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Web-Based Cardiac Rehabilitation: A Co-Design Workshop

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Abstract. Background. Only 20-40% of candidates actually attend cardiac rehabilitation programs in Australia, with attendance numbers remaining unchanged in the last 20 years. Common barriers to cardiac rehabilitation are geographical isolation, work responsibilities and transportation. Web-based cardiac rehabilitation can provide an alternative, patient centred, flexible delivery option. **Objective.** The objective of this study was to describe how patient-generated input, through a workshop on desired content and features, informs technology and implementation specifications for the patient portal of a cardiac rehabilitation website. **Methods.** *UX Design* theoretical framework, using a co-design workshop, with thematic analysis and a survey. **Results.** We recruited 7 participants and 1 cardiac rehabilitation coordinator. The median age of participants was 75.0 (IQR 74.0-78.0), 4 (57.1%) were male and all had completed a cardiac rehabilitation program. Most used a smart phone (5, 71.4%) and Facebook (6, 85.7%). Four themes were identified: input information, format of information, usability and support of health behavior change, informing the next iteration of the workshops and contribute to the cardiac rehabilitation patient website development.

Keywords. Cardiac rehabilitation, co-design, web-based, remote health

1. Introduction

Cardiac rehabilitation (CR) is the sum of interventions needed to ensure the best physical, psychological, and social conditions, slowing the progression of cardiovascular disease, and restoring quality of life. There is high-quality evidence that CR significantly reduces death, reoccurring cardiac events and improves quality of life, empowering people to better understand and take charge of their health [1]. In rural and remote Australia, low referral rates, scarcity of health professionals, poor perceptions around the benefits of CR, lack of flexibility in the delivery of CR programs and geographical isolation are major challenges to CR attendance [2,3]. Recent studies have shown that only 20-40% of candidates attend CR programs [1]. Furthermore, the practice of and attendance at CR in Australia has not changed in the last 20 years [4].

CR is predominantly delivered face to face or via telephone. Individual studies have had positive outcomes when exploring and trialling web and app-based models. An Australian study reported improvements in CR adherence (94% vs 68%) and completion (80% vs 47%) using a smart phone home-based care model [5]. Likewise, an online program of CR implemented in the UK showed positive results across clinical and psychosocial outcomes such as improvements in angina frequency ($p = 0.002$), physical activity (+497 steps intervention group, -861 steps control group) and emotional quality

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of life ($p = 0.04$) [6]. Web-based CR can address the issues relating to the rigidity of current CR delivery models and distance-related barriers.

This study will contribute to the development of a patient portal, within the https://www.chapproject.com.au/ website, with password protected login. The patient portal will include interactive secondary prevention advice, daily reminders to exercise, and private password protected messaging with a CR specialist. It will also incorporate the recording and monitoring of data, including objectively collected activity data via smartphone or bluetooth device. Providing a flexible and tailored approach to CR.

2. Objectives

The co-design process involves human centered design, ensuring a patient centered care model that meets the needs and abilities of the people who will ultimately use and engage with it [7]. The objective of this study was to describe how patient-generated input, through a workshop on desired content and features, informs technology and implementation specifications for the patient portal.

3. Methods

3.1 Participant Recruitment

Participants who have completed or currently undertaking a CR program within the regional Local Health Network were recruited via the local CR coordinator, who approached potential participants, providing them with the Patient Information and Consent Form.

3.2 Study design and setting

This study was conducted at the Flinders University Rural School in the Limestone Coast Local Health network. Patient consent was obtained prior to beginning the workshop, inclusive of audio recordings. Participants were eligible for inclusion based on their current or past inclusion in a CR program. The workshops used the *UX Design* theoretical framework, gaining critical feedback and insights from participants. We also assessed participant satisfaction with the website with a validated satisfaction survey on completion of the workshop.

