The Effectiveness of an App-Based Breast Cancer e-Program in China: A Multi-Center Randomized Controlled Trial

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Acknowledgement
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Hunter Cancer Research Alliance, Australia
A Mobile Application of Breast Cancer e-Support Program for Chinese Women with Breast Cancer undergoing Chemotherapy: Results of a Multicentre Randomised Controlled Trial
Breast Cancer in **China**

Annual age-standardised female breast cancer incidence (red line) and mortality (blue line) rates in China from 1976 to 2010 and projected incidence and mortality (dotted lines) to 2025. (Wong, et al, 2015)
Integrative Review on the Effectiveness of Internet-Based Interactive Programs for Women With Breast Cancer Undergoing Treatment

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Zhu and Chan completed the data collection and provided the statistical support and analysis. All of the authors contributed to the conceptualization and design and the manuscript preparation.

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Keywords: breast cancer; Internet-based interactive program; self-efficacy; psychological well-being; symptom distress; quality of life

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Problem Identification: Internet-based interactive programs have been developed to address health needs for women with breast cancer undergoing treatment, but evidence has been inadequate to establish the effectiveness of these programs. This article aims to synthesize studies published in English or Chinese regarding the effectiveness of these programs on the outcomes of symptom distress, social support, self-efficacy, quality of life, and psychological well-being for women with breast cancer undergoing treatment.

Literature Search: CINAHL Complete, MEDLINE®, Mosby's Nursing Index, PsyCINFO®, Scopus, Web of Science, Joanna Briggs Institute, Cochrane Library, Embase, and China National Knowledge Infrastructure. Databases were searched from the start of the database to April 2015.

Data Evaluation: 174 articles were retrieved, yielding 23 eligible articles. A manual search led to an additional five eligible articles. After 10 were excluded, 3 qualitative and 15 quantitative studies were evaluated. Data were analyzed to identify similarities and differences across articles.

Synthesis: Internet-based interactive programs moderated by healthcare professionals have demonstrated positive effects on women's self-efficacy, symptom distress, and psychological well-being, but inconclusive effects have been found on social support and quality of life.

Conclusions: Moderated Internet-based interactive programs are a promising intervention for women with breast cancer undergoing treatment.

Implications for Research: Studies with more robust research designs and theoretical frameworks and conducted in different countries and cultures are warranted to elucidate the effectiveness of these programs.

Women with breast cancer who are undergoing active treatment, including surgery, chemotherapy, or radiation therapy, may suffer from a number of symptoms that often interfere with their lives (Cheng, Wong, Ling, Chan, & Thompson, 2009; Dodd, Cho, Cooper, & Miaskowski, 2010). Symptom management is crucial for women with breast cancer, and the reduction of symptom distress is a critical indicator of successful psychosocial support (Ruland et al., 2013). Self-efficacy is a crucial concept in symptom management because it determines how women think, feel, self-motivate, and perform (Bandura, 1977). Social support also plays an important role in how women with breast cancer deal with their diagnoses and treatments (Lou, Yates, McCarthy, & Wang, 2013; Smith et al., 2011). Patients' symptom distress, self-efficacy, and social support are three interrelated components that influence a person's ability to cope with chronic disease (Hunt et al., 2012; Lou et al., 2013). In addition, women with breast cancer undergoing treatment are reported to experience poor quality of life (QOL) and psychological well-being (So et al., 2010; Tsitsis & Lavdani, 2014). Therefore, healthcare
Aim of this study

Aim

Develop and evaluate a mobile application of Breast Cancer e-Support (BCS) program for Chinese women with breast cancer undergoing chemotherapy

Hypotheses

- Self-efficacy
- Social support
- Quality of Life
- Symptom distress
- Anxiety and depression

Zhu, Ebert, Liu, Chan, (2017)
Research design

Phase I
Develop the Breast Cancer e-Support program

Phase II
A single-blinded Randomised Controlled Trial (RCT)

Phase III
Process evaluation
Breast Cancer e-Support (BCS)

Theoretical framework for Breast Cancer e-Support program
症状护理

上肢淋巴水肿 (Upper limb lymphedema)

上肢淋巴水肿的处理

睡眠问题 (Sleep problem)

睡眠是机体修复的时间。如果得不到足够的睡眠，患者会出现疲乏。

自我形象改变 (Change in self-image)

术后一侧或两侧的乳房缺如，使患者不敢抬头挺胸，精神萎靡。

口腔炎 (Oral mucositis)

