

Mobile Health Application-Based Interventions to Improve Self-management of Chemotherapy-Related Symptoms Among People with Breast Cancer Who Are Undergoing Chemotherapy: A Systematic Review

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Abstract

Background: Since the COVID-19 pandemic, there have been an increasing number of studies on using mobile health (mHealth) to support the symptom self-management of patients with breast cancer (BC). However, the components of such programs remain unexplored. This systematic review aimed to identify the components of existing mHealth app-based interventions for patients with BC who are undergoing chemotherapy and to uncover self-efficacy enhancement elements from among them.

Methods: A systematic review was conducted for randomized controlled trials published from 2010 to 2021. Two strategies were used to assess the mHealth apps: The Omaha System, a structured classification system for patient care, and Bandura's self-efficacy theory, which assesses sources of influence that determine an individual's confidence in being able to manage a problem. Intervention components identified in the studies were grouped under the 4 domains of the intervention scheme of the Omaha System. Four hierarchical sources of self-efficacy enhancement elements were extracted from the studies using Bandura's self-efficacy theory.

Results: The search uncovered 1,668 records. Full-text screening was conducted on 44 articles, and 5 randomized controlled trials ($n = 537$ participants) were included. Self-monitoring under the domain of "Treatments and procedure" was the most frequently used mHealth intervention for improving symptom self-management in patients with BC undergoing chemotherapy. Most mHealth apps used various "mastery experience" strategies including reminders, self-care advice, videos, and learning forums.

Conclusion: Self-monitoring was commonly utilized in mHealth-based interventions for patients with BC undergoing chemotherapy. Our survey uncovered evident variation in strategies to support self-management of symptoms and standardized reporting is required. More evidence is required to make conclusive recommendations related to mHealth tools for BC chemotherapy self-management.

Key words: mHealth; applications; breast cancer; chemotherapy; self-management.

Implications for Practice

Due to the closure of clinics during the COVID-19 pandemic, an increasing number of mobile health (mHealth) app-based programs are being used to support self-management for patients with breast cancer (BC) undergoing chemotherapy. This review identified a lack of standardized guidelines for constructing, assessing, and reporting the results of mHealth-based interventions. Healthcare providers can use the Omaha System to develop a structured intervention program. In addition, self-efficacy is an important factor for patients with BC to support symptom self-management at home. Future studies are recommended to adopt an mHealth intervention program containing self-efficacy enhancement elements for fostering self-management among this group of patients.

Introduction

Breast cancer (BC) is the most prevalent form of cancer and the leading cause of death (15.5%) among females worldwide.¹ Chemotherapy has been widely utilized as the first option of treatment for patients with BC in China.² Currently, 81.4% of Chinese patients with BC receive chemotherapy,

with its attendant toxicities.^{2–5} The evidence suggests that cancer patients at home often poorly assess and self-manage their symptoms, including pain, depression, and fatigue.⁶ It is thus critical to provide a self-management program for patients with BC who are receiving chemotherapy.

Previous self-management programs were usually delivered by healthcare professionals when patients visited clinics,^{7,8}

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which was limited during the COVID-19 pandemic.⁹ Further, patients in rural areas have reduced access to professional support. Mobile health (mHealth), which can be described as the utilization of mobile apps to promote health-related behaviors and deliver timely and tailored health care for improving health-associated outcomes has become a major mode of healthcare delivery.¹⁰ Throughout the global pandemic, mHealth apps have gained in popularity to support care management, health information, wellness maintenance, and personal monitoring in order to facilitate the process of symptom self-management.¹¹, p. 489

Self-efficacy, defined as the belief, judgment, and confidence in one's ability to plan and perform a certain behavior/action to gain the desired outcome, has been shown to be an important factor affecting the self-management behavior of patients with BC.^{12,13} Patients with higher self-efficacy levels may have better symptom control due to their self-management ability.¹⁴ Increasingly, mHealth apps have been utilized to support patients with cancer undergoing chemotherapy; however, the evidence regarding the impact of the use of mHealth apps on the self-efficacy of patients with BC remains incomplete.^{15,16}

In addition, although prior reviews have summarized several common features of these mHealth apps for patients with cancer,¹⁵⁻¹⁷ it remains unclear what intervention components are commonly used in patients with BC undergoing chemotherapy and whether these components contain self-efficacy enhancement elements to improve the patients' level of self-efficacy in self-managing chemotherapy-induced symptoms. Accordingly, the objectives of the review were (1) to identify the intervention components of existing mHealth self-management programs; and (2) to uncover self-efficacy enhancement elements from the intervention components of the studies.

