Journal of Advances in Medical and Biomedical Research | ISSN:2676-6264

Identifying Educational Contents and Technical Features of a Self-Management Smartphone Application for Women with Breast Cancer

Mohamad Jebraeily[1], Samereh Eghtedar[2], Haleh Ayatollahi[3], Zahra Mohammadzadeh[1*]

1. *Dept. of Health Information Technology, Faculty of Allied Medical Sciences, Urmia University of Medical Sciences, Urmia, Iran*
2. *Dept. of Nursing Education, Faculty of Nursing and Midwifery, Urmia University of Medical Sciences, Urmia, Iran*
3. *Dept. of Obstetrics and Gynecology, School of Medicine, Solid Tumor Research Center, Urmia University of Medical Sciences, Urmia, Iran*

Article Info

10.30699/jambs.30.139.129

Received: 2020/11/19;
Accepted: 2021/05/03;
Published Online: 31 Jan 2022;

Use your device to scan and read the article online

Corresponding Information:

Zahra Mohammadzadeh,
Dept. of Health Information Technology, Faculty of Allied Medical Sciences, Urmia University of Medical Sciences, Urmia, Iran
E-Mail: : Mohammadzadeh.z@umsu.ac.ir

ABSTRACT

Background & Objective: Breast cancer patients need a variety of skills and abilities to deal with the consequences of the illness. Self-management is one of the operational strategies that leads to disease acceptance, treatment adherence, and improving the quality of life. The use of smartphone applications (apps) can play a pivotal role in the support and self-management of breast cancer patients. This study aimed to identify the educational contents and technical features of a self-management smartphone app for women with breast cancer in Iran.

Materials & Methods: This descriptive, cross-sectional study was carried out in 2020. The statistical population of the study consists of 120 women with breast cancer who were selected via simple random sampling. For data collection, a self-designed questionnaire was developed in which validity and reliability of the questionnaire was measured. The statistical analysis of the data was made using the SPSS software.

Results: From the breast cancer patients' point of view, the most important educational contents of the smartphone app. include information acquisition (4.73), lifestyle management (4.65), symptom management (4.43), psychological management (4.01), and compatibility with changes (3.98) respectively. In terms of technical features the most important characteristics were ease of the app. use (4.83), simple visual interface (4.75), security and privacy of information (4.63), reminders (4.55) and the ability to communicate (4.42).

Conclusion: For more effective smartphone apps, educational contents and technical features of apps should be designed based on the needs and preferences of patients. To ensure the use and acceptance of the app., developers should design apps that have technical requirements.

Keywords: Breast cancer, Smartphone applications, Educational contents, Technical features

Introduction

Among women, breast cancer is ranked first in incidence and mortality in most countries of the world. The incidence rates of the disease in developed and developing countries are 55.9 and 29.7 cases per 100,000 respectively. However, mortality rates in developing countries is 17% higher compared to developed countries (1, 2). The new cases of breast cancer have been on the rise, with an estimated 2.3 million cases worldwide in 2020 (3).

Based on recent reports, roughly 20 new cases per 100,000 women are identified in Iran every year (4). According to statistics of the National Cancer Institute of Iran, 57.6% of breast cancers are seen in women under the age of 50, which is a decade lower than the global peak age of incidence (5). Breast cancer has significant effects on the lives of sufferers and creates challenges to personal life, daily activities, job, communication, and family roles and also hurts the quality of life and mental health of patients (6). Breast cancer patients need a variety of skills and abilities to deal with the physical, mental, and psychological consequences of illness, such as positive thinking, emotional expression, disease acceptance, religious rites, yoga, sports, and social and family support (6-8).

