

Usability of a Reminder App that May Help to Reduce Radiotherapy-related Skin Toxicity in Patients With Breast Cancer

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Abstract

Background/Aim: Patients irradiated for breast cancer may experience acute skin toxicity. To reduce this risk, a mobile application was created which reminds patients to carry out skin care. Before using this app in patients, a pre-study evaluating its usability in healthy volunteers was required.

Patients and Methods: In this prospective study, 30 healthy volunteers from Germany and Denmark were asked to test the app and complete a questionnaire including ten statements (“yes or “no”) in three sections.

Results: Satisfaction rates (statements affirmed with “yes”) were 66.7% (18/27 participants) and 78.6% (22/28) in the section “download and installation”, and 100% (29/29) and 96.7% (29/30) in the section “navigation”. In the section “content/functions”, the six statements were addressed by 28-30 participants; satisfaction rates were 86.7% to 100% (median 96.5%). Dichotomous responses were supplemented by individual comments.

Conclusion: This study revealed that the reminder app needed improvement before tested in patients and demonstrated the importance of a pre-study in healthy volunteers.

Keywords: Breast cancer, radiotherapy, acute skin toxicity, reminder app, healthy volunteers.

Introduction

Adjuvant radiotherapy following breast-conserving surgery is a standard local treatment for breast cancer (1, 2). In addition, post-operative irradiation may be required also

after mastectomy if specific risk factors exist (1, 3). Radiotherapy for breast cancer may lead to significant acute skin toxicity, namely moderate or severe dermatitis, which can be quite burdensome for the affected patients (4, 5). To reduce this risk of radiation dermatitis, a mobile application



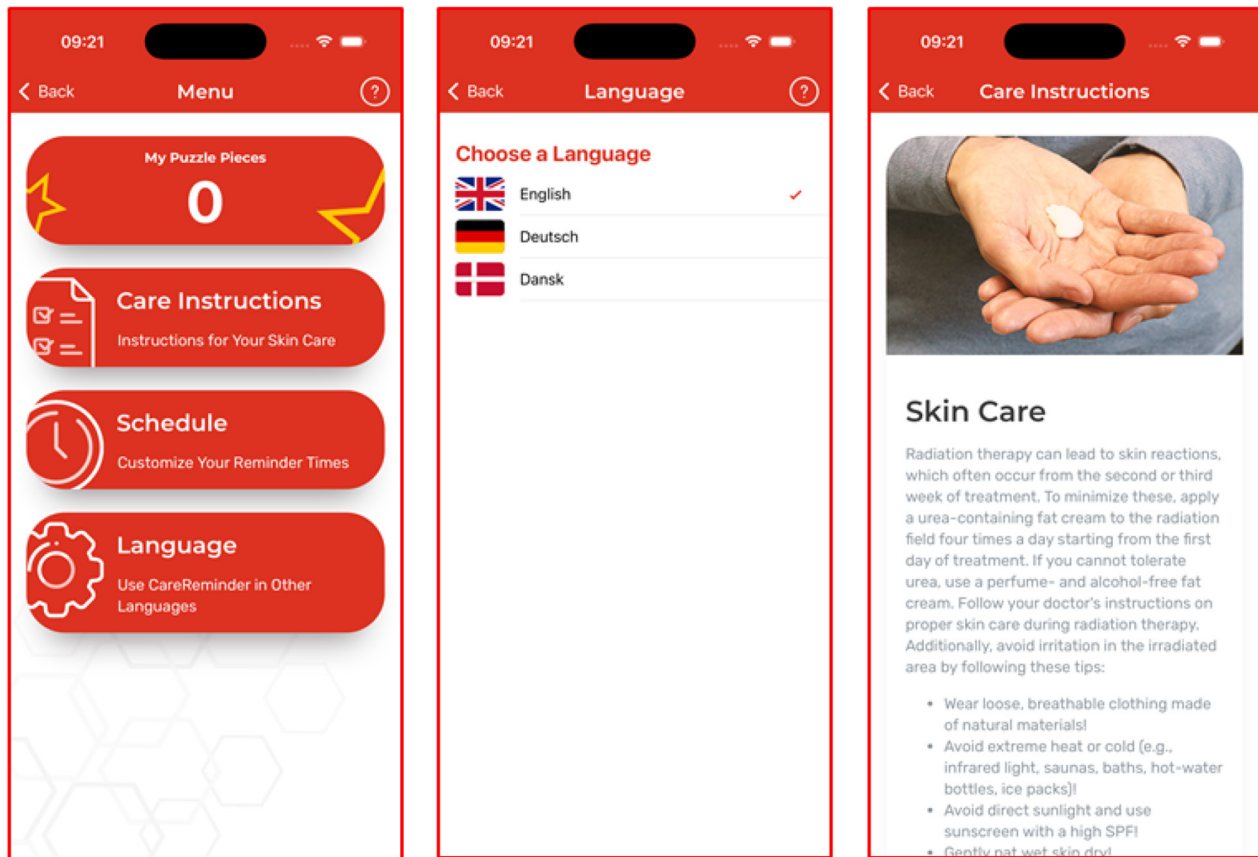
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Figure 1. *Continued*