Material and Methods

The protocol of this systematic review was registered with PROSPERO (CRD42021286658). The review was conducted according to the PRISMA guideline ([Supplementary Table 1](#)).¹⁸

Eligibility Criteria

Studies were included in the systematic review if (a) they were randomized controlled trials; (b) they were published in English from January 2010 to December 2021; (c) they had enrolled patients with BC (18 years or older) who were undergoing chemotherapy; (d) the interventions contained components of symptom self-management; and (e) the service was delivered through mobile applications.

Studies were excluded if (a) they were case studies, cross-sectional studies, qualitative studies, protocols, reviews, conference abstracts, or guidelines; (b) they involved participants who were pregnant women or who had been diagnosed with non-BC cancers; (c) the participants received other BC treatments apart from chemotherapy (i.e., surgery, radiotherapy, targeted therapy); (d) the interventions focused on the prevention and screening/detection of BC; (e) they were conducted using computer-based online programs, games, or artificial intelligence.

Search Strategy and Study Selection

We carried out a systematic review by searching electronic databases (MEDLINE, EMBASE, PubMed, Cochrane Library, and PsycINFO) and Clinical Trial registries

(ClinicalTrials.gov and WHO ICTRP) to identify all relevant studies published from 2010 to 2021. Searching was conducted following the flow of PRISMA. The search terms used in the topic, abstracts, and keywords of the studies are shown in [Supplementary Table 2](#). Two authors (N.S. and L.S.) independently conducted the data searching and screening following the eligibility criteria. Any discrepancies were discussed and resolved with a third reviewer (A.K.C.W.). The final updated electronic searches were performed on December 31, 2021.

Quality Assessment

The Cochrane Handbook of Systematic Reviews (Version 6.2)¹⁹⁻²² was employed to evaluate the methodological quality and risk of bias (RoB) of the included randomized controlled trials. [Supplementary Table 3](#) shows the risk of bias assessment using the Cochrane RoB tool, covering 6 domains of bias and was independently conducted by 2 reviewers (N.S. and L.S.).

Data Extraction

A descriptive approach was employed to answer the questions put forward in the present review. Data related to the study characteristics (i.e., author and country, study design, sample size, group descriptions, etc.), intervention duration, and frequency (i.e., duration, number of app-based follow-ups, component frequency, etc.) were extracted independently by 2 authors (N.S. and L.S.) in the form of tables.

Data Analysis

The Omaha System, a standardized system of terminologies recognized by the American Nurses Association (ANA) and used to describe and evaluate the impact of healthcare services, was adopted to synthesize the intervention components.²³ Prior evidence indicated that the Omaha System is effective at classifying nurse-designed intervention components to improve self-efficacy and quality of life of BC patients undergoing chemotherapy.^{24,25} In a back pain study, the Omaha System was used to systematically organize the intervention components and promote the quality of the study.²⁶ The Omaha System includes an assessment component, a services component, and an evaluation component. The service component, termed "Intervention Scheme" is composed of 4 domains, shown in [Table 1](#).²⁷ The duration and frequency of the mHealth-based programs were analyzed in accordance with the Omaha System-based categories of intervention components. Self-efficacy enhancement elements in the intervention programs were extracted from studies according to the 4 hierarchical sources of Bandura's self-efficacy theory, namely, mastery experiences, vicarious experiences, verbal persuasion, and physiological and affective states.¹³

Results

Study Selection

A total of 1,668 studies were identified in the initial search. After the removal of duplicates, 1,249 articles were screened based on their titles and abstracts ([Supplementary Table 4](#)). Thirty-nine articles were excluded since they focused on patients who had completed chemotherapy, had more than 1 type of cancer, or were about study protocols without results. Eventually, 5 studies were included ([Supplementary Figure 1](#)).