The studies show that the self-management program for chronic diseases has a positive effect on the improvement of self-efficacy and quality of life, and health outcomes especially in cancer patients (7, 8). Self-management is

one of the emerging operational strategies in the field of chronic disease management, which leads to enhancement of patients' skills and confidence through managing their diseases, including the symptoms handling, treatment adherence, and lifestyle improvement **(8, 9)**. Self-management is a concept that refers to the ability of active participation and responsibility of the patient in conscious clinical decisions and cooperation with healthcare providers **(10, 11)**. Given the importance of self-management and remote monitoring of breast cancer patients, the use of smartphone apps can be useful and helpful in the health domain **(12, 13)**.

Because of the popularity and ubiquity of smartphones and also potential capacities and the low cost of this technology, the use of health apps in different countries has increased **(14, 15)**. Today, smartphone apps are used as a support tool for breast cancer patients in various fields such as controlling the side effects of treatment, adherence to medication, reduction of patients' stress and depression, self-monitoring of physical activity, handling of nutrition, communication of patient-clinician, improving quality of life, promoting emotional well-being and sharing accurate and up-to-date information **(14-16)**.

Understanding patient's learning needs, expectations, and preferences is the first step in designing more effective apps **(17,18)**. Nowadays, the patient-centered design is an app development method that can help to enhance patient adoption and utility of the app **(19)**. Then patients' involvement in determining the educational contents and technical features of smartphone apps is critical in the development of smartphone apps as a self-management tool **(17-22)**.

Many studies have been conducted worldwide on the needs assessment of women with breast cancer with different and specific results based on cultural and environmental characteristics **(15, 21, 23, 24)**. In Iran, SheikhTaheri et al, conducted a survey to identify the educational needs of breast cancer patients for designing a self-care app **(19)**. They investigated breast cancer patients undergoing only chemotherapy (not all treatments methods) with a small sample of patients.

Due to the increasing prevalence of breast cancer among Iranian women and the vital need to empower these patients for self-management, development of smartphone apps seems very important. The design of apps based on patients' needs and preferences will make this app more acceptable **(15, 23-26)**. According to this background, the aim of this study was to identify the educational contents and technical features necessary for a self-management app from the perspective of breast cancer patients in Iran.

Materials and Methods

This is a descriptive, cross-sectional study completed in 2020. The statistical population of the study consists of 120 women with breast cancer who were selected via simple random sampling. After studying valid scientific texts and related articles, educational contents and technical features of the smartphone app were extracted. The educational contents were classified into 5 main categories including information acquisition (7 items), lifestyle management (7 items), psychological management (5 items), symptom management (6 items), and compatibility with changes (6 items). Also in the technical features of the app, 12 requirements were determined **(15, 21, 23, 27-32)**. Then, a researcher-made questionnaire was designed, which contained three parts The first part of the questionnaire included the information on respondents' demographics (age, educational level, marital status, employment status, treatment modality, type of surgery, use of personal smartphone and interest in using smartphone applications). The second part consisted of the educational contents of the smartphone app including 31 items in 5 main categories. The final part determined the technical features of the app. The questionnaire's choices were scored based on five degrees Likert scale (1=unimportant, 5=very important). The validity of the questionnaire was evaluated through the contents in the scientific articles and opinions of a group of various experts (including 2 nursing educators, 2 obstetricians, 2 oncologists and 2 health information management professionals). The reliability of the questionnaire was measured through internal consistency so that the overall score was calculated 0.85 by Cronbach's alpha coefficient. The questionnaires were distributed from April to June 2020 among breast cancer patients who referred to Omid and Imam Khomeini hospitals in Urmia (North West of Iran) for treatment and follow-up of their disease. The statistical analysis of data was made using the SPSS software (version 16). For descriptive variables, frequency, percentage, mean, and standard deviation were reported.

The study protocol was approved by the Ethics Committee of Urmia University of Medical Sciences (approval ID: IR.UMSU.REC.1398.374). The questionnaires were completed anonymously, and the collected information was considered confidential.

Results

Of the 120 questionnaires distributed among the breast cancer patients, we received responses

from 103 participants with total response rate of 85.83%. The highest percentage of participants ranged between 40-50 years (40.78%).The majority of patients were married (74.23%), high school graduates (46.60%), unemployed (64.08%) and urban residents (72.89%). 31.06% of patients had family history of breast cancer. In terms of treatment modality, 82.52% had mastectomy and also all of them underwent chemotherapy. 88.35% of patients owned smartphones and 85.43% were interested in using breast cancer applications (Table 1).

