

Breast Cancer-Related Apps in Google Play and App Store: Evaluate of Their Functionality and Quality

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Abstract

Aim: This study aimed to evaluate the functionality and quality of breast cancer-related apps which can be accessed from Turkey.

Methods: The research covers 707 mobile applications, which were searched using the keywords "cancer", "oncology" and "breast cancer" in Google and App store stores between January and June 2019. The quality of apps was assessed with the user version of the Mobile App Rating Scale (MARS).

Results: Mobile applications focus on communication, education and treatment order / plan categories. The average MARS quality score for applications in all of the two stores was determined as 3.42. According to the average score of the scale sub-dimensions; It was seen that they were ranked as functionality, aesthetics, information quality and participation. MARS scale sub-groups were listed as functionality, aesthetics, knowledge quality, and participation.

Conclusion: e-Health is a subject that has just started to be used actively in health. Although basic information about breast cancer was used, information on prevention, early diagnosis and precautions was relatively limited and was not personalized. Support from healthcare professionals and further efforts should be made to develop evidence-based breast cancer knowledge and innovative technology and applications regarding cancer.

Implications for practice: e-Health technologies are a good tool in breast cancer, but appear to lack evidence-based content and individual specific areas such as age and education level.

Introduction

The use of technology in healthcare is preferred as a powerful method for maintaining patient follow-up, care and information (Fernandes et al., 2013; Lyles, López, Pasick, & Sarkar, 2013). The development of technology in mobile devices is reflected in health services, and many medical mobile applications (apps) that contain information about health are easily installed on phones (Önder, Narin, Landau, & Kandel, 2013). These applications are generally used by healthy people to gain awareness, and even provide nutritional and exercise advice in daily life. In addition, the ministry of health ensures that the health service is supported by technological tools by making the physician appointment system available to the public through the phone application. In a study, it is pointed out that easy access to mobile applications by everyone will make positive contributions to the maintenance of health services (Krebs & Duncan, 2015). In another study, it is stated that the use of mobile applications in healthcare has increased at a level acceptable to the society (Stoyanov et al., 2015). Based on this information; It is thought that the mobile application can be a useful tool in managing the problems that may occur in a non-clinical environment, ensuring their participation in their care and receiving consultancy services.

In recent years, individuals have access to information and prefer internet and smart phone applications rather than printed media such as brochures and books. These applications facilitate access to

information, as well as interesting, increasing reading and practice (Sert, 2012). In a study conducted with patients with breast cancer, it was observed that the mobile application developed to report symptoms and to cooperate with the hospital contributed positively to the acceptance and process of the disease in patients (Egbring et al., 2016). Patients experience postoperative problems and training methods such as brochures, consultancy and booklets are used in addition to verbal expression to cope with these problems (Lee et al., 2014; Ryhanen, Siekkinen, Rankinen, Korvenranta, & Leino-Kilpi, 2010). It is reported that after the trainings, women frequently used the internet (22.5–45%) to obtain information after breast cancer surgery (Muhamad, Afshari, & Mohamed, 2011; Valero-Aguilera et al., 2014). Based on this information, bringing evidence-based information together with the ease of use of mobile applications to the service of the society will be one of the most important services that can be provided to these individuals. There are many websites on breast cancer organized by different individuals or institutions. However, studies investigating the functions and quality of existing sites are limited. This study aims to determine the intended use and quality of breast cancer applications available in the Google play store and app store.

Methods

First author searched English and Turkish app about BC from January 2018 to 2019. All of the app in the App store and Google play store about BC within the defined time horizon were included in the study.

Search Strategy

This review was completed using the Primary Reporting Items for Systematic Reviews and Metaanalyses (PRISMA) Guidelines. In the selection of mobile applications, applications related to different ORL sub-specialties were searched in both the Google Play Store and the Apple App Store. The sub-specialties screened are "medicine", "health fitness" and "reference". The keywords used are "cancer / cancer", "oncology / oncology", "breast cancer / breast cancer" and "breast / breast". In total, 1683 English or Turkish apps were included.