如何应对口腔炎呢？

讨论中心

长沙-赵素容

各位老师们，姐妹们大家早上好！

12月16日 10:08

长沙-赵素容

我动手术有两个半月啦，每天坚持慢跑一公里，练一次五禽戏，感觉很好！

12月17日 00:07

中山-潘怡

我也每天慢跑一公里😊 这两天风有点大

12月17日 00:08

中山-潘怡

我在放疗，有在放疗的姐妹吗？

发送 😊
化疗期间要吃什么好

多吃点高蛋白、高维生素类的食品

忌油腻、腌制、油炸食品

中药调理有用吗

找一个好的中医调理一下可以辅助化疗效果。绿豆可以清火，泡水...
Technical Note

Development of a mobile application of Breast Cancer e-Support program for women with breast cancer undergoing chemotherapy

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Abstract.
BACKGROUND: Women with breast cancer undergoing chemotherapy experience a variety of physical and psychosocial symptoms, which have negative effect on women’s quality of life and psychological well-being. Although M-health technologies provides innovative and easily accessible option to provide psychosocial support, mobile phone based interventions remain limited for these women in China.
OBJECTIVE: To develop a new mobile application to offer information as well as social and emotional support to women with breast cancer undergoing chemotherapy to promote their self-efficacy and social support, thus improving symptom management strategies.
METHODS: Basing on previous theoretical framework which incorporated Bandura’s self-efficacy theory and the social exchange theory, a new mobile application, called Breast Cancer e-Support Program (BCS) was designed, with the content and functionality being validated by the expert panel and women with breast cancer.
RESULTS: BCS App program has four modules: 1) Learning forum; 2) Discussion forum; 3) Ask-the-Expert forum; and 4) Personal Stories forum. BCS program can be applied on both android mobile phones and iPhones to reach more women.
CONCLUSIONS: This is the first of its kind developed in China for women with breast cancer undergoing chemotherapy. A randomized controlled trial is undertaking to test the effectiveness of BCS program.

Keywords: M-health, mobile phone, application, breast cancer, chemotherapy, symptom management

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Breast Cancer e-Support Program

Zhongshan Hospital,
Xiamen University

Hunan Cancer Hospital,
Central South University
CONSORT Flowchart

Enrollment

Assessed for eligibility (n=163)
- Excluded (n=49): Not eligible (n=32), Refused (n=17)

Completed T0 assessment and randomisation (n=114)

Allocation

Allocated to intervention group (n=57)
- Receive BCS+ routine care (n=56)
- Exclude (n=1): Withdrew (n=1)

Allocated to control group (n=57)
- Receive routine care (n=50)
- Excluded (n=7): withdrew (n=4), ceased chemotherapy (n=1), transfer to another hospital (n=1), Uncontactable (n=1)

Completed T1 assessment at 3 months (n=56)

Completed T1 assessment at 3 months (n=50)

Follow-up

Lost follow-up (n=1): withdrew (n=1)

Lost follow-up (n=1): uncontactable (n=1)

Completed T2 assessment at 6 months (n=55)

Completed T2 assessment at 6 months (n=49)

Analysis

Intention-to-treat analysis (n=57)