Table 1. Demographic and clinical characteristics of the Participants

Variables	Value
Age in years	N (%)
< 30	4 (3.88%)
30-40	20 (19.42%)
40-50	42(40.78%)
50-60	25 (24.27%)
≥ 60	12(11.65%)
Marital statues	N (%)
Married	68 (66.02%)
Single	16 (15.53%)
widowed	13 (12.62%)
Divorced	6 (5.83%)
Education level	N (%)
University degree	26 (25.24%)
High school(diploma)	48 (46.60%)
Primary school	21 (20.39%)
Illiterate	8 (7.77%)
Work status	N (%)
Unemployed	66 (64.08%)
Employed	37 (35.92%)
Treatment modality	N (%)
Chemotherapy	103 (100%)
Surgery	85 (82.52%)
Radiation therapy	53(51.45%)
Hormone therapy	37 (35.92%)
Place of residence	N (%)
Urban	76 (73.79%)
Rural	27 (26.21%)
Family history of breast cancer	N (%)
Yes	32 (31.07%)
No	71 (68.93%)
Use of personal smartphone	N (%)
Yes	91 (88.35%)
No	12 (11.65%)
Interested in using breast cancer applications	N (%)
Yes	88 (85.43%)
No	15 (14.57%)

According to the patients' opinion, in the category of information acquisition, the highest and lowest levels of scale were related to common side effects of treatment (4.68) and breast anatomy (3.48) respectively; in lifestyle management, the highest rate was related to physical activity (4.55) and the lowest rate was related to

pregnancy (3.28). Impact of spirituality (4.15), in psychological management; management of chemotherapy side effects (4.75) , in symptom management ;and adaptation to physical changes (4.36), in Compatibility with changes were the highest average scores (Table 2)..

Table2. Mean of items related to educational contents of breast cancer smartphone app (range 1-5)

desired features	Items	Mean	S.D
	common side effects of treatment	4.68	0.51
	effects of the disease on quality of life	4.33	1.05
	different types of treatments	4.17	0.80
Information acquisition	reconstructive breast surgery	4.14	1.07
	types of breast cancer	4.05	1.02
	breast surgery	4.05	1.02
	breast anatomy	3.48	1.23
	physical activity	4.55	0.68
	dietary modifications	4.42	0.73
	social activities	4.14	0.91
Lifestyle management	physical health	3.68	1.01
	daily activities	3.43	1.14
	sexual health	3.37	1.11
	Pregnancy	3.28	1.34
	impact of spirituality	4.15	0.97
	stressors during disease	4.11	0.79
Psychological management	relaxing	3.98	0.99
	fear of recurrence	3.95	0.95
	management of negative emotions	3.86	1.08
	management of chemotherapy side effects	4.45	0.78
	pain management	4.33	0.81
Symptom management	stress management	4.25	0.87
	management of surgery side effects	4.08	0.99
	management of radiotherapy side effects	3.90	1.17
	empowering self-care	4.03	0.66
	adaptation to physical changes	4.18	1.12
	finding new fun activities	4.05	0.91
Compatibility with changes	adaptation to emotional problems	3.92	0.92
	acceptance of disease	3.73	1.01
	disease compatibility	3.55	0.96
	creating a sense of purpose	3.37	1.15

The most important technical features of smartphone app include: ease of use of the app (4.83), simple and well-ordered visual interface (4.75), security and privacy of patient information (4.63), reminders about drug, diet, exercise, appointment (4.55),and ability to communicate with the health team (4.42) respectively (Table 3).