App Selection Process

In the first search, data for each application was categorized according to the application name and version number, the cost of the application (if applicable) and the presence of in-app purchases. Applications were deemed eligible to be included in this review if they were in Turkish / English, were free (including or not included in-app purchases), were designed for breast cancer, and contain information about early diagnosis or treatment. The included apps have been downloaded to the Apple iPhone X and Samsung Galaxy S5. Practices dealing with early diagnosis methods, treatment options and cancer prevalence related to breast cancer were included in the study. Applications not related to the scope of the study, applications promoting a business or individual, applications requiring hardware purchase, and applications in languages other than Turkish / English were excluded from the study. A total of 707 apps were included which in 356 Google play store and 351 App store (Fig. 1).

App Extraction

First author (AA) downloaded the apps and critically evaluated the selected apps by a checklist. Because of the wide variation in the included apps, an Excel sheet was designed for data extraction. The first part of datasheet was general information about the app and publication year. The second part included number of downloads, user rating, number of reviews, available for free, and developer ID. Finally, the third part of it composed of BC early diagnosis methods, treatment options and cancer prevalence. We extracted the following data: developer, user rating, available for free, BC education, BC treatment, and BC communication.

Quality Assessment

The "Mobile Application Rating Scale" (MARS) scale was used to evaluate the quality of mobile applications in the stores. Developed by Stoyanov et al., The MARS measurement tool evaluates the qualities of the application in four sub-categories: (1) Participation (entertainment, interest, customization, interaction and target group), (2) Functionality (performance, ease of use, navigation, gestural design), (3) Aesthetics (layout, graphics, visual appeal) and (4) Information quality (accuracy of application description, objectives, quality and quantity of information, visual information, reliability, evidence base). Each item is evaluated on a 5-point Likert (1-Poor, 2-Poor, 3-Acceptable, 4-Good, 5-Excellent) scale. Overall quality score; It consists of the mean scores of the interaction, functionality, aesthetics and information quality subscales. Each application was evaluated with the MARS scale independently by two authors. If the authors gave different points to the same application, the average of the two authors' scores was accepted as the MARS scale score for that application. MARS score was given with standard deviation (SD) and 95% confidence interval (CI).

Results

Characteristics of the Selected Apps

All applications were classified according to "education", "treatment order / plan" and "communication" sub-specialties. It was determined that 268 applications were used for education, 76 for treatment and 12 for communication purposes in the Google play store. In the app store, it was determined that there were 235 applications for education, 102 for treatment plan and order, and 14 applications for communication purposes. Of the applications in both stores, 270 (38.2%) required internet for content access and 120 (17.1%) required in-app purchases. Some of the applications (36.2%) had more than 10 users' ratings for the current application version (n = 269, 38.1%) and this rating was above 3 (max: 5). It was seen that the number of applications (361/707) that received four or more stars from the user ratings constituted 51% of the total (Table 1).

Table 1
 Characteristics of the breast cancer-related mobile apps.

Characteristics	App store (n = 351) n (%)	Google play store (n = 356) n (%)
Education	235 (66.9)	268 (75.2)
Cancer information	53 (22.7)	88 (39.0)
Guide	72 (30.6)	53 (19.7)
Lecture notes	64 (27.2)	55 (20.5)
Scientific journals	46 (19.5)	56 (20.8)
Treatment	102 (29.1)	76 (21.3)
Breast cancer symptoms	31 (30.3)	22 (28.9)
Laboratory values	26 (25.5)	21 (27.6)
Nutrition in cancer	24 (23.7)	15 (19.9)
Drug use	21 (20.5)	18 (23.6)
Communication	14 (4.0)	12 (3.5)
Radiotherapy session follow-up	8 (57.1)	9 (75.0)
Patient-physician follow-up	6 (42.9)	3 (25.0)
Developer		
Corporation	251 (57.3)	203 (57.1)
Individual developer	150 (42.7)	153 (42.9)
User rating (stars)		
0	4 (1.1)	1 (0.2)
1	10 (2.8)	11 (3.1)
2	13 (3.7)	14 (3.9)
3	25 (7.1)	28 (7.8)
4	91 (25.9)	92 (25.8)
5	89 (25.4)	89 (25.0)
Missing	119 (34.0)	121 (34.2)
Available for free		