The 5 studies were implemented in 5 different countries, namely, Switzerland,²⁸ Sweden,²⁹ Japan,³⁰ the USA,³¹ and China.³² The characteristics of the included studies were extracted and are summarized in Table 2. A total of 537 participants were analyzed in the included studies. Sample sizes ranged from 23 to 139. Among the 5 included studies, the majority

(*n* = 4) focused on patients with BC who were undergoing adjuvant chemotherapy,^{28,30-32} rather than neoadjuvant chemotherapy. Only 1 study²⁹ specifically focused on patients with BC who were receiving neoadjuvant chemotherapy. Neoadjuvant chemotherapy is more commonly utilized in the early-stage treatment of BC to reduce the size of tumors, facilitating breast-conserving surgery. All studies were assessed for quality and risk of bias (see Supplementary Table 3).²⁸⁻³²

Table 1. Structure of the intervention scheme in the Omaha System.²³⁻²⁷

Omaha system intervention scheme	Definitions
Teaching, guidance, and counseling	Activities designed to provide information and materials, encourage action and responsibility for self-care and coping, and assist the individual/family/community to make decisions and solve problems
Treatments and procedure	Technical activities such as wound care, specimen collection, resistive exercises, and medication prescriptions that are designed to prevent, decrease, or alleviate signs and symptoms of the individual/family/community
Case management	Activities such as coordination, advocacy, and referral that facilitate service delivery, improve communication among health service providers, promote assertiveness, and guide the individual/family/community toward the use of appropriate resources
Surveillance	Activities (i.e., detection, measurement, critical analysis, and supervision) planned to discern the condition of the individual/family/community regarding a given status or phenomenon

Objective 1: Intervention Components in mHealth Symptom Self-management Programs

The intervention components in mHealth-based symptom self-management programs for patients with BC receiving chemotherapy were structured based on the Omaha System Intervention Scheme: (1) Teaching, guidance, and counseling; (2) Treatments and procedure; (3) Case management; and (4) Surveillance.

Domain 1: Teaching, Guidance, and Counseling

Self-care Advice

Self-care advice was applied in 2 studies.^{29,30} When patients reported mild or moderate symptoms in the apps, they would receive automatic self-care advice.^{29,30} The self-care advice was developed through literature reviews and oncological practice guidelines, as well as through discussions and consultations with healthcare professionals.²⁹ The evidence-based suggestions on symptom self-management were tailored to the severity of the symptoms that the patients had just rated.²⁹

Table 2. Characteristics of the included studies.

Author/ country	Study design	Sample size	Name of program/app	Intervention group	Control group
Egbring 2016 ²⁴ Switzerland	3-arm RCT	N = 139	Consilium Care	Group B: Used the Consilium Care app without a physician review Group C: Used the mobile app and reviewed the reported data with the physician at scheduled visits	Group A: Received regular physician support No access to a mobile app while undergoing chemotherapy
Fjell 2020 ²⁵ Sweden	RCT	N = 149	Interaktor	Symptom self-reporting Sent reminders to submit a report Monitored patient reports in real time Sent alerts of risk symptoms Provided self-care advice and relevant websites	Had visits with a physician before each chemotherapy session Had visits with a contact nurse Consulted with the nurse by telephone
Handa 2020 ²⁶ Japan	Feasibility RCT	N = 95	Breast cancer patient support system (BPSS)	Evaluated the side effects and recorded symptoms reported by patients. Provide tips on self-care	Received ordinary instructions on symptom management Received explanatory materials compiled by the anticancer agent manufacturers Recorded progress using their own notes
Post et al. (2013) ²⁷ USA	Pilot RCT	N = 50	Communicating Health Assisted by Technology (CHAT)	Completed symptom inventories Viewed videos on how to communicate about symptoms Tracked and shared symptom records with clinicians	Received the usual care
Zhu et al. (2018) ²⁸ China	RCT	N = 104	Breast cancer e-support (BCS) program	Learning forum Discussion forum Ask-the-Expert forum Personal Stories forum	Had no access to breast cancer e-support (BCS) No restrictions imposed on both groups in terms of performing other internet searches for information or social support

Table 3. Duration and frequency of the interventions in the included programs.