Table3. Technical features of breast cancer smartphone app (range 1-5)

Technical features	Mean	S.D
Ease of use of app	4.83	0.42
Simple and well-ordered visual interface	4.75	0.48
Security and privacy of patient information	4.63	0.55
Reminders about drug, diet, exercise, appointment	4.55	0.62
Ability to communicate with the health team	4.42	0.73
Up- to-date and supportive services of app	4.24	0.94
Ability to share experiences with other patients via chat	4.20	0.88
User customization	4.07	1.06
Appropriate use of color , texture, font, and graph	3.93	1.11
Consistency of elements and icons	3.88	1.18
Fast loading screens	3.67	1.22
Large Touch and easy Navigation	3.59	1.35

As shown in Figure 1, from the standpoint of the breast cancer patients, the most important contentfeatures of smartphone app in 5 main categories include information acquisition (4.73), lifestyle management (4.65), symptom management (4.43), psychological management (4.01), and compatibility with changes (3.98) respectively.

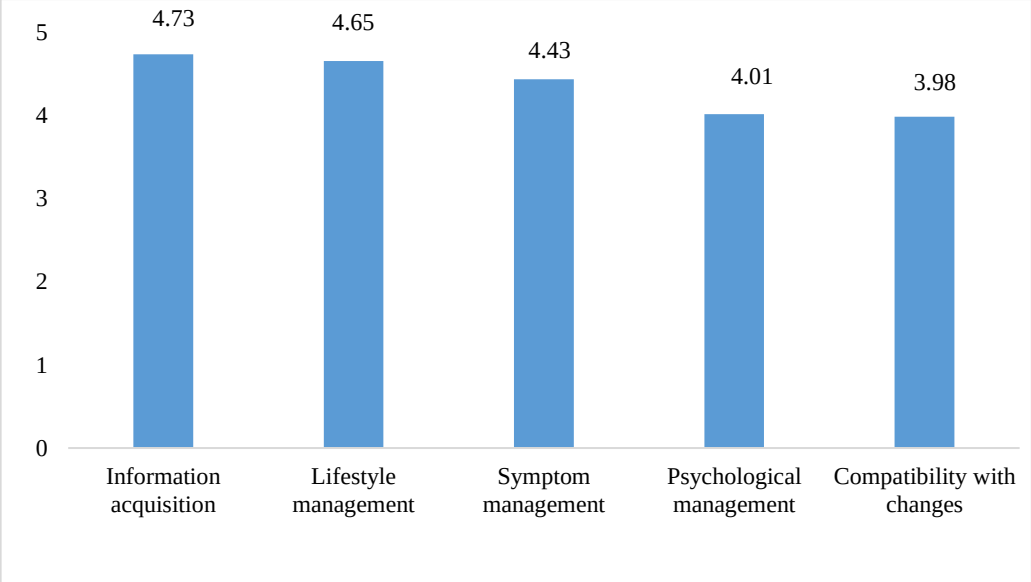

Figure 1. Educational contents of smartphone app, in 5 main categories (range 1-5)

Discussion

The aim of this study was to identify the educational contents and technical features required by an app for the self-management of women with breast cancer. The findings of this study indicated that the considerable educational contents included physical activity, side effects of treatment, dietary modifications, side effects of management, and stress management. In a similar study in 2020, a mobile health app for breast cancer self-management support in Taiwan via a design thinking approach was developed. The information needs of patients extracted a sum of 8 significant topics including treatment, physical action, diet, emotional help, health records, social resources, experience sharing, and master meeting **(15)**. A study matching with the present study showed that breast cancer patients were less satisfied with the information received and the most unmet information needs of patients were about treatment options and their accompanying risks

and side effects, as well as psychosocial support, depressive symptoms, and physical functioning **(33)**.

Based on the findings of this study, breast cancer patients are willing to learn about educational contents, information acquisition (4.73), treatment types and their side effects, lifestyle management (4.65) including physical activity and dietary modifications, and symptom management (4.43) including chemotherapy side effects management and pain and stress management. The study by Sheikh Taheri et al, (2018) indicated that the most important needs of breast cancer patients on the internet include treatment (4.62), daily activity (4.51), disease (4.42), disease acceptance and self-image (4.37), the effect of disease on private life (4.21), and sexual health (4.2) **(19)**.