Intention-to-treat analysis (n=57)
<table>
<thead>
<tr>
<th>Variables</th>
<th>Total (n=114) N(%)/Mean(SD)</th>
<th>BCS participants (n=57) N(%)/Mean(SD)</th>
<th>Control participants (n=57) N(%)/Mean(SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age: mean(SD)</strong></td>
<td>47.2(8.3)</td>
<td>46.2(8.5)</td>
<td>48.2(8.1)</td>
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<tr>
<td><strong>Marital Status</strong></td>
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<td></td>
<td></td>
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<tr>
<td>Married</td>
<td>111(97.4)</td>
<td>57(100.0)</td>
<td>54(94.7)</td>
</tr>
<tr>
<td>Single</td>
<td>2( 1.8)</td>
<td>0(  0.0)</td>
<td>2(  1.0)</td>
</tr>
<tr>
<td>Divorce</td>
<td>1(  0.9)</td>
<td>0(  0.0)</td>
<td>1(  0.5)</td>
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<td><strong>Education Level</strong></td>
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<td></td>
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</tr>
<tr>
<td>No education</td>
<td>18(15.8)</td>
<td>9(15.8)</td>
<td>9(15.8)</td>
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<tr>
<td>Elementary school</td>
<td>31(27.2)</td>
<td>13(22.8)</td>
<td>18(31.6)</td>
</tr>
<tr>
<td>Junior middle school</td>
<td>33(28.9)</td>
<td>16(28.1)</td>
<td>17(29.8)</td>
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<tr>
<td>High School</td>
<td>20(17.5)</td>
<td>11(19.3)</td>
<td>9(15.8)</td>
</tr>
<tr>
<td>University or above</td>
<td>12(10.5)</td>
<td>8(14.0)</td>
<td>4(  7.0)</td>
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<tr>
<td><strong>Family income (RMB) #</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;1000</td>
<td>22(19.3)</td>
<td>14(24.6)</td>
<td>8(14.0)</td>
</tr>
<tr>
<td>1000~2999</td>
<td>60(52.6)</td>
<td>24(42.1)</td>
<td>36(63.2)</td>
</tr>
<tr>
<td>3000~4999</td>
<td>17(14.9)</td>
<td>10(17.5)</td>
<td>7(12.3)</td>
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<tr>
<td>&gt;5000</td>
<td>14(12.3)</td>
<td>8(14.0)</td>
<td>6(10.5)</td>
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<td>1( 0.9)</td>
<td>1( 1.8)</td>
<td>0( 0.0)</td>
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<tr>
<td><strong>Occupation #</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>19(16.7)</td>
<td>10(17.5)</td>
<td>9(15.8)</td>
</tr>
<tr>
<td>No</td>
<td>86(75.4)</td>
<td>44(77.2)</td>
<td>42(73.7)</td>
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<td>9(  7.9)</td>
<td>3(  5.3)</td>
<td>6(10.5)</td>
</tr>
<tr>
<td>Variables</td>
<td>Total (n=114) N(%)/Mean(SD)</td>
<td>BCS participants (n=57) N(%)/Mean(SD)</td>
<td>Control participants (n=57) N(%)/Mean(SD)</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>-----------------------------</td>
<td>---------------------------------------</td>
<td>------------------------------------------</td>
</tr>
<tr>
<td><strong>BMI (kg/m²):</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>23.4(2.9)</td>
<td>23.0(2.6)</td>
<td>23.7(3.2)</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Cancer Stage</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>21(18.4)</td>
<td>9(15.8)</td>
<td>12(21.1)</td>
</tr>
<tr>
<td>2</td>
<td>49(43.0)</td>
<td>28(49.1)</td>
<td>21(36.8)</td>
</tr>
<tr>
<td>3</td>
<td>42(36.8)</td>
<td>19(33.3)</td>
<td>23(40.4)</td>
</tr>
<tr>
<td>4</td>
<td>2(  1.8)</td>
<td>1(  1.8)</td>
<td>1(  1.8)</td>
</tr>
<tr>
<td><strong>Surgery</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breast conserving surgery</td>
<td>5(  4.4)</td>
<td>3(  5.3)</td>
<td>2(  3.5)</td>
</tr>
<tr>
<td>Mastectomy</td>
<td>97(85.1)</td>
<td>45(78.9)</td>
<td>52(91.2)</td>
</tr>
<tr>
<td>Others</td>
<td>12(10.5)</td>
<td>9(15.8)</td>
<td>3(  5.3)</td>
</tr>
<tr>
<td><strong>Comorbidity</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>3(  2.6)</td>
<td>1(  1.8)</td>
<td>2(  3.5)</td>
</tr>
<tr>
<td>No</td>
<td>111(97.4)</td>
<td>56(98.2)</td>
<td>55(96.5)</td>
</tr>
<tr>
<td><strong>Complication</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>1(  0.9)</td>
<td>0(  0.0)</td>
<td>1(  1.8)</td>
</tr>
<tr>
<td>No</td>
<td>113(99.1)</td>
<td>57(100.0)</td>
<td>56(98.2)</td>
</tr>
<tr>
<td><strong>Health Outcomes</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>224.7(59.2)</td>
<td>235.3(64.6)</td>
<td>214.1(51.7)</td>
</tr>
<tr>
<td>Social support</td>
<td>5.5(  0.7)</td>
<td>5.6(  0.7)</td>
<td>5.4(  0.8)</td>
</tr>
<tr>
<td>Symptom severity</td>
<td>3.5(  2.0)</td>
<td>3.3(  2.0)</td>
<td>3.7(  2.0)</td>
</tr>
<tr>
<td>Symptom interference</td>
<td>3.1(  1.9)</td>
<td>2.8(  1.8)</td>
<td>3.3(  2.1)</td>
</tr>
<tr>
<td>Quality of life</td>
<td>92.8(18.4)</td>
<td>94.6(19.5)</td>
<td>90.9(17.3)</td>
</tr>
<tr>
<td>Anxiety</td>
<td>9.9(  2.4)</td>
<td>10.3(  2.4)</td>
<td>9.5(  2.3)</td>
</tr>
<tr>
<td>Depression</td>
<td>12.6(  2.2)</td>
<td>12.6(  2.0)</td>
<td>12.6(  2.4)</td>
</tr>
</tbody>
</table>
Mean Change of Health Outcomes from Baseline, 12th week to 24th week (n=114)

A. Change in Self-efficacy Scores at Three Time Points

<table>
<thead>
<tr>
<th>Time Point</th>
<th>Intervention</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>T0</td>
<td>235.3</td>
<td>214.1</td>
</tr>
<tr>
<td>T1</td>
<td>227.1</td>
<td>197.1</td>
</tr>
<tr>
<td>T2</td>
<td>232.1</td>
<td>220.9</td>
</tr>
</tbody>
</table>