Study and year	Program duration	Number of app-based follow-ups	Frequency/period				
			Follow-up	1 Teaching, guidance, and counseling: 1.1 Self-care advice 1.2 Consultation 1.3 Learning forum	2 Treatments and procedures 2.1 Self-monitoring	3 Case management 3.1 Alert 3.2 Referral	4 Surveillance 4.1 Review 4.2 Reminder
Egbring 2016 ²⁸	6 weeks	3	On day 1, 21, 42	N/A	2.1 Daily	N/A	4.1 Review reports every 3 weeks 4.2 Reminder to use the app every 3 weeks
Fjell 2020 ²⁹	18 weeks	Real-time	At 2 weeks after treatment	1.1 Continuous access to evidence-based self-care advice. 1.2 Nurses' feedback depends on the severity of the alerts 1.3 Continuous access to relevant websites	2.1 Daily on weekdays at 8 AM–4 PM	3.1 Yellow alerts: contact during the day; Red alerts: contact within 1 h	4.2 Sending reminders if a daily report had not been submitted.
Handa 2020 ³⁰	12 weeks	N/A	N/A	N/A	2.1 Not reported	N/A	N/A
Post 2013 ³¹	160 days	N/A	N/A	1.3 No limitation on frequency on the day before the treatment visit	2.1 Once per week	N/A	4.1 Review in each treatment visit 4.2 Reminder once per week
Zhu 2018 ³²	12 weeks	2	At month 3, month 6	1.2 Answering questions within 24 hours. 1.3 Discussion forum: daily reading of all messages and provision of expert advice; New knowledge updated every 2 weeks	N/A	N/A	N/A

Learning forum

There were 2 types of learning forums: Peer learning and self-learning. The peer-learning forum was utilized to allow patients with BC to communicate virtually with peer patients.³² Patients with BC were invited to learn self-care strategies and to share information and emotions with their peers.³² A self-learning forum was developed in 2 studies.^{31,32} Post et al.³¹ uploaded videos to the forum related to the skills involved in handling chemotherapy-related symptoms (fatigue, depression, and pain), while Zhu et al.³² delivered to the learning forum updated knowledge about BC and strategies for symptom self-management.

Consultation

In only 1 study³² were real-time consultations used as an intervention component to provide professional support. The participants could ask symptom-related questions on the “Ask-the-Expert forum.” The healthcare professionals, including a doctor and a nurse, were required to provide feedback on the questions within 24 hours.

Domain 2: Treatments and Procedures

Self-monitoring

Self-monitoring refers to patients monitoring symptoms on their own. It is adopted as a real-time technical activity where patients with BC can be empowered to prevent and manage symptoms by themselves. In 4 studies,^{28–31} participants were allowed to conduct daily self-monitoring of symptoms. In these studies, the participants monitored themselves for

chemotherapy-induced symptoms listed under the Common Terminology Criteria for Adverse Events (CTCAETM).²⁸ For each symptom, there was a definition or description, a symptom severity rating scale, and self-care advice.²⁸ In particular, Egbring et al.²⁸ asked the participants to self-monitor their daily functional activities and 30 preselected symptoms listed in the CTCAE, using a mobile app.

Domain 3: Case Management

Alerts

In 1 study,²⁹ alerts were sent to nurses or physicians when patients were found to have severe symptoms. Fjell et al.²⁹ set up a built-in risk screening and evaluation system, which included 2 levels of alert: A yellow alert (for less severe symptoms), which required a nurse to contact patients during the day; and a red alert (for more severe symptoms), which required contact to be made within 1 hour.

Referral

One trial²⁹ involved the provision of referral services using mobile apps. The healthcare providers could advise patients via the app to contact an emergency department when patients reported severe symptoms outside the weekday hours.²⁹

Domain 4: Surveillance

Review

A total of 3 studies^{28,29,31} provided a review function for participants in the intervention group. Based on this function,

the self-monitoring reports of patients could be reviewed and tracked by physicians at outpatient clinics.³¹ Egbring et al.²⁸ compared the effects among 3 groups: Group A (the control group), group B (the app group), and group C (the app and physician-supervision group). Only the participants in group C could review and discuss the self-monitoring reports with their physicians during planned visits.²⁸ It should be noted that an app²⁹ provided the function to monitor the patients' symptom self-reporting history in graphs.

Reminders

Three studies^{28,29,31} provided reminder functions. In 2 studies,^{29,31} a reminder message could be sent to patients with BC who had not submitted symptom records for 1 day. In another study,²⁸ nurses and physicians reminded patients to use the app during scheduled visits.

Intervention Duration and Frequency

The duration of the mHealth-based intervention varied among the different studies (see Table 3). The duration of the programs ranged from 6 weeks²⁸ to 160 days.³¹ Only Zhu and colleagues conducted a longer follow-up at 6 months to test the sustained effects of the mHealth support program in patients with BC.