The results of other studies about the information needs of women with breast cancer indicated that the most important needs of patients include treatment options, side effects, diet, exercises, emotions, lifestyle changes, communication with health care providers and social support **(33- 35)**. A comparison of the results of these researches with the results of the current study show that the information needs of breast cancer patients are consistent with the content features of the smart mobile application. The results of the study of Al Ayubi et al, in 2019 demonstrated that the most important usability factors of social m-health application for physical activity include ease of learning (4.72), ease of use (4.69), pleasant interface (4.35), organization of information (4.38), and ease of navigation (4.38) **(36)**.

The results of another study conducted by SheikhTaheri et al, showed that the most important educational contents for designing a self-care app include various side effects of chemotherapy and the techniques of self-care to manage these side effects, self-care recommendations on nutrition, physical activity, hopeful messages, spiritual health and stress management **(19)**.

Our research focuses on the educational needs of all breast cancer patients with a variety of treatment methods (surgery, radiation therapy, chemotherapy, etc.) and the results showed that in addition to lifestyle management and side effect of treatment emphasis should be placed on information acquisition, symptom management, psychological management and compatibility with changes.

Based on the present study, the most important technical features were ease of use of the app (4.83), simple and well-ordered visual interface (4.75), security and privacy of patient information (4.63), reminders about drug, diet, exercise, appointment (4.55), and the ability to communicate with the health team (4.42). The study by Park et al, in 2018 indicated that desired functions and features of mobile phone medication adherence from users' viewpoints include optimization of information input, improvement of reminders, user-friendliness, upgrading app performance, backup of data and interoperability **(37)**. Using smartphone features such as reminders makes people participate in related activities **(26, 38-40)**.

The majority of breast cancer survivors believe that health apps designed can be effective for a healthy lifestyle **(20)**. To the best of our knowledge, smartphone apps can be very useful tools to empower breast cancer patients and help them with self-management. In many studies, the importance of need assessment and survivors' preferences of breast cancer patients before designing and presenting an app has been noted **(15,18, 19, 21, 25)**. In the same way, our study addersed the needs assessment and survivors' preferences of breast cancer patients to identify the requirements of patients to design a self-management app, the results of which can be considered by health apps developers.

Conclusion

Findings of the current study indicated that the control of treatment side effects, physical activity, dietary modifications, pain and stress management are the most desired contentfeatures prioritized by breast cancer patients. To ensure the use and acceptance of app, developers should design apps that possess technical requirements such as ease of use, simple visual interface, data privacy and security, fit reminders and user customization. Therefore, it seems necessary to involve breast cancer patients in designing smartphone applications. Eventually, for more effecttive smartphone apps, educational contents and technical features of apps should be designed based on the patients' needs and preferences.

Acknowledgments

This paper is derived from MSc thesis of Health Information Technology (No. 9872), supported by the Research Council of Urmia University of Medical Sciences, Urmia, Iran. The authors would like to thank all the professors and staff of Omid and Imam Khomeini hospitals in Urmia and Urmia University of Medical Sciences who assisted us in this study.

Study limitation

The existence of coronavirus conditions for breast cancer patients made it very difficult and time-consuming to collect questionnaires, which was solved by allocating more time to the questionnaire collection process.

Conflict of Interest

The authors declare no conflict of interest.