was created that reminds patients four times a day to carry out specific skin care. However, before such a reminder app could be tested in patients irradiated for breast cancer, a pre-study evaluating its usability (functionality and practicability) in healthy volunteers was required. In line with other trials, the reminder app would be considered not useful if the satisfaction rate was less than 60% (6, 7). If this rate was between 60% and 80%, the app was considered useful but rated to require further development and optimization. The present prospective study was conducted in 30 healthy volunteers from Germany and Denmark who were recruited by project partners of the Interreg project Health Advancing Technologies for Elderly (HeAT). The study participants were asked to download the reminder app, to test it, and to complete a questionnaire including ten statements belonging to one of three different sections.

Patients and Methods

This prospective study included 30 healthy volunteers, 20 from Germany and 10 from Denmark. It was approved by the Ethics Committee at the University of Lübeck, Germany (2024-281_1) as part of the protocol of a randomized trial (8). The study participants were asked to download a reminder app developed by Nextlabel OHG, a company from Lübeck specialized in the development and design of software. The link for the app was provided by Nextlabel OHG *via* e-mail. Subsequently, the participants were asked to test the app and to complete a questionnaire, which was available in English, German, and Danish. After opening the app, the users were able to select their preferred language (English, German, or Danish). Afterwards, they received some information regarding the recommended skin care and skin protection to

