VIDEO TOOLS TO SUPPORT PATIENT EMPOWERMENT IN ORTHOPAEDIC REVALIDATION

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ABSTRACT

This paper reports an exploratory study into tools for post-operation revalidation from joint replacement. In the project, two design teams developed and evaluated two early concepts for revalidation support collaboratively with a physiotherapist and two patients. The concepts were 1) a patient-led, unscripted video tool and 2) a game-like scripted video tool serving patient-physiotherapist communication. Other key stakeholders are the orthopaedic surgeon who, along with the design researcher and others, are the driving participants in a longer-term research collaboration. The design case studies revealed their potential for patient empowerment in that