References

1. Sharma R. Breast cancer incidence, mortality and mortality-to-incidence ratio (MIR) are associated with human development, 1990-2016: evidence from Global Burden of Disease Study 2016. Breast Cancer. 2019;26(4):428-45. [DOI:10.1007/s12282-018-00941-4] [PMID]
2. Sung H, Ferlay J, Siegel RL, et al. Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA Cancer J Clin. 2021. [DOI:10.3322/caac.21660] [PMID]
3. Ferlay J, Colombet M, Soerjomataram I, et al. Estimating the global cancer incidence and mortality in 2018: GLOBOCAN sources and methods. Int J Cancer. 2019;144(8):1941-53. [DOI:10.1002/ijc.31937] [PMID]
4. Cebeci F, Yangın HB, Tekeli A. Life experiences of women with breast cancer in south western Turkey: A qualitative study. Eur J Oncol Nurs. 2012;16(4):406-12. [DOI:10.1016/j.ejon.2011.09.003] [PMID]
5. Bab S, Abdifard E, Elyasianfar S, Mohammadi P, Heidari M. Time trend analysis of breast cancer in Iran and its six topographical regions: a population-based study. J Med Life. 2019;12(2):140.
6. Mosher CE, Johnson C, Dickler M, Norton L, Massie MJ, DuHamel K. Living with metastatic breast cancer: a qualitative analysis of physical, psychological, and social sequelae. Breast. 2013;19(3):285-92. [DOI:10.1111/tbj.12107] [PMID] [PMCID]
7. Sarenmalm EK, Browall M, Persson LO, Fall-Dickson J, Gaston-Johansson F. Relationship of sense of coherence to stressful events, coping strategies, health status, and quality of life in women with breast cancer. J Psychosoc Oncol Res Pract. 2013;22(1):20-7. [DOI:10.1002/pon.2053] [PMID]
8. Loh SY, Packer T, Chinna K, Quek KF. Effectiveness of a patient self-management programme for breast cancer as a chronic illness: a non-randomised controlled clinical trial. J Cancer Surviv. 2013;7(3):331-42. [DOI:10.1007/s11764-013-0274-x] [PMID]
9. Børøsund E, Cvancarova M, Moore SM, Ekstedt M, Ruland CM. Comparing effects in regular practice of e-communication and Web-based self-management support among breast cancer patients: preliminary results from a randomized controlled trial. J Med Internet Res.2014;16(12):e295. [DOI:10.2196/jmir.3348] [PMID] [PMCID]
10. De Castro EK, Ponciano C, Meneghetti B, Kreling M. Quality of life, self-efficacy and psychological well-being in Brazilian adults with cancer: A longitudinal study. Psychology (Irvine). 2012;3(04):304. [DOI:10.4236/psych.2012.34043]
11. Mehraeen E, Safdari R, SeyedAlinaghi S, Noori T, Kahouei M, Soltani-Kermanshahi M. A mobile-based self-management application-usability evaluation from the perspective of HIV-positive people. Health Policy Technol. 2020;9(3):294-301. [DOI:10.1016/j.hlpt.2020.06.004]
12. McCorkle R, Ercolano E, Lazenby M, Schulman-Green D, Schilling LS, Lorig K, et al. Self-management: Enabling and empowering patients living with cancer as a chronic illness. CA Cancer J Clin. 2011;61(1):50-62. [DOI:10.3322/caac.20093] [PMID] [PMCID]
13. Davis SW, Oakley-Girvan I. Achieving value in mobile health applications for cancer survivors. J Cancer Surviv. 2017;11(4):498-504. [DOI:10.1007/s11764-017-0608-1] [PMID]
14. Davoodi S, Mohammadzadeh Z, Safdari R. Mobile phone based system opportunities to home-based managing of chemotherapy side effects. Acta Inform Med. 2016;24(3):193. [DOI:10.5455/aim.2016.24.193-196] [PMID] [PMCID]
15. Hou I-C, Lan M-F, Shen S-H, Tsai PY, Chang KJ, Tai H-C, et al. The development of a mobile health app for breast cancer self-management support in Taiwan: design thinking approach. JMIR Mhealth Uhealth. 2020;8(4):e15780. [DOI:10.2196/15780] [PMID] [PMCID]
16. Choi JH, Park S-J, Kwon H, Lee H-J. Application and evaluation of mobile nutrition management service for breast cancer patients. J Nutr. 2020;53(1):83-97. [DOI:10.4163/jnh.2020.53.1.83]
17. Richards R, Kinnersley P, Brain K, Staffurth J, Wood F. The preferences of patients with cancer regarding apps to help meet their illness-related information needs: qualitative interview study. JMIR Mhealth Uhealth. 2019;7(7):e14187. [DOI:10.2196/14187] [PMID] [PMCID]
18. Saeidnia HR, Ausloos M, Mohammadzadeh Z, Babajani A, Hassanzadhh M. Mobile-based self-care application for COVID-19: Development process using the ADDIE model. Stud Health Technol Inform. 2022;289:110-113. PMID: 35062104. [DOI:10.3233/shti210871]
19. Sheikhtaheri A, Nahvijou A, Mashoof E. Evaluation of the Information Needs of Breast Cancer Patients in the Internet. Basic & Clinical Cancer Research. 2018;10(3):1-11.