Characteristics	App store (n = 351)	Google play store (n = 356)
	n (%)	n (%)
Yes	331 (94.3)	339 (95.2)
No	20 (5.7)	17 (4.8)

Quality of the Breast Cancer-Related Apps (uMARS Score)

According to the MARS scale score, it was found that approximately 75% (525/707) of the applications related to breast cancer got four or more points (Min: 0, Max: 5). It was determined that the highest score was 4.4 and 227 (32.1%) applications received full points (5). It was found that most of the applications were scored between three and four points (Fig. 2). The average overall MARS quality score (average score of four subscales) in applications in all two stores was determined to be 3.42 ± 0.68 (CI: 3.58–3.72). Scale sub-dimensions were listed as functionality 4.05 ± 0.57 , aesthetics 3.70 ± 0.7 , knowledge quality 3.23 ± 0.74 , and participation 2.34 ± 0.56 . Education applications 3.65 (SD: 0.31; CI: 3.57–3.95) average scores are 3.31 (SD 0.16; CI: 3.53–3.73) higher than the average score of communication applications was determined to be.

Discussion

The research includes a comprehensive review of the functionality and quality of breast cancer-related applications available from phone stores. The results of the study include the results of evaluating the applications with a valid and reliable measurement tool that measures these properties. Applications in education category; information on the cancer process, a guide, lecture notes and a scientific journal. Applications in the treatment category; It was determined that it contained information about symptoms, laboratory values, nutrition and medications. It was observed that those in contact were of the type to be used for radiotherapy sessions and patient-physician communication. The results of the research could not be compared, since no similar research was available on breast cancer.

It was determined that the images of 18 applications containing information on early diagnosis methods in breast cancer were at a level that could be accessed from any search engine and the applications were not supported by video. In other studies that conduct mobile application reviews, it is pointed out that application contents lack evidence-based information and that content visuals should be enriched (Azar et al., 2013; Cowan et al., 2013; Wearing, Nollen, Befort, Davis, & Agemy, 2014). In another study, it is pointed out that there is no standard in the creation of health-related mobile application content, but it is emphasized that only the modification of the contents by application developers creates a limitation (Hughson, Daly, Woodward-Kron, Hajek, & Story, 2018). With this situation, it is pointed out that it is possible to access non-evidence based, incomplete or even incorrect information with mobile applications (Tripp et al., 2014). It can be said that the mobile application contents are in line with other research data and that the application contents are evaluated by experts and presented to the users in the stores will contribute to coping with these problems.

It was found that the applications in the study were of medium quality and the highest score from the MARS assessment tool sub-dimensions was functionality. This result shows that the programs offer ease of use, performance and navigation opportunities by the users and it is a very important feature for an application. In a study evaluating applications with a similar measurement tool in Australia, it was noted that the quality of weight management and health practices for children / adolescents was higher in functionality sub-dimension scores than others (Bardus, van Beurden, Smith, & Abraham, 2016). In a study examining pregnancy practices with a similar measurement tool, it was found that functionality scores higher in MARS sub-dimensions than others (Brown, Bucher, Collins, & Rollo, 2019). The lowest score of the information quality among other sub-dimensions of the MARS measurement tool is also similar to other studies (Bardus et al., 2016; Brown et al., 2019). In addition to these, it was observed in the study that the participation score was lower than the other sub-dimensions. He states that this situation is insufficient in terms of entertainment, interest, customization and interaction features of mobile application contents and needs to be improved. It is seen that the features and effects offered to users by mobile applications produced in different cultures and languages are similar. In this context, it can be said that the features of mobile applications that need to be developed in the world are similar.

Mobile applications offer an extraordinary opportunity for patient follow-up, information and behavioral change in the field of health due to their easy accessibility and high usability (Bastl, Kmenta, Berger, & Berger, 2018). When mobile application contents are equipped with high evidence level information, they can turn into an effective educational material. With the widespread use of mobile applications to be developed by healthcare professionals, the transfer of correct information will be easier (Stoyanov et al., 2015). In addition, it is the first research in our country that includes the systematic process carried out to select applications and the use of the MARS measurement tool to evaluate the quality of its applications.

