Virtuous Cycles of Wellbeing

Evaluation of an App to Support Older Adults with Wounds

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ABSTRACT

Virtuous Cycles of Well-Being is a project funded by the N8 Industry Innovation Forum and delivered by a multidisciplinary partnership covering the Universities of Leeds, Liverpool and Lancaster, with support from Smith & Nephew and the Hull City Healthcare Partnership. The aim of Virtuous Cycles of Well-Being is to explore technology-based wound-care services, solutions and products to support older adults in managing wounds more independently. In this paper we present Phase 2 of the Liverpool University element of this project involving an evaluation of a functioning app presented on a Kindle. The aim was to evaluate opinion and use of the app by wound care service users. Nine participants were recruited with an average age of 65. A semi-structured interview methodology was employed following researcher demonstration and participant interaction with the app.

Categories and Subject Descriptors

H.5.2 [**Information Interfaces and presentation**]: User Interfaces—*Evaluation/methodology*; J.3 [**Computer Applications**]: Life and medical sciences—*health*

General Terms

Human Factors

Keywords

Digital interventions, Evaluation study, Ageing population

1. INTRODUCTION

The research reported in this paper arose from one of the projects identified at a forum on Healthy & Active Ageing that took place in November 2012 which brought together interested academics and industrialists to explore the area of Healthy & Active Ageing, and funded by N8. The ambition was to create innovations (in the form of physical products, service innovations or anything else that would might work) that would enable older adults to maintain their own wellbeing for as long as possible. Our collaboration, created following the forum, encompasses a multidisciplinary partnership across three different sites; led by Leeds and comprising input from the University of Liverpool and Lancaster University. This academic input is complimented by the involvement of leading industrial medical technological organisation, Smith & Nephew and Hull City Healthcare Partnership. We were inspired by research on vicious circles [3] in new product development systems, with a view to creating the opposite effect, ie, self-perpetuating cycles of wellbeing. The people at the forum identified three priority areas: staying connected to work, managing chronic wounds, and supporting people caring for people with dementia. The project is named Virtuous Cycles of Well-Being. In this paper we focus on managing chronic wounds. Given the nature of the problem, we adopted the Action Design Research methodology proposed by Sein et al. [6]. The overall aim of Virtuous Cycles of Well-Being is to research and develop technological-based wound-care services, solutions and products for older wound sufferers. Research has shown that increased independence and self-management in the face of health issues improves wellbeing. It was anticipated at the outset that the technological-based wound care services would improve wellbeing and lead to the minimisation of hospital admissions through wound-care related issues, thus being in the interests of both patient and stakeholders.

With respect to the industry innovation forum funding cycle, the project took several cycles around the three step process to the left of the figure, one for each stage of funding (starting March 2013 and July 2013), and the iterative process shown to the right of the figure was used in each cycle for the Build, Intervene, Evaluate step.

2. WOUND CARE MANAGEMENT

The target population we aimed at were adults over 65 years old who live in sheltered or social housing, on low incomes. These can gain significant improvement to their well-being through the use of digital services. In particular, we focussed