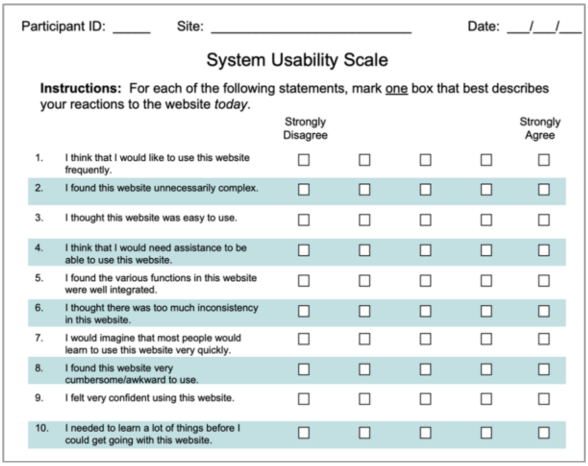
UX stands for *user experience*, and aims to create a positive user experience, resulting in consumer ready products, involving end-user's holistic engagement with the project at any and all points on a continuum [8]. UX workshops are guided by three main components: goal setting, questions, and activities [9]. Workshops under the UX design method use a set of principles and practices that allow researchers to identify problems or themes and create solutions and innovation.

Sample sizes for formal usability studies typically require 10-12 participants, with less formal usability studies 4-5 participants [10]. Usability studies have found that 80% of problems and actionable feedback are found from the first four participants [10]. Based on this, we aimed to recruit 10 participants per workshop, overrecruiting by 2 participants, allowing for attrition. Our final sample size was 7 participants.

3.3 Instruments

Participants were asked to fill in the demographic questionnaire at the workshop, including their age, gender, country of birth, education level, occupation, heart condition and attendance at CR. They were also asked about their relationship with information technology, including their social media platform, Internet connection and most common device.

On completion of the workshop, they answered the System Usability Scale (SUS) (Figure 1). The SUS provides web designers with a quick and reliable way to determine the subjective usability of the developing website with a valid tool (*a* 0.7-0.9) [11].



Participant ID: _____ Site: ______________________ Date: ___/___/___

System Usability Scale

Instructions: For each of the following statements, mark one box that best describes your reactions to the website *today*.

		Strongly Disagree				Strongly Agree
1.	I think that I would like to use this website frequently.	☐	☐	☐	☐	☐
2.	I found this website unnecessarily complex.	☐	☐	☐	☐	☐
3.	I thought this website was easy to use.	☐	☐	☐	☐	☐
4.	I think that I would need assistance to be able to use this website.	☐	☐	☐	☐	☐
5.	I found the various functions in this website were well integrated.	☐	☐	☐	☐	☐
6.	I thought there was too much inconsistency in this website.	☐	☐	☐	☐	☐
7.	I would imagine that most people would learn to use this website very quickly.	☐	☐	☐	☐	☐
8.	I found this website very cumbersome/awkward to use.	☐	☐	☐	☐	☐
9.	I felt very confident using this website.	☐	☐	☐	☐	☐
10.	I needed to learn a lot of things before I could get going with this website.	☐	☐	☐	☐	☐

Figure 1. System Usability Scale [12]

At the end of the workshop, the participants were asked to fill in an evaluation form and supply feedback. This evaluation form included 11 questions; these were divided into two parts. Part 1 sought feedback about what they liked, did not like and what interested them most out of the event. Part 2 sought feedback, based on a Likert scale, on the venue, food, audio visual, length, content, and presenters.

3.4. Data collection and analysis

The workshop was audio-recorded and transcribed. The workshop activities facilitated data collection and included focussed discussion about the format, within the website, participants preferences for receiving education, such as written (pdf/print, video, animation) and the CR Modules. The website's usability was explored through access to the website user interface design (Figure 3-5). Further to this the website's usability was assessed with set cues guiding discussions with questions such as: *Could you use it without help?*, *Is the navigation of the website clear? Is the language clear and easy to understand?*, and *Does it look good?*

These questions were responded to with sticky notes, with participants encouraged to share their responses when placing on the white board. Photographs of the white board and field notes were taken for later reference. The website's usability was assessed with the SUS [11]. Baseline data was collected through a questionnaire prior to the workshop.

The audio recordings were transcribed verbatim by the first author and then analysed using thematic analysis, which allowed themes to be generated from the data, and then organized into higher-order themes. Further, analysis from the post workshop SUS, assessed the patients' perception of the website in terms of audio, visual, content, usefulness and user-friendliness. Baseline data (nominal) from the demographic questionnaire is presented as frequencies (n) and percentages (%).

3.5. Ethical approval

All eligible participants provided informed consent before the workshop. Ethical approval was obtained from the Southern Clinical Human Research Committee (SA HREC) and the Southern Adelaide Local Health Network Director, Office for Research (266.20), from the 23 October 2020 till 23 October 2023. Site specific approval was also granted (EGR/20/RSS/15-19).