Implications for Nursing

The applications available in the stores can be used in patient follow-up in the relevant clinics, patient-nurse interaction and patient education.

Nurses' patient follow-up needs to be improved. The care service supported by technological products attracts more attention and provides more active participation by patients.

Conclusion

It is inevitable that mobile health applications will become widespread due to the advantages offered to patients and healthcare personnel. However, a healthcare professional should be involved in the creation of the application contents and the contents should be created by obtaining expert opinion. It seems that good evaluation is required to achieve this goal and there is no standard for academic approval. Examining previous applications in the formation stages of an application, determining the strengths and weaknesses in terms of both content and design will make a significant contribution to the researcher.

There is a need for more researchers working in this field and applications prepared with the support of healthcare professionals for different patient groups.

Limitation

Firstly, unlike many analyses based on app markets, we did not account for download counts or user ratings (which could be used as indicators of app popularity). Our priority was to assess breast cancer and market-related functionalities in order to inform future app development; therefore, all apps related to breast cancer that were relatively active were included. Secondly, even though the uMARS has been validated with mHealth apps, its application to cancer-related apps has yet to be validated, especially regarding the quality of the breast cancer information.

Declarations

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Conflict of Interest

None of the authors or affiliated institutions associated with this manuscript submission has any financial or personal relationship or affiliation that could influence the present work.

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Availability of data and material

Not applicable

Code availability

Not applicable

Authors' contributions

Study conception and design, A. A, Data collection, A. A,

Data analysis and interpretation, A. A, A. G. Drafting of the article, A. A, A. G.

Critical revision of the article, A. A, A. G.

Ethics approval:

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Consent for publication:

Not applicable

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Figures

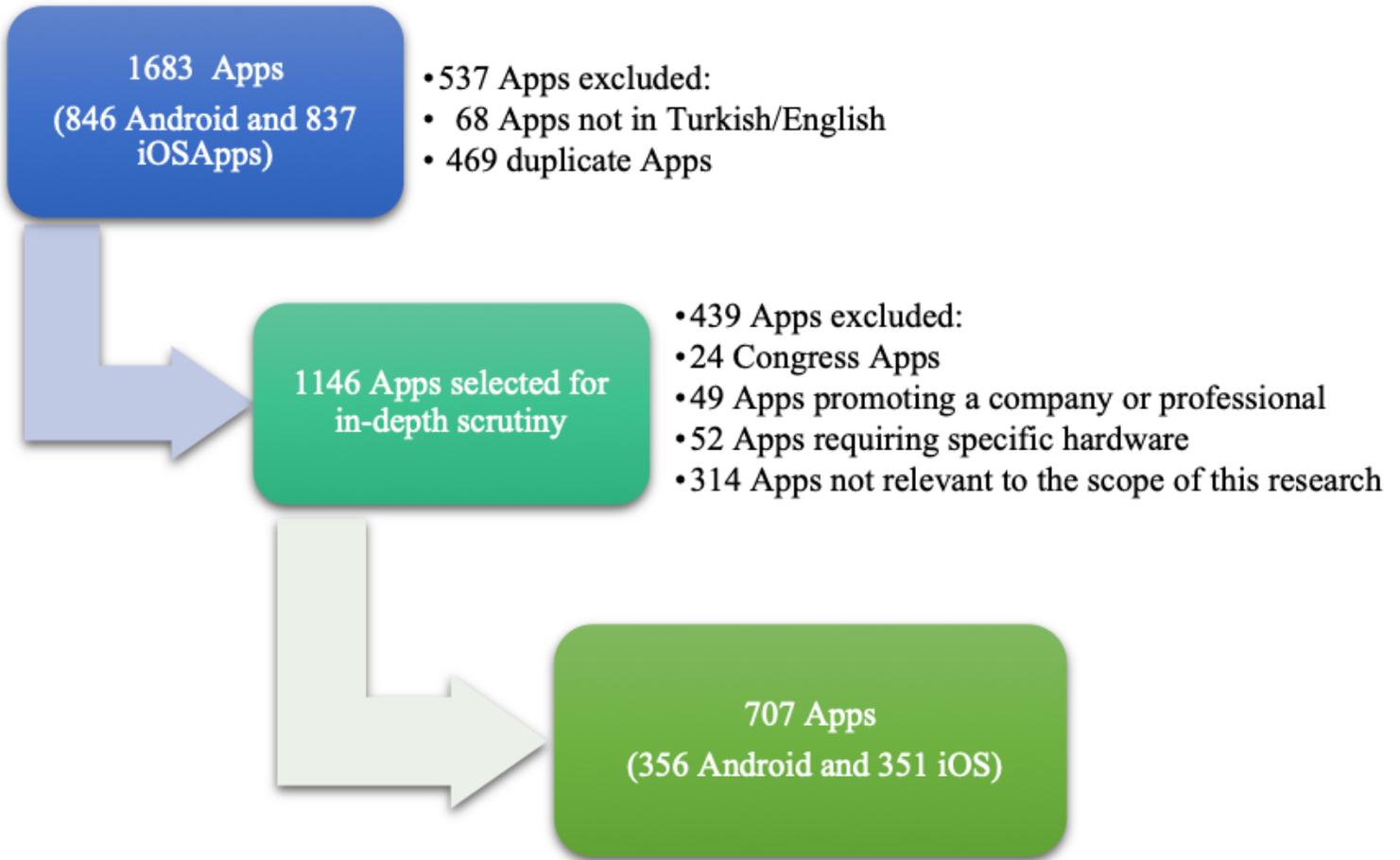


Figure 1

Primary reporting items for systematic reviews and meta-analyses (PRISMA) flowchart for apps selection.

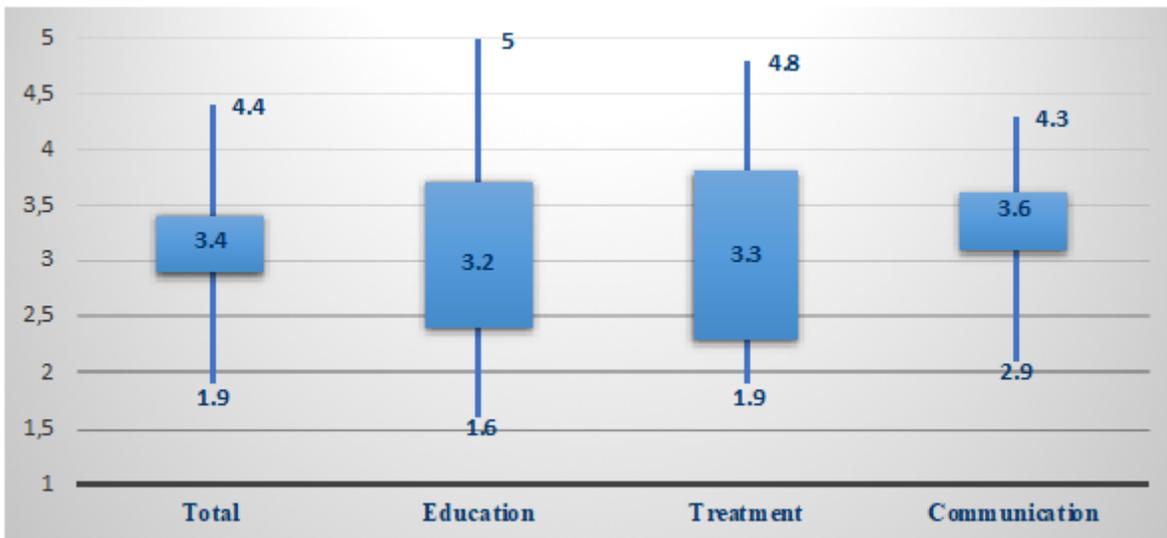


Figure 2

The user version of the Mobile App Rating Scale overall and section-specific scores of the breast cancer-related apps (n=707). Note: The bottom and top edge of the boxes represent the first and third quartiles;

the lines within the boxes represent the medians and the ends of the bottom and top whiskers represent the minimum and maximum values.