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Physicians' Views of a Digital Intervention to Support Respiratory Patients: Take-a-Breath Pre-Pilot Usability Study

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Abstract. Although eHealth interventions are increasingly recognized as a useful tool to support healthcare, relatively few studies focus on the physician-end's usability. This study aims to evaluate the Healthcare Professional's (HCP) platform of the Take-A-Breath project, a Greek initiative for personalized respiratory disease monitoring, training and self-management. The pre-pilot usability study, involving 10 participants, combines qualitative methods, behavioral observations, and standardized measures of user experience and usability. While relatively high scores indicate overall acceptance, concerns are also discussed, particularly related with the volume of information provided and actions available to the users, hindering the usability of the system due to an overload effect. Findings emphasize also the need for more tailored in-app wordings as well as the integration of similar systems with the already set up electronic health record systems. This study contributes to understanding digital intervention success among HCPs in respiratory healthcare.

Keywords. Usability, respiratory care, eHealth, healthcare professionals

1. Introduction

A better understanding of how physicians perceive and use digital health interventions to achieve improved outcomes is of utmost importance [1]. A review of digital health interventions across multiple diseases found that usability from the physicians side was assessed in only 33% of studies [2]. The Take-A-Breath project is a Greek collaborative initiative focused on personalized management of respiratory diseases, empowering

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patients to self-manage their health effectively. The patient's system collects data on behavior while using an inhaler device, aiming to enhance medical care and treatment adherence. The software comprises a smart mobile application for patients, and a healthcare professional (HCP) website application for personalized patient management. The HCP website application provides access to data generated within the Take-A-Breath project by the patients' application. It serves as a personalized patient management page, offering interaction channels with patients to ensure active user participation. The platform primarily offers three options: (a) interaction with individual patients for data review, supporting progress monitoring, or assignment of activities, (b) management involving the addition, editing, and deletion of materials on the platform such as questionnaires, educational material, and assignment criteria, and (c) mass assignment of activities to a broad group of patients by the healthcare professional [3].

This study's primary objective is to present the task performance (TP) and the user experience and usability measures results of the HCP's subsystem pre-pilot usability study, with the focus on what is needed to ensure the acceptability of the platform.

2. Methods

2.1. Study Design & Participant Recruitment

The HCPs recruited for the study were restricted on their specialty being pulmonology. Specialized doctors in training were also included to assess the experience of new professionals. A total of 10 participants were involved in remote sessions, each lasting approximately 1.5 hours, conducted through online teleconference software. All participants were treated as "*naïve users*", namely as users who were not trained for the specific application. They provided informed consent, including permission for the recording of camera, screen, and sound for analytical purposes.

2.2. Data Collection & Analysis

The data gathering process involved several phases, encompassing preparatory tasks, i.e. a short overview of the application to be used, scenario enactment, semi-structured interviews, and the implementation of standardized user experience and usability measures. In the preparatory steps, moderators set the context, explained the think-aloud process, and gathered demographic data from participants. Following this, the Scenario Execution phase commenced, where participants were directed to perform tasks while verbalizing their thought processes in a "think-aloud" setting [1]. A series of HCP user scenario tasks were devised to assess the platform's usability within specified usage scenarios. TP data, focusing on successful completion or failure, were systematically recorded. After the scenario execution, participants engaged in semi-structured interviews to provide additional context and discuss observed actions or behaviors.

For quantitative data, standardized measures of user experience and usability including the Post-Study System Usability Questionnaire (PSSUQ) [4], System Usability Scale (SUS) [5], and User Experience Questionnaire (UEQ) [6] were administered.

The analysis primarily focused on calculating the reported measures of user experience and usability scores and evaluating TP.

3. Results

3.1. Participants

Ten HCP participants, all native Greek speakers, were engaged in the study. The gender distribution among the participants consisted of six males and four females with an average age approximately 38 years old. Among them, two participants were seniors, aged between 50-55, while the rest were relatively young, falling within the age range of 25-45. All participants rated themselves relatively high in regards to their web application skills, except one senior participant who rated their skills slightly lower.

3.2. Participants feedback, scores, and observations

Analysis of the data collected using the standardized measures of user experience and usability revealed diverse outcomes, summarized as follows:

- SUS: The SUS score recorded was 68.889, slightly below the generally accepted score of 70, indicating a moderate level of usability acceptance by users.
- UEQ: All elements scored above the accepted standard, with Attractiveness receiving the highest score at 1.593. On the UEQ, 3 is considered the perfect score, while 1 signifies the acceptance standard. Other elements achieved the following scores: Perspicuity (1.519), Efficiency (1.667), Dependability (1.429), Stimulation (1.463), and Novelty (1.472).
- PSSUQ: The overall PSSUQ score was 2.875, reflecting a relatively moderate but positive score. Within the PSSUQ, Information Quality received the lowest score at 2.852, followed by Interface Quality (2.667), and System Usefulness (3.056).