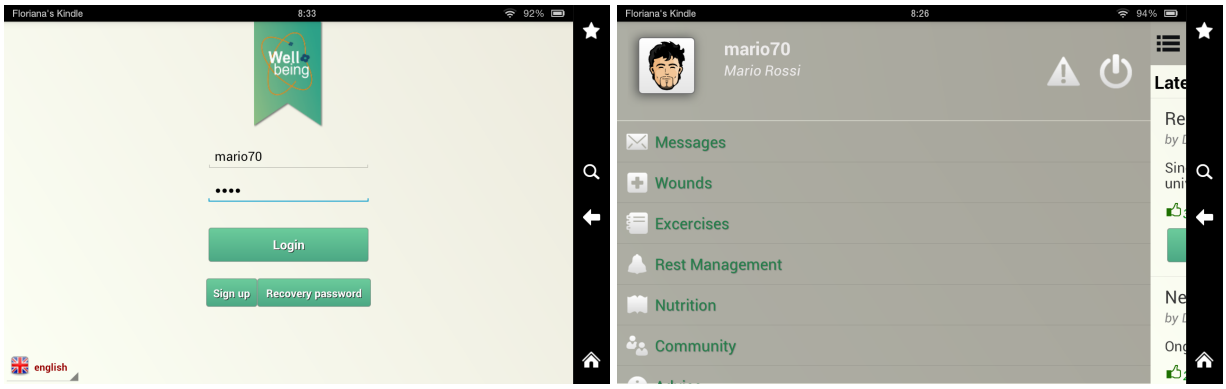

Figure 1: Prototype Introductory Page and Menu

on wound care management, as the process lends itself to the notion of stages of care. As soon as a wound is formed, the body immediately initiates stages of protection and repair [2]. Medical procedures to heal wounds are designed to facilitate this natural process. Informing patient about this process would empower them and aid self help. To this aim, patients should be informed of the various stages, the length of time each stage should take, or what to expect within each stage.

Assessment is the most important stage, as it helps decide the most suitable course of action, but such assessment is difficult due to extreme variability of wound type, concision and severity. Patients without professional medical training will often struggle to identify important changes in their wounds. As a result, wound care is often not as effective, increasing recovery time and even resulting in serious regression. An assessment tool to make the task easier, or more accessible to patients or untrained individuals, could improve personal wound care.

The wound healing process can also significantly impeded through lack of exercise, decreased circulation, poor nutrition/hydration and sleep disturbance. Lifestyle changes affected by long term illness or wounds can result in many of these factors. Advice and tools to support lifestyle improvement could aid in recovery and individual well-being.

A healthy living program that can tracks and advises on the wound healing process, as well as exercise, nutrition, hydration and sleep patterns to ensure patients are maintaining their fitness to support the natural healing process, would be of great benefit to the target population.

2.1 Framing the solution: methodology

Our methodology was informed by a socio-technical systems thinking approach to innovation and management processes [1] combined with the concept of Virtuous Cycles of Wellbeing [7]. An initial design workshop was held, facilitated by an improvisation specialist, to elaborate on the various issues. Problems were discussed and very low fidelity (eg, paper & string) prototypes created. Following the discussions at the initial workshop three key dimensions were highlighted that needed to be considered in the development of solutions that would create virtuous cycles of wellbeing for our target users rather than be laboratory-based demonstrations of potential. These inspired the definition of a theoretical framework that was used to inform a literature review on innovation management systems in the area of wound management and a socio-technical systems analysis of current wound management practices. Next an *alpha design* workshop was held, where key findings from the literature review and socio-technical systems analysis were presented to target users and their representatives and co-design activities were used to develop alpha prototypes. The results from these were passed to an independent design group who developed beta design solution concepts.

3. PROTOTYPE

A prototype app was realised on an Android platform (Honeycomb 3.0) optimised for a Kindle Fire HD tablet, connected to a MySQL database residing on a remote server. The purpose of the prototype was to provide the patients participating to the evaluation stage with a concrete example of what a system might look like, and which features might be included in a potential more intelligent application. By looking at a working prototype, patients would be able to have a better feeling on whether they might like an app of this sort, and the potential benefits and pitfalls in its use. The prototype was pre-populated with mock data, but the participants were also able to have a hands-on session, where they could enter their own test data.

Figure. 1 shows the introductory page and the menu. The patient can choose to browse or update information on their wounds, or browse or updates the various other aspects of the well being cycle: nutritional details, regimen of exercises, rest management. Figure 2 shows a collection of screenshots from the app. The top row shows the main details of a particular wound, and which features can be kept track of on the app. The middle row show, to the left, an example of the Size feature: the patient can introduce their data on the size of the wound, and can also (with the Quick Add bottom) take a picture of the wound, by using the built-in camera. This was added to the prototype to discuss with the participant the possibility (and opportunity) of introducing some image recognition feature to a potential system, to aid the assessment of size, but also as a repository of images from