There was heterogeneity among the different studies in the frequency with which components of the intervention were carried out (see Table 3). For the "Treatments and procedure" component, 2 studies^{28,29} required participants to self-monitor their symptoms daily. For the "Surveillance" component, the frequency of reminders varied among 3 studies,^{28,29,31} ranging from a reminder to self-monitor sent out daily in 1 study²⁹ and weekly and every 3 weeks, respectively, in another 2 studies.^{28,31} The frequency of review was similar in 2 studies,^{28,31} where a 3-week follow-up period was adopted for physicians to review a patient's reports of symptoms.

In addition, 3 studies²⁹⁻³¹ reported the adherence rate in the mHealth self-management program (i.e., app usage rate or rate of adherence to study tasks). One study reported a decline of 25.5% in adherence to app usage among patients with BC after the completion of 4 courses of chemotherapy.³⁰

Objective 2: Self-efficacy Enhancement Elements in the Intervention Programs

The self-efficacy enhancement elements in the intervention programs were extracted from the included studies in

accordance with the 4 hierarchical sources of Bandura's self-efficacy theory, including (1) mastery experience, (2) vicarious experience, (3) social and verbal persuasion, and (4) physiological and affective states¹³ (Table 4).

Mastery Experience

Mastery experience allows patients with BC to explore past successful experiences of dealing with healthcare issues and helpful strategies. Four trials contained the mastery experience component in their intervention programs. Three studies^{28,29,31} reminded patients to perform mHealth app-based self-monitoring strategies by using physician-initiated reminders^{28,32} or automatic system-initiated reminders.²⁹ Three studies used self-care advice,²⁹ symptom communication videos,³¹ and a learning forum³² to deliver information on symptom self-management strategies and recollections of successful self-management experiences.

Vicarious Experience

Vicarious experience efficacy through observations of the successful self-management experiences of other patients with a similar demographic background is another way to improve symptom self-management. In only 1 study³² were video stories of BC patients who had successfully self-managed their symptoms uploaded to a newly developed personal stories forum, for the participants to review.

Social and Verbal Persuasion

Social and verbal persuasion can be used to increase self-efficacy through encouragement and positive advice from healthcare providers. The patients in 4 out of 5 studies^{28,29,31,32} received positive encouragement from the healthcare professionals (i.e., physicians and nurses) when they adhered to the self-management plan.

Physiological and Affective States

Self-efficacy could be enhanced when the patients found that their physiological and affective states had improved due to daily self-management and monitoring. In the reviewed studies, the majority ($n = 4$)²⁸⁻³¹ adopted symptom self-monitoring, although the intensity of their self-monitoring differed among the studies, ranging from once per day^{28,29} to once per week.³¹

Table 4. Self-efficacy enhancement intervention components.¹³

Study and year	Bandura's self-efficacy theory			
	Mastery experience	Vicarious experience	Social and verbal persuasion	Physiological and affective states
Egbring 2016 ²⁸	Reminder to use the app	N/A	Physicians' review and discussion with patients on the symptom reports	Daily Self-monitoring
Fjell 2020 ²⁹	Reminder messages to report daily Self-care advice	N/A	Nurses' discussion with patients on the symptom reports	Daily Self-monitoring
Handa 2020 ³⁰	N/A	N/A	N/A	Self-monitoring
Post 2013 ³¹	Reminder Symptom communication videos	N/A	Physicians' review of the symptom reports	Self-monitoring once per week
Zhu 2018 ³²	Learning forum	Personal Stories forum	Discussion forum Ask-the-Expert forum	N/A

Discussion

The present review summarized the intervention components (Objective 1) and uncovered the self-efficacy enhancement intervention components (Objective 2) among mHealth app-based self-management programs for patients with BC who are undergoing chemotherapy. With regard to the intervention components, these were categorized based on 4 domains of the Omaha System, namely (1) Teaching, guidance, and counseling; (2) Treatments and procedure; (3) Case management; and (4) Surveillance. Among these, self-monitoring, categorized under the domain of “Treatments and procedure”, was the most frequently used intervention component in mHealth-based self-management programs for patients with BC undergoing chemotherapy (Objective 1). This is consistent with recent reviews showing that patient-reported indicators are one of the vital components in developing an mHealth app for patients with BC.^{17,33}

Adherence, or compliance, is also a parameter lacking sufficient data. In 1 study, patients’ adherence to self-monitoring declined by 25.5% after the completion of 4 cycles of chemotherapy.³⁰ A previous review³⁴ identified 7 pertinent factors (perceived usefulness, usability, behavioral intention, social influence, self-efficacy, perceived privacy risk, and attitude) that might affect the compliance of individuals in using apps for self-management. Clearly, the field is evolving and more information is needed to determine how best to implement mHealth.