4. Results

4.1. Participant characteristics

The characteristics of the participants are given in Table 1. Out of the 8 participants eligible and consenting to be involved 7 participated. The median age of participants was 75.0 (IQR 74.0-78.0). There were more male than female participants (4, 57.1%). The majority were adequately educated with only one participant having completed their education at primary school level (1, 14.3%). All the participants were retired (7, 100%) and had completed a CR program (7, 100%).

Table 1. Participant demographic characteristics

Characteristics	Descriptive Statistics, n=7 (%)
Age, median (Interquartile range)	75.0 (IQR 74.0-78.0)
Sex	
Male	4 (57.1)
Female	3 (42.9)
Country of Birth	
Australia	5 (71.4)
United Kingdom	2 (28.6)
Education Level	
Primary school	1 (14.3)
Secondary school	3 (42.9)
Certificate	2 (28.6)
Bachelor's degree	1 (14.3)
Occupation	
Retired	7 (100.0)
Cardiovascular Condition	
Acute Myocardial Infarction	6 (85.7)
Heart Failure	1 (14.3)
Cardiac Rehabilitation	
Yes	7 (100.0)

Participants information technology characteristics are given in Figure 2. Facebook (6, 85.7%) and Twitter (2, 28.6%) were the most used social media platforms. The National Broadband Network (NBN) was used by just over half of the participants (4, 57.1%) and the majority used a smart phone (5, 71.4%).

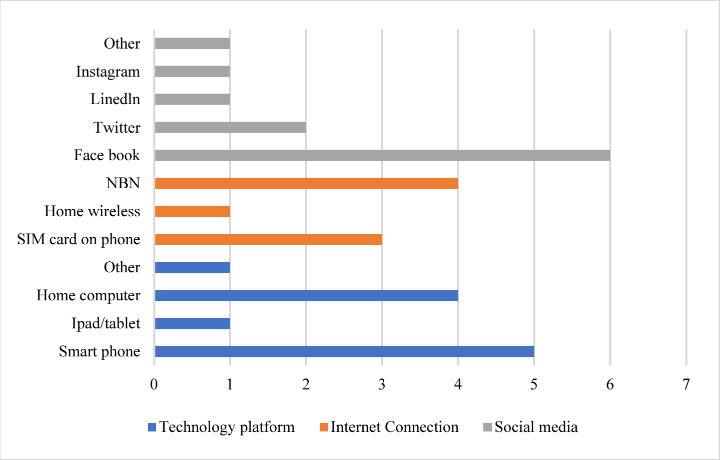


Figure 2. Information technology characteristics

5. Overview

From the workshop presentation and discussion, a total of 4 themes were identified that reflected participants concerns and ideas: *input information, format of information, usability* and *support of health behavior change.*

5.1. Input Information

Initially participants were shown a design page and log in page for the website (Figure 3) with some background discussion regarding the three models of CR, face to face, telephone or web based. It was highlighted that the starting point for choosing web-based CR was through the CR coordinator. From this one participant stated a, *'step by step guide for registration, with a help contact number'* would help if they found the process overwhelming or confusing.

Further to the above discussion the use of wearable devices was discussed by a couple of participants when viewing the slide shown in Figure 4. They said: *'given an apple watch as a gift, it is surprising some days how little we do'* and- *'iPhone health app, I use it sometimes,'* which then led to another participant asking about those people who do not/would not use a wearable device*, 'How else can activity be measured if no watch or app is used?'*

Following on from this the participants observed the slide in Figure 5, which created discussion around the human element of consistency in information being input. One participant commented on this specifically stating the need for: *'personal accountability to enter information and complete tasks.'* Which led to participants querying the dials on the screen reflecting health status. Another participant wanted to know how the reading for mental health under care plan was obtained, asking: 'mental health information, how will this work?'