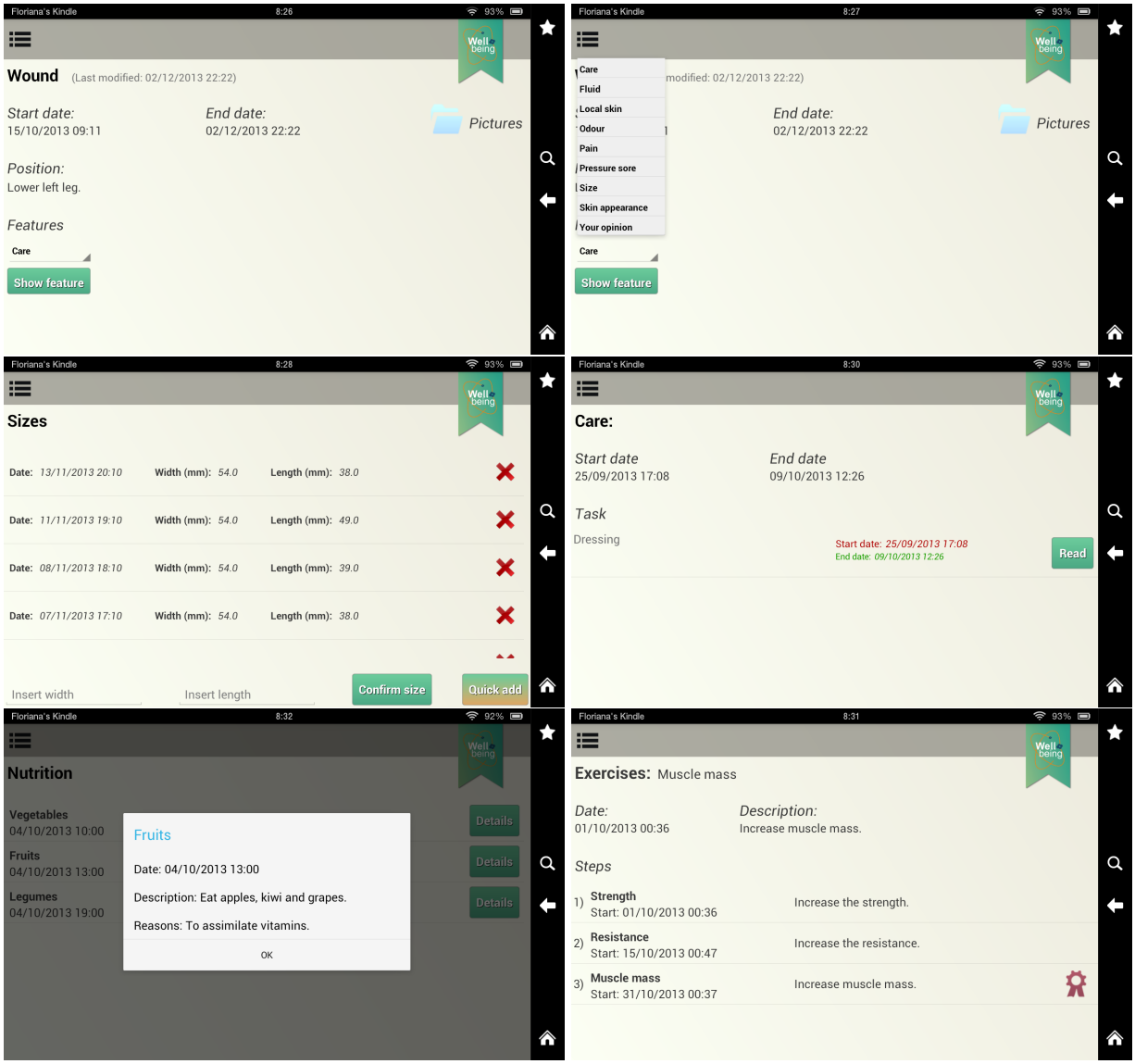

Figure 2: Wound care: various features

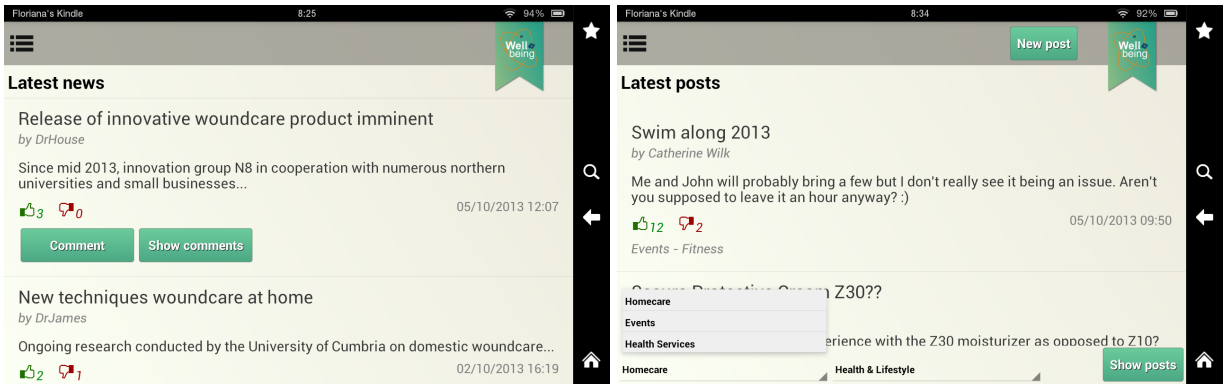

Figure 3: Community features

the wound to show to the clinicians at the next visit. The bottom row in Fig. 2 shows the nutrition page, with a set of pieces of advice given to the patient, details of each appear on a pop-up window, and an example of exercise regimen for the patient. For the latter, a sample gamification element was introduced (with the "target" achieved being rewarded with a rosette), to be able to discuss with the patients possible motivational mechanisms to improve compliance with the clinician's advice through games [4].

FInally, a community page (see Fig. 3) was included to introduce a social aspect to the app, whereby patients using the system can exchange posts, pictures, or comments, with the familiar mechanism of voting by "like" and "dislike". As before, this feature was introduce to elicit comments and discussion on the possibility of improving the patients well being, and overcoming the sense of isolation, by increasing a sense of belonging to a wider group [5].

4. EVALUATION

The kindle prototype app was evaluated both by a deliberative panel and by user evaluations. It is the results of the user evaluations that are reported here.

A working app was presented on a Kindle to wound suffers located across three different geographical areas. The aim was to evaluate opinion and use of the functioning app by wound care service users. Nine participants were recruited with an average age of 65, five from Hull (low socioeconomic background), two from Bradford (mid socioeconomic background) and two from Liverpool (mid socioeconomic background).

Participants were shown the app on the kindle and were given a demonstration[1] and the opportunity to explore the app. We then used semi-structured interview methodology to evaluate the participants interaction with the app, and their views of the app. Key questions included: Were there any features which stood out to you to be particularly confusing; Do you have any suggestions which you feel would make the app easier to use; and what benefits do you feel would come out of using the app?

[1]Due to the difficulties of wifi access at one of the venues, two of the participants were unable to see the working app. Instead they were shown the Kindle in general and slides of the different screens of the app.

5. RESULTS AND DISCUSSION

We discuss two types of findings. The first concern the methodology, and the second concern the participants' evaluations.

5.1 Methodological findings

One of the issues was that in one of the places where the app was evaluated there was not access to the internet, and as a consequence the app itself could not be evaluated, these was the case for two participants. Instead participants were shown slides of the app, and at the same time were shown the tablet. The interviews in this circumstance were less well focused on the app itself, and focused more on the issues of wounds. In addition, the participants were more negative towards the app concept. In addition, these participants also raised the cost of the app (the only two participants to do so).

This suggested that if people are only shown a concept design they think of costs more than benefits and that they think in practical terms. The second issue was the challenges of getting participants to talk about the individual components of the app, which was important for the further development of the app. Instead, participants wished to talk about the app as a whole and as a theoretical concept only. We also found that the subjective confidence in IT skills was a predictor of device handling and app interaction during the evaluation sessions.

5.2 General findings

General findings can be grouped under four themes: the relationship between patient and practitioner; the data management aspects of the app; social support through the app; and barriers.