“Teaching, guidance, and counseling” is an important intervention component and domain for improving symptom self-management and health-related outcomes. Three components (self-care advice, learning forum, and consultation) were categorized under this domain. According to Harrington,³⁵ social influence from the support given by healthcare professionals is required for effective mHealth app use.

For the domain of “Surveillance”, only 1 program²⁸ adopted an mHealth app under the monitoring of physicians. Other studies suggest healthcare providers (i.e., physicians and nurses) be involved in the component of surveillance for delivering reminders and monitoring patient-reported outcomes.^{36–39} Nurses could monitor the patients’ self-management activities through mHealth apps during the period between scheduled hospital visits. One study found that patients with BC who received an mHealth app program under the monitoring of nurses reported significantly higher adherence to exercise and better QoL after surgery.⁴⁰

With regard to the self-efficacy enhancement intervention components, these were extracted based on the 4 hierarchical sources of Bandura’s self-efficacy theory. “Mastery experience,” a way to remind the patients about their past successful experiences of dealing with self-care management, was commonly used. However, patients with BC who are commencing chemotherapy may lack past successful experiences of symptom self-management. An app-based “Learning forum” could provide self-care advice or symptom communication skills related to symptom self-management strategies, contributing to the obtaining of mastery experience for this group of patients. On the basis of these successful experiences, patients were given timely reminders to use apps, leading to an increase in their self-efficacy level.

“Vicarious experience” (that of peer patients) was the least frequently utilized self-efficacy enhancement intervention element in the included studies—only 1 study,³² by Zhu et al. from China, adopted a Personal Stories Forum to offer recorded videos from peer patients who had successful experiences of self-management during the course of chemotherapy. One prior review also noted “connectivity with other patients” being uncommonly used.¹⁷ “Vicarious experience” from peer patients could offer opportunities for this group of patients to share common experiences and gain support from each other.

A discussion forum such as the Personal Stories Forum could also provide a platform for healthcare providers to deliver positive examples to patients. In this case, the discussion forum could be identified as another self-efficacy enhancement element, “Verbal persuasion.” Finally, self-monitoring, categorized under the domain of “Physiological and affective states,” was commonly used in the included studies to help patients monitor and record their physiological status. One prior review advocated this finding that mHealth-based self-monitoring was useful for improving self-efficacy and fostering self-management activity in patients with BC,⁴¹ because it raised their health awareness.

To the best of our knowledge, the present review is the first to adopt the Omaha System as the model to categorize the components of mHealth self-management programs for patients with BC undergoing chemotherapy. While we recognize the limitations of a study including only 5 trials, this review identified several gaps to be filled in future studies. First, when designing an mHealth self-management program, efforts should be made to improve the usability, self-efficacy, and social influence (i.e., professional support) of the program. Second, there was heterogeneity among the reviewed mHealth interventions and measurements. Currently, there are no standardized methods of assessing and reporting mHealth-based intervention programs. It is suggested that, in the future, guidelines or a structured model be used, such as the Omaha system, to identify and guide the components of mHealth-based intervention programs.

Conclusion

This systematic review summarized the intervention components of mHealth app-based self-management programs for patients with BC receiving chemotherapy. Self-monitoring is the most commonly used intervention component in mHealth programs aimed at improving the symptom self-management of patients. The Omaha System may be introduced to direct healthcare providers to design structured interventions and measure the clinical effectiveness of mHealth interventions. In addition, self-efficacy can be considered as a factor to build into mHealth programs to support symptom self-management at home. Future studies are recommended for the adoption of mHealth intervention programs containing self-efficacy enhancement elements to foster self-management among this group of patients.

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Conflict of Interest

The authors indicated no financial relationships.

Author Contributions

Conception/design: N.S., A.K.C.W., F.K.Y.W. Financial support: N.S. Data analysis and interpretation: N.S., A.K.C.W., L.S. Manuscript writing: N.S., A.K.C.W. Final approval of manuscript: All authors.

Data Availability

No new data were generated or analyzed in support of this research.

Supplementary Material

Supplementary material is available at *The Oncologist* online.

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