20. Ong SW, Jassal SV, Miller JA, Porter EC, Cafazzo JA, Seto E, et al. Integrating a smartphone-based self-management system into usual care of advanced CKD. Clin J Am Soc Nephrol. 2016;11(6):1054-62. [DOI:10.2215/CJN.10681015] [PMID] [PMCID]

21. Phillips SM, Conroy DE, Keadle SK, Pellegrini CA, Lloyd GR, Penedo FJ, et al. Breast cancer survivors' preferences for technology-supported exercise interventions. Support Care Cancer. 2017;25(10):3243-52. [DOI:10.1007/s00520-017-3735-3] [PMID] [PMCID]

22. Rabin C, Bock B. Desired features of smartphone applications promoting physical activity. Telemed J E Health. 2011;17(10):801-3. [DOI:10.1089/tmj.2011.0055] [PMID]

23. Harder H, Holroyd P, Burkinshaw L, Watten P, Zammit C, Harris PR, et al. A user-centred approach to developing bWell, a mobile app for arm and shoulder exercises after breast cancer treatment. J Cancer Surviv. 2017;11(6):732-42. [DOI:10.1007/s11764-017-0630-3] [PMID] [PMCID]

24. Fischer M, Inoue K, Matsuda A, Kroep J, Nagai S, Tozuka K, et al. Cross-cultural comparison of breast cancer patients' quality of life in the Netherlands and Japan. Breast Cancer Res Trea. 2017;166(2):459-71. [DOI:10.1007/s10549-017-4417-z] [PMID] [PMCID]

25. Sheikh Taheri A, Norouzi E, Sadoughi F. Developing a mobile-based self-care application for patients with breast cancer undergoing chemotherapy. Journal of Health Administration. 2019;22(4):35-49.

26. Saeidnia H, Mohammadzadeh Z, Saeidnia M, Mahmoodzadeh A, Ghorbani N, Hasanzadeh M. Identifying Requirements of a Self-care System on smartphones for preventing coronavirus disease 2019 (COVID-19). Iran J Med Microbiol. 2020;14(3):241-6. [DOI:10.30699/ijmm.14.3.241]

27. Kapoor A, Nambisan P, Baker E. Mobile applications for breast cancer survivorship and self-management: A systematic review. Health Informatics J. 2020;26(4):2892-905. [DOI:10.1177/1460458220950853] [PMID]

28. Zhu J, Ebert L, Guo D, Yang S, Han Q, Chan SW-C. Mobile breast cancer e-support program for Chinese women with breast cancer undergoing chemotherapy (Part 1): Qualitative study of women's perceptions. JMIR Mhealth Uhealth. 2018;6(4):e85. [DOI:10.2196/mhealth.9311] [PMID] [PMCID]

29. Lozano-Lozano M, Galiano-Castillo N, Martín-Martín L, Pace-Bedetti N, Fernández-Lao C, Arroyo-Morales M, et al. Monitoring energy balance in breast cancer survivors using a mobile app: reliability study. JMIR Mhealth Uhealth. 2018;6(3):e67. [DOI:10.2196/mhealth.9669] [PMID] [PMCID]