The evaluation found a surprising lack of trust between patient and practitioner exists which is fuelling an 'us and them' culture with respect to wound manager. Participants expressed the view that the 'practitioner doesn't always know

best'. Participants suggested that the app could be a means of addressing these issues. The app could be used as a joint enterprise with both participants and professionals adding information. The app was viewed as a way of aiding continuity between health care professionals:

> It is good as all the information is in one place and you could show your carers your progress - a way of precisely recording what has happened at each stage and it will prevent mix ups.

Concerns were raised that this would produce more work for practitioners and that it would not be a priority within an NHS budget if that were the case.

The second theme feeds on from the sharing of information. Participants suggested that by recording information on the app it would improve participants' self-concept. There was a consensus that the app would be a good way of storing information that would be forgotten between appointments, and would be easily retrievable. For example, this participant commented:

> It would be good to have information about the specific types of medication i.e. what each one I am on is used for. This is so when the medication is changed by the clinician sometimes you don't know what it's supposed to be for.

One of the main benefits of the app was seen as the ability to gain access to and digest information at a suitable rate. Participants felt that any tool which could aid self-management would be met positively. A related benefit of the app was the around goal creation and development which would facilitate better wound management. There was a strong sense that the more knowledge gained, the more control and confidence it was felt there would be over their own health care issues:

> I think the app will help with providing knowledge on the problem which would lead to understand and therefore, a stronger feeling of independence, which is important.

However, the most feedback we received concerned the community application of the app. Participants discussed the unmet need in terms of emotional wound care support. They suggested that currently there was little support for patients struggling to cope with secondary issues such as embarrassment, depression and feeling alone. Participants suggested the community aspect of the app was seen as an antidote to these issues and it was likened to a 'virtual waiting room'. The evaluation found that wound care patients consider themselves part of a community, often forming bonds with fellow patients in a clinic:

> People are more inclined to talk to others who have been through a similar experience to themselves and to take advice from others in this way.

The ability to communicate their problems to people who have been though something similar was important. Thus, the Community Tab was met with great positivity with parallels being drawn to other social networking such as Facebook. In fact, the familiarity with social networking facilitated the positive response to the community tab. Participants felt the community tab would provide reassurance and would be useful to patients who were more isolated, as one participant commented:

> I think that's useful, especially for people who are on their own. They will be able to ask people for their advice.

Although participants focused primarily on the advantages of the app, concerns were raised around some aspects of the app. For example, participants were concerned about privacy settings, and some participants favoured a 'patient only' viewing set-up, which would exclude professionals:

> But I particularly like the community. I do not think the clinicians should be able to see that

On the other hand some participants were concerned about safety concerns and wished for professional monitoring. Other barriers to the app's use concerned technological skills, although participants were keen to point out that age was not a barrier to learning those skills. Technology will be a barrier to some people.

> Its becoming more and more common though although there are quite a few who will have nothing to do with it

Socio-economic status was considered a barrier. Those of our participants from lower SES groups were more distrustful and less willing to engage in the either the app or the concept of the app. They were also more averse to the notion of self-care. They saw self-management as a burden and an extra responsibility that should not be theirs. This contrasted with those from higher SES who suggested they would find the app empowering.

Finally, participants acknowledged that technology was also used in existing healthcare settings and they gave examples such as appointment sign-in at the GP and self-management of blood pressure. For example one participant commented:

> It's good that its on a touch screen as its really easy to use. People are getting used to touch screens as they are appearing in places like doctors surgeries so eventually everyone will be familiar with this type of technology.

Participants also discussed the advantages and disadvantages of the reliance on technology in health care services, and there were divided views as to the extent that this

should be adopted. The app was viewed as a secondary, additional service to compliment the existing wound care service rather than a "sole use" tool. Participants were also concerned that this app should not impact upon the amount of human contact received via appointments. They suggested that the app would be used as an 'informant' tool and it was envisaged that appointment visits could be reduced by way of self-care via the app.

5.3 Conclusions on the Patient-Led Development of the App

The use of patient-led identification of needs requiring solutions may identify different priorities to the professionals. The design process helps ensure that innovations are fit for purpose and acceptable to the patient/carer. The design process leads to a speeding up the process of appropriate innovation. The innovations are tailored with patients and carers to meet their needs, recognising their unique insights. The process reflects the principle of delivering patient-centred care.

6. ACKNOWLEDGMENTS

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