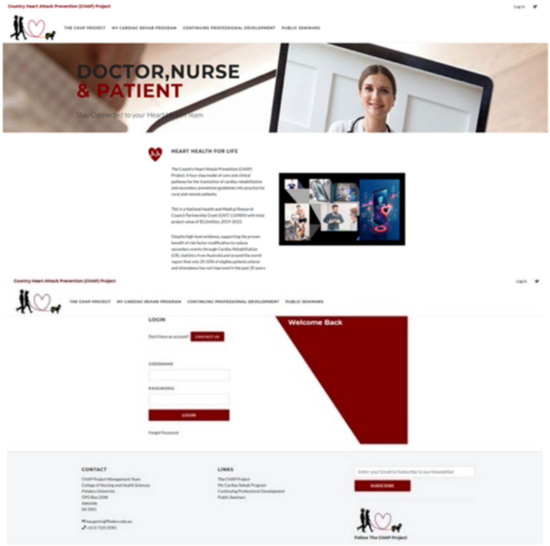


Figure 3. Design and log in pages

Figure 4. User interface design example

Figure 5. User interface design example

There was some general discussion about other information that could be input into the patient portal with one participant reflecting on their use of the notes feature on their smart phone asking: *'could it have a notes section like you have in a smart phone?'*

5.2. Format of information

There was a lot of discussion and reflection after the presentation was complete with participants talking about what would make the information in the website interesting and relatable. Some comments around this theme were:

- *'videos-pharmacist, cooking, dietician'*
- *'written information available from the video/audio information'*
- *'animation of a normal heart and different procedures'*
- *'links to the Heart Foundation books'*

5.3. Usability

Within this theme there was a significant comment by one participant, stating. *'Consider platforms the website is available on (not just desktop/laptop)'* Another participant expressed concern, if they were to use the web-based CR option, due to, *'not confident understanding information.'* As this concern was discussed it related to the elements seen in Figures 3-5.

5.4. Support of health behavior change

The participants felt the website would be a positive tool for behavior change, with three participants highlighting the areas they recognized as important:

- *'activity is exercise, keep doing something every day'*
- *'medication reminders are important and often get forgotten'*
- *'support when unable to speak to/appointment with CR clinician'*

Finally, an important component to health messages was around food, specifically that they are positive. One participant highlighted the need for the subtle reversal of dietary information, stating: *'dietician to tell us what we can eat not what we can't eat.'*

5.5. Website evaluation

The website's usability was evaluated using the SUS, with a mean SUS score of 58.7 (SD 19.2) (Figure 6). The SUS is scored from 0-100, with a score 68 indicating okay usability, 68-80.3 good usability and >80.3 excellent usability [12]. There were 8 SUS completed as the CR coordinator attending the workshop also completed one. Of the 8 SUS completed 2 were incomplete, with > 8 answers not completed. These unanswered scores were then scored at 3, per the SUS scoring criteria [12].

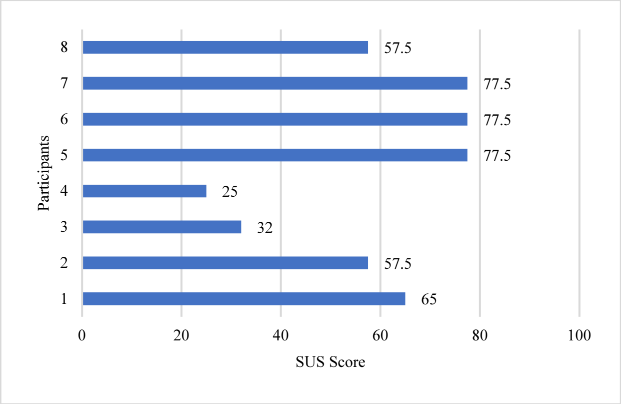


Figure 6. System Usability Scale

6. Discussion

For this study we organized a co-design workshop which was attended by people who participated in a CR program following a cardiac event. Participants were predominantly male and older age. Most participants owned a smart phone and used one social media platform. There is no readily available Australian data on elders use of smart phones and social media. However, one study from the United States (US) looking at the relationship between Facebook use, loneliness, social satisfaction and confidence with technology, reported a much lower percentage of Facebook users (42%) compared to non-Facebook users (58%) than in this study [13].

During this workshop the participants had the opportunity to see the user interface designs of the patient CR website and share their ideas, express their concerns and inform on how elements could be improved. This workshop identified themes and generated ideas from the process of how information is input to users for ease of navigation, particularly in the initial stages of commencing CR. The themes and ideas that emerged were *input information, format of information, usability* and *support of health behavior change* (Table 2).

The website's usability was assessed by the SUS, with an average score reflecting less than okay usability. However, the individual participant total scores represented a 50% response rate for okay usability. The SUS merely gives us a measure of the website's usability in this early development phase. Looking at the individual responses is irrelevant, as it does not offer up anything actionable, it is only diagnostic, as seen in the SUS questions [14]. Participants in this study are representative of the CR population, by age, and gender providing the researchers and web developers with feedback from the population most likely to access CR. Furthermore, our sample size is consistent with the literature for UX Design workshops with actionable feedback obtainable from as little as four participants. However, there is a lack of cultural and language diversity, limiting the feedback to only English-speaking populations. Finally, the SUS scores do not accurately reflect the website's usability given two participants had not completed every answer and only a modified score was achieved. It is expected with further iterations of the website's development, when presented at future workshops, this score will improve.

Table 2. Workshop themes and developments

Patient comments/needs	Features and functionality developments to respond to the patients' needs
Input information	
'Step by step guide for registration, with a help contact number'	Different forms of tutorial on the use of the portal: video, pop-up messages on the screen, written tutorial Helpline for patients through chat or telephone Cardiac rehabilitation coordinators explaining the use of the portal for those attending face-to-face
'Given an apple watch as a gift, it is surprising some days how little we do'	Engage with Cardiac nurses and the CR team to promote to patients the use of freely available activity trackers apps Collecting data of activity trackers through the portal (e.g. Bluetooth technology) Giving feedback to patients on their weekly level of activity through push notifications/SMS Having a graph where patients can follow-up their activity progress on a weekly basis
'iPhone health app, I use it sometimes'	Engage with Cardiac nurses and the CR team to promote to patients the use of freely available activity trackers apps Collecting data of activity trackers through the portal (e.g. Bluetooth technology) Giving feedback to patients on their weekly level of activity through push notifications/SMS Having a graph where patients can follow-up their activity progress on a weekly basis
'How else can activity be measured if no watch or app is used?'	Collecting data on daily living and leisure activities rather than exercise only data (e.g. patients being able to report they did 30 min of gardening/week) Import data from wearable tracker to patient portal
'Personal accountability to enter information and complete tasks'	Use of objective questionnaires to collect data Progress bar to indicate completed tasks/ yet to do
'Mental health information, how will this work?'	Use of validated questionnaires
'Could it have a notes section like you have in a smart phone?'	Have the content organized on the portal as daily or weekly tasks to patients (e.g. eat 5 pieces of vegetable/day as a daily task) Have a calendar in the portal where patients can access their daily or weekly tasks Have a functionality that allows patients to input personal tasks and tick the completed ones
Format of information	
'Videos-pharmacist, cooking, dietician' *'Written information available from the video/audio information'* *'Animation of a normal heart and different procedures'* *'Links to Heart Foundation books'*	Minimize the use of texts Deliver information through short videos and animations Have references to My Heart My Life book on the portal (e.g. learn more about this on Page X of My Heart My Life) Use of videos from reliable sources such as Heart Foundation
Usability	
'Consider platforms the website is available on (not just desktop/laptop)'	Consider designing the portal for smartphones and tablets as a priority
'Not confident understanding information'	Use of plain language Reassuring patients that they can access content as many times as they want even after having completed a specific module
Support of health behavior change	
'Medication reminders are important and often get forgotten'	Collect data on medication and times of taking the medication Patients can choose to receive push notifications/SMS at the times they are taking their medications
'Support when unable to speak to/appointment with CR clinician	Create a private chat on the portal through which patients can message CR clinician Peer support function (forum)
'Activity is exercise, keep doing something every day'	Collecting data on daily living and leisure activities rather than exercise only data (e.g. patients being able to report they did 30 min of gardening/week)
'Dietician to tell us what we can eat not what we can't eat	Invite patients to make videos with recipes to be displayed on the portal

The workshop provided critical information for the next iteration of the CR website development, particularly highlighting the need for elder friendless for ease of website navigation and connectivity, with a CR clinician at commencement and throughout the formal program. This finding is consistent with a report from the US stating that 73% of people over the age of 65 in the United States are connected to the web [13]. Suggestive of a demographic that could be a captive and capable audience for web-based CR.

This workshop will inform the next iteration of the patient CR website development, providing structure for future UX Design workshops, enabling the next level of participant feedback.

Acknowledgements

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Conflict of Interest

No conflict of interest

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