B. Change in Quality of Life Scores at Three Time Points

<table>
<thead>
<tr>
<th>Time Point</th>
<th>Intervention</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>T0</td>
<td>94.6</td>
<td>90.9</td>
</tr>
<tr>
<td>T1</td>
<td>92.9</td>
<td>84.1</td>
</tr>
<tr>
<td>T2</td>
<td>92.2</td>
<td>85.7</td>
</tr>
</tbody>
</table>

C. Change in Symptom Interference Scores at Three Time Points

<table>
<thead>
<tr>
<th>Symptom Interference</th>
<th>Intervention</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>T0</td>
<td>2.8</td>
<td>3.3</td>
</tr>
<tr>
<td>T1</td>
<td>3.0</td>
<td>3.9</td>
</tr>
<tr>
<td>T2</td>
<td>3.1</td>
<td>3.8</td>
</tr>
</tbody>
</table>
The association of usage data of BCS program and health outcomes

Baseline
- Self-efficacy
- QoL
- Symptom severity

At 3 months
- Self-efficacy
- Social support
- QoL

At 6 months
- Self-efficacy
- Anxiety

Usage Duration of the BCS Whole Program
• **Self-efficacy.** Self-efficacy theory and social exchange theory are appropriate in guiding the intervention (Zhang M, Chan SW, You L, et al; Shorey S, Chan SWC, Chong YS, et al, 2015).

• **QoL.** App-based intervention can achieve comparative functionality and similar effectiveness regarding QoL as computer-based intervention. (Gustafson et al, 2008)

• **Symptom distress**
  - **Symptom interference subscale**: modify the interpretation
  - **Symptom severity subscale**: hinders the engagement
  - Reduce barriers: involvement of caregiver (Future studies)
Discussion

• ? Social support ↑Engagement ↑Perceived social support. BCS program compared with other online chat platform
  • The credibility of information
  • The consultation from healthcare professionals
  ➢ Promote engagement: address the benefits (Future studies)

  ➢ Access to a wide variety of information materials can increase or decrease patients’ anxiety and depression? (Future studies)

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Abstract

Background: Women undergoing chemotherapy for the treatment of breast cancer have frequently reported unmet supportive care needs. Moreover, easily accessible and innovative support is lacking.

Objective: The purpose of this trial was to determine the effectiveness of an app-based breast cancer e-support program to address women’s self-efficacy (primary outcome), social support, symptom distress, quality of life, anxiety, and depression. Secondary objectives included exploring the association between women’s health outcomes and the breast cancer e-support usage data.

Methods: A multicenter, single-blinded, randomized controlled trial was conducted. A total of 114 women with breast cancer, who were commencing chemotherapy and were able to access internet through a mobile phone, were recruited in the clinics from 2 university-affiliated hospitals in China. Women were randomized either to the intervention group (n=57) receiving breast cancer

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Abstract

Background: Women with breast cancer undergoing chemotherapy experience difficulty in accessing adequate cancer care in China. Mobile apps have the potential to provide easily accessible support for these women. However, there remains a paucity of randomized controlled trials to evaluate the effectiveness of app-based programs targeting specifically women with breast cancer undergoing chemotherapy. Moreover, women’s perceptions and experiences related to using and interacting within the app-based program have rarely been reported. Therefore, an app-based Breast Cancer e-Support program was developed and evaluated using a randomized controlled trial. Based on the incorporation of Bandura’s self-efficacy and social exchange theory, Breast Cancer e-Support program lasted for 12 weeks covering 4 cycles of chemotherapy and had 4 components: (1) a Learning forum, (2) a Discussion forum, (3) an Ask-the-Expert forum, and (4) a Personal Stories forum.

Objective: As a part of the randomized controlled trial, the aim of this study was to explore the participants’ perception of Breast Cancer e-Support program, its strengths and weaknesses, and suggestions to improve the program.

Methods: A descriptive qualitative study was employed. Thirteen women with breast cancer from 2 university-affiliated hospitals in China, who were randomly allocated to the Breast Cancer e-Support program in the randomized controlled trial, were interviewed from November 2016 to February 2017. Purposive sampling was used based on women’s scores of self-efficacy after the completion of the intervention. Inductive content analysis was used to analyze the transcripts, allowing the categories and subcategories to flow from the data.
Summary

• The Breast Cancer e-Support program was feasible and acceptable by the participants.
• Findings showed potentially positive effects on QoL, symptom interference and self-efficacy.
Thank you

Professor Sally Chan
Dean of Nursing
Head of School
School of Nursing and Midwifery
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