30. Kim J, Lim S, Min YH, Shin Y-W, Lee B, Sohn G, et al. Depression screening using daily mental-health ratings from a smartphone application for breast cancer patients. J Med Internet Res. 2016;18(8):e216. [DOI:10.2196/jmir.5598] [PMID] [PMCID]

31. Knoerl R, Hong F, Blonquist T, Berry D. Impact of Electronic Self-Assessment and Self-Care Technology on Adherence to Clinician Recommendations and Self-Management Activity for Cancer Treatment-Related Symptoms: Secondary Analysis of a Randomized Controlled Trial. JMIR cancer. 2019;5(1):e11395. [DOI:10.2196/11395] [PMID] [PMCID]

32. Nielsen AM, Welch WA, Gavin KL, Cottrell AM, Solk P, Torre EA, et al. Preferences for mHealth physical activity interventions during chemotherapy for breast cancer: a qualitative evaluation. Support Care Cancer. 2020;28(4):1919-28. [DOI:10.1007/s00520-019-05002-w] [PMID] [PMCID]

33. Faller H, Brähler E, Härter M, Keller M, Schulz H, Wegscheider K, et al. Unmet needs for information and psychosocial support in relation to quality of life and emotional distress:Acomparison between gynecological and breast cancer patients. Patient Educ Couns.2017;100(10):1934-42. [DOI:10.1016/j.pec.2017.05.031] [PMID]

34. Beaver K, Twomey M, Witham G, Foy S, Luker KA. Meeting the information needs of women with breast cancer: piloting a nurse-led intervention. Eur J Oncol Nurs. 2006;10(5):378-90. [DOI:10.1016/j.ejon.2006.02.004] [PMID]

35. Schmidt A, Kowalski C, Pfaff H, Wesselmann S, Wirtz M, Ernstmann N. The influence of health literacy on information needs among women newly diagnosed with breast cancer, with special reference to employment status. J Health Commun. 2015;20(10):1177-84. [DOI:10.1080/10810730.2015.1018626] [PMID]

36. Al Ayubi SU, Parmanto B, Branch R, Ding D. A persuasive and social mHealth application for physical activity: a usability and feasibility study. JMIR Mhealth Uhealth. 2014;2(2):e25. [DOI:10.2196/mhealth.2902] [PMID] [PMCID]

37. Park JYE, Li J, Howren A, Tsao NW, De Vera M. Mobile phone apps targeting medication adherence: quality assessment and content analysis of user reviews. JMIR Mhealth Uhealth.

2019;7(1):e11919. [DOI:10.2196/11919] [PMID] [PMCID]

38. Henry BL, Moore DJ. Preliminary findings describing participant experience with iSTEP, an mHealth intervention to increase physical activity and improve neurocognitive function in people living with HIV. J Assoc Nurses AIDS Care. 2016;27(4):495-511. [DOI:10.1016/j.jana.2016.01.001] [PMID] [PMCID]
39. Saeidnia HR, Mohammadzadeh Z, Hassanzadeh M. Evaluation of Mobile Phone Healthcare Applications During the Covid-19 Pandemic. Stud Health Technol Inform. 2021;281:1100-1. [DOI:10.3233/SHTI210363] [PMID]
40. Saeidnia HR, Ghorbi A, Kozak M, Herteliu C. Smartphone-based healthcare apps for older adults in the COVID-19 Era: Heuristic Evaluation. Stud Health Technol Inform. 2022;289:128-131. PMID: 35062108. [DOI:10.3233/shti210875]

How to Cite This Article:

Jebraeily M, Eghtedar S, Ayatollahi H, Mohammadzadeh Z. Identifying Educational Contents and Technical Features of a Self-Management Smartphone Application for Women with Breast Cancer. J Adv Med Biomed Res. 2022; 30 (139): 129-137.

Download citation:
BibTeX | RIS | EndNote | Medlars | ProCite | Reference Manager | RefWorks

Send citation to:
Mendeley Zotero RefWorks