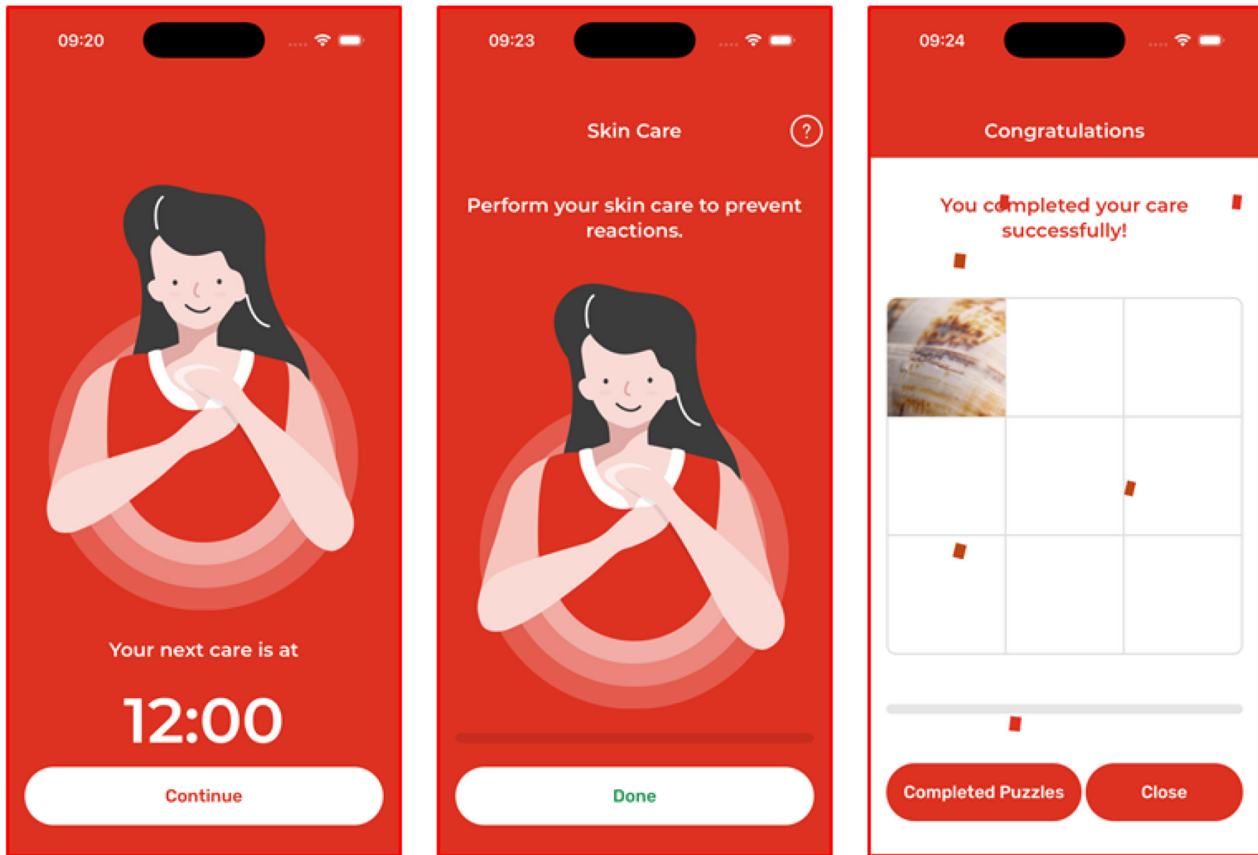


Figure 1. Representative screen shots of the reminder app.

be performed during and after the course of radiotherapy. The users could define the times they would like to be reminded to carry out their skin care each day (four times a day, for example at 09:00 h, 12:00 h, 15:00 h, and 18:00 h). After being reminded, the users had to confirm each time *via* a button that they performed the required skin care. For every second of successful and confirmed performance, they received a puzzle piece as a kind of reward. Representative screen shots of the reminder app are given in Figure 1.

The questionnaire consisted of ten statements that were categorized in three different sections, namely “download and installation” (two statements), “navigation” (two statements), and “content/functions” (six statements). The ten statements to be affirmed (“yes”) or negated (“no”) and the three sections are shown in Figure 2. In addition to addressing the statements in a

dichotomous way, the participants could make individual comments. In line with previous trials, the reminder app was considered not useful if the satisfaction rate (rate of affirmed statements) was less than 60% (6-8). If this rate was between 60% and 80%, the app was considered useful but needed further optimization.

Results

Four statements were addressed by all 30 participants, two statements by 29 participants, three statements by 28 participants, and one statement by 27 participants. In addition, 37 individual comments were provided by the participants related to the three sections, 17 comments related to the section “download and installation”, three comments to the section “navigation”, and 17 comments

Download and installation			
	Yes	No	Comment
The download of the application worked without any problems.	<input type="radio"/>	<input type="radio"/>	_____
There were no delays in the installation.	<input type="radio"/>	<input type="radio"/>	_____
Navigation			
	Yes	No	Comment
The main menu is understandable.	<input type="radio"/>	<input type="radio"/>	_____
The navigation within the app worked perfectly.	<input type="radio"/>	<input type="radio"/>	_____
Content / functions			
	Yes	No	Comment
The information about skin care is easy to understand.	<input type="radio"/>	<input type="radio"/>	_____
Adding and deleting an extra reminder time was easy for me.	<input type="radio"/>	<input type="radio"/>	_____
The app reminded me at the selected times.	<input type="radio"/>	<input type="radio"/>	_____
Opening the app on a reminder notification worked without any problems.	<input type="radio"/>	<input type="radio"/>	_____
The functions of the app are self-explanatory.	<input type="radio"/>	<input type="radio"/>	_____
The language setting could be changed easily.	<input type="radio"/>	<input type="radio"/>	_____
Additional comments			

Figure 2. The questionnaire to be completed by the study participants including the ten statements and the three sections.

to the section “content/functions”. Twenty-two additional comments were not related to one of the sections.

The satisfaction rates were 66.7% (18 of 27 participants) and 78.6% (22 of 28 participants) in the

section “download and installation”, and 100% (29 of 29 participants) and 96.7% (29 of 30 participants) in the section “navigation”, respectively (Table I). In the section “content/functions”, the six statements were addressed

Table I. Rates of affirmation (“yes”) and negation (“no”) of the ten statements regarding functionality and practicability of the reminder app.