TP was denoted as "Miss (M)" when a participant made a mistake but corrected it, "Success (S)" when the task was completed successfully, and "Failed (F)" when the task was not completed due to a usability factor.

Table 1. Task Performance of health care professional users

Tasks	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10
Task 1: Login	S	S	S	S	S	S	S	S	S	S
Task 2: Menu Comprehension	S	M	S	M	M	M	M	M	F	F
Task 3: Add a patient	M	M	S	F	M	M	F	F	F	M
Task 4: Locate and open Patient's Tab	M	M	M	F	M	S	S	M	S	S
Task 5: Locating and reviewing measurements and scores	S	M	S	M	M	S	S	S	M	M
Task 6: Assigning a Questionnaire	S	M	S	M	M	S	M	S	M	M
Task 7: Patient's device management	S	S	S	S	S	M	S	S	F	S
Task 8: Assigning educational material	M	S	S	S	M	M	S	M	S	F
Task 9: Setting Notification Criteria	F	F	M	F	F	F	M	S	F	F
Task 10: Adding educational material	S	S	M	S	S	M	M	S	S	F
Task 11: Adding a questionnaire	S	S	S	S	S	M	S	M	S	S
Task 12: Setting mass applied notifications	S	S	M	F	S	S	S	M	F	S
Task 13: Search and compare patients	M	S	S	S	S	M	M	M	S	M
Task 14: Mass assignment of activities	M	M	M	F	M	M	M	M	F	M

4. Discussion

The assessment of the entire application revealed a borderline acceptance based on the measures of user experience and usability results. However, upon delving deeper into participant feedback, it became evident that more detailed insights could be drawn. Participants emphasized the complexity of managing multiple health record systems within the same clinical site. Integrating the health record (HR) module embedded in the Take-A-Breath HCP sub-system into an already implemented clinical HR is preferred by physicians. Having multiple health record systems within one organization can jeopardize patient safety by scattering information, boosting the risk of errors, and inflating search time expenses [7]. This situation can hamper efficiency, as users might hesitate to consult other systems, worsening the issue of incomplete patient data [7].

In terms of the rest of the features, mainly educational modules, questionnaires, and measurement display features, participants rated them highly in terms of usability, expressing overall satisfaction with their functionality. Tasks related to the custom notification rules feature on the other hand, a novel addition to the application, received low ratings in both usability and satisfaction assessments, indicating the need for a more refined design informed by further user research. Nevertheless, despite the low ratings, participants acknowledged the utility, presentation, and aesthetic design of the custom notification rules feature. The study also revealed issues with obviously inappropriate in-app wordings, which could have been identified via rigorous testing prior to the present study. Content comprehensibity was challenging for all participants, highlighting a need for better-tailored content and personalization, an important aspect of self-care digital interventions [8]. Furthermore, the complexity of actions due to the health record's presence and the perceived *"too many options"* by some participants further complicated otherwise simple actions, highlighting the importance of simplicity, minimalistic design, and distinct actions for successful system adoption. Avoiding information overload is a key factor in the success of an information technology system [9].

While most individual modules were generally accepted as aforementioned and deemed useful, the overall complexity of the application posed challenges for users. Issues such as information overload and unclear communication of the "right" usage hinted at limited overall acceptability. This could be attributed to the lack of testing iterations during the design and development cycles of the system. A cyclical process of design, evaluation and redesign should be repeated for as long as necessary[10]. Iterative processes produce better applications because some of the changes that attempt to solve one issue may fail to solve another[11].

To address these challenges prior to the pilot study, although an iterative testing process during design and development would be preferable, complimenting the app with a user manual could prove highly useful and improve understanding for the main monitoring actions of the platform and support the HCPs during patient recruitment. This study successfully identified key issues aligned with the literature that could hinder the smooth adoption of the system and in need of further research.

5. Conclusions

In conclusion, this usability study sheds light on healthcare professionals' perceived usability regarding the Take-A-Breath HCP web app. Despite the marginal acceptance of the application based on the usability measured scores, the study underscores the

nuanced challenges arising from the information and available action overload. The identified issues, such as the absence of tailored wording and the impact of information overload, underscore the need for proactive measures. While certain modules within the app received positive feedback, the study emphasizes the necessity of involving physicians in the design stages to ensure the system is tailored to their needs. As the use of digital tools in health care expands, it will be critical to learn from physicians' preferences and experiences to ensure that the tools fit well into their daily work life.

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