTC QLQ-C30, EORTC QLQ-PR25 via app daily at any time during radiotherapy and 3 weeks after</td>
<td>Management of symptoms</td>
<td>Medium-High</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ intervention*</td>
<td>completion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uhm et al [46]</td>
<td>Yes</td>
<td>PRO + intervention*</td>
<td>EORTC QLQ-C30, EORTC QLQ-BR23 at baseline and 12 weeks</td>
<td>12-week regimen of aerobics</td>
<td>Medium-High</td>
</tr>
</tbody>
</table>

4 of the 5 included studies referred to apps that assessed QoL [43-46]

Other variables measured: depression status, daily food intake, sleep disturbance, sense of coherence, physical activity, user satisfaction, and others

All the studies allow patients to collect patient-reported outcome measures and 3 of them include a related-intervention app [43, 45, 46]

Adherence to the self-reporting measures was associated with higher accuracy of depression screening.

Of the 3 studies that included intervention [43, 45, 46], only 2 reported a QoL improvement [45, 46]

2 prospective nonrandomized multicenter controlled trials, 1 with control group.

No RCTs

* Significant improvement in quality of life
2 studies involved the same app [42,44] 
Only 1 app was available for download at the online store, with a free and premium version

Three of the 4 apps were targeted at cancer patients

The main features of the apps were focused on: exercise and nutrition logging; collection of PROs; detection, reporting and management of symptoms; and exercise by a step counter

App functionalities included: customization and personalization features; motivational features; and social features

<table>
<thead>
<tr>
<th>STUDY</th>
<th>APP NAME</th>
<th>PLATFORM</th>
<th>AVAILABLE IN MARKETS</th>
<th>PRICE</th>
<th>DOWNLOADS</th>
<th>RATINGS</th>
<th>PATIENTS TARGETED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kim et al [42]</td>
<td>Pit-a-Pat</td>
<td>Android/iOS</td>
<td>No</td>
<td>Unknown</td>
<td>Unknown</td>
<td>Unknown</td>
<td>Yes</td>
</tr>
<tr>
<td>McCarroll et al [43]</td>
<td>LoseIt!</td>
<td>Android/iOS</td>
<td>Yes</td>
<td>free/premium</td>
<td>Android: 5,000,000-10,000,000</td>
<td>Android: 4.4; iOS: 4.0</td>
<td>No</td>
</tr>
<tr>
<td>Min et al [44]</td>
<td>Pit-a-Pat</td>
<td>Android/iOS</td>
<td>No</td>
<td>Unknown</td>
<td>Unknown</td>
<td>Unknown</td>
<td>Yes</td>
</tr>
<tr>
<td>Sundberg et al [45]</td>
<td>Interaktor</td>
<td>Unknown</td>
<td>No</td>
<td>Unknown</td>
<td>Unknown</td>
<td>Unknown</td>
<td>Yes</td>
</tr>
<tr>
<td>Uhm et al [46]</td>
<td>Smart After Care</td>
<td>iOS</td>
<td>No</td>
<td>Unknown</td>
<td>Unknown</td>
<td>Unknown</td>
<td>Yes</td>
</tr>
</tbody>
</table>
DISCUSSION

• Mobile phone health apps represent an opportunity to monitor psychological distress and QoL related to cancer
• In this line, we conducted a systematic literature review
• Only 5 studies were identified with apps that focus on QoL and/or well-being assessment in breast or prostate cancer patients

Clinical and Technological Strengths and Weaknesses

👍 The use of related-treatment mobile phone apps have reported a significantly improvement in cancer patients’ QoL
Displaying daily patient reports in real time and providing personalized feedback are a significant advantage
Mobile apps are ubiquitous technologies with the potential to monitor patients and provide personalized interventions in real-time
These may take advantage of internal or external sensors to collect data

👎 Lack of framework-based and cancer-focused apps used in studies involving cancer patients
Small samples of studies and lack of RCT protocols
Usability and accessibility issues with cancer patients

Patients’ satisfaction with the health apps

👍 Only one study provided information about satisfaction level using the app
From the market review, only one app reported a quality certification and a considerable number of user comments

More evidence-based apps are needed for breast and prostate cancer
These apps must be cancer-focused and consider usability and accessibility issues
Important to consider patient satisfaction using the app
Studies designed based on RCT are imperative for reaching high-quality evidence base for these apps
## LIMITATIONS

<table>
<thead>
<tr>
<th>Excluded apps that were not focused on breast or prostate cancer patients</th>
<th>Considered only the assessment of 2 main psychological variables in psycho-oncological care: QoL and well-being</th>
</tr>
</thead>
<tbody>
<tr>
<td>Psychological measures, such as fatigue or the secondary symptoms produced by the cancer treatments should be considered</td>
<td>We might have missed some studies that were not identified with our search terms or not published</td>
</tr>
</tbody>
</table>
CONCLUSION

Lack of rigorous trials regarding QoL and/or well-being assessment in breast and/or prostate cancer patients

More evidence-based apps, which could be tested in futures RCT protocols, are still needed

Promising results are expected to be available from some RCTs that are still running

A strong and collective effort should be made by all health care providers to determine those cancer-focused apps that are useful and reliable for patients
This publication has received funding from the European Union’s Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement number 722012 (Cancer: Activating Technology for Connected Health).

The authors would like to sincerely thank Dr. Luis Fernandez-Luque for his guidance and support.
All images used in this presentation are free stock photos licensed under Creative Commons
Source: Pexels
URL: https://www.pexels.com/
License: CC0 1.0 Universal (CC0 1.0)
License URL: https://creativecommons.org/publicdomain/zero/1.0/

This is a Multimedia Appendix to a full manuscript published in the JMIR mHealth and uHealth. For full copyright and citation information see http://dx.doi.org/10.2196/mhealth.8741