Statement	n/N participants (%)	
	Yes	No
Download and installation		
The download of the application worked without any problems.	18/27 (66.7)	9/27 (33.3)
There were no delays in the installation.	22/28 (78.6)	6/28 (21.4)
Navigation		
The main menu is understandable.	29/29 (100.0)	0/29 (0.0)
The navigation within the app worked perfectly.	29/30 (96.7)	1/30 (3.3)
Content / functions		
The information about skin care is easy to understand.	29/30 (96.7)	1/30 (3.3)
Adding and deleting an extra reminder time was easy for me.	28/29 (96.6)	1/29 (3.4)
The app reminded me at the selected times.	26/30 (86.7)	4/30 (13.3)
Opening the app on a reminder notification worked without any problems.	27/28 (96.4)	1/28 (3.6)
The functions of the app are self-explanatory.	28/30 (93.3)	2/30 (6.7)
The language setting could be changed easily.	28/28 (100.0)	0/28 (0.0)

by 28 to 30 participants. In this section, the satisfaction rates ranged between 86.7% and 100% (median 96.5%).

The individual comments related to the section “download and installation” indicated problems with receiving the e-mail with the link or the download of the app (11 comments) and problems with the activation code/password (five comments). One comment mentioned that the program of the app “was in German at the start”. Of the three comments related to the section “navigation”, two were favorable (“easy to navigate - no problem”) and one stated problems with changing the language. The problem regarding the choice of the language was also mentioned in six comments related to the section “content/functions”. Five users missed or would like modifications of the information regarding skin care, five users indicated problems with the reminders, and one user just mentioned that he or she did not modify the times to be reminded.

Discussion

According to our previous study, 31.2% of 327 patients irradiated for breast cancer experienced at least moderate radiation dermatitis (9). The prevalence of moderate or severe radiation dermatitis in other studies ranged

between 3% and 76% (10-31). Therefore, this acute toxicity can be considered a credible problem. It should also be avoided because it can impair the patients’ quality of life (4, 5). To reduce the risk of radiation dermatitis, the patients are asked to carry out specific skin care several times a day. However, the patients may find this challenging. Therefore, an app was created that provides instructions of skin care and skin protection during and following the course of radiotherapy (8). Moreover, this app reminds the patients four times a day of performing the required measures of skin care with specific cremes and lotions. Before the reminder app can be tested in prospective clinical trials involving patients irradiated for breast cancer, it needs to be evaluated with respect to functionality and practicability in a series of healthy volunteers. Therefore, this prospective study was conducted. Healthy volunteers from two countries completed a questionnaire of ten statements and added individual comments regarding their experience with the download and installation of the app, the navigation through the app, and its content and functions.

According to the findings of this study, the evaluated version of the reminder app required some improvement with respect to its download and installation. The satisfaction rates in this section were only 66.7% and

78.6%. Moreover, 17 individual comments were made in relation to the section “download and installation”. In the section “navigation”, the satisfaction rates were very high (100% and 96.7%, respectively). Of the three comments related to navigation, two comments were favorable and one comment that indicated problems with changing the language appeared more appropriate for the section “content/functions”. In that section, the satisfaction rates were >93% for five of the six statements. The corresponding rate for the statement “the app reminded me at the selected times” was also >80%. According to the pre-defined consequences based on satisfaction rates, modifications of this section of the app are not considered mandatory (8). However, when considering the individual comments related to this section, some improvements regarding the availability of the information regarding skin care and protection appear reasonable. The same applies to the language setting. The results of this study in healthy volunteers have led to modifications and further optimization of the reminder app.

In summary, this study revealed that the reminder app needed improvement. Moreover, our findings demonstrated that a pre-study in healthy volunteers is important to allow for further optimization of the app before it could be tested in a clinical trial including patients receiving local irradiation for breast cancer.

Conflicts of Interest

The Authors are involved in the Interreg-project HeAT. Otherwise, no conflicts of interest exist in relation to this study.

Authors' Contributions

All Authors are staff members of a project partner of the Interreg-project HeAT and participated in the design of the study and the collection of the data. The data were summarized by D.R. who also drafted the article. The article was reviewed and its final version approved by all Authors.

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Artificial Intelligence (AI) Disclosure

No artificial intelligence (AI) tools, including large language models or machine learning software, were used in the preparation, analysis, or presentation of this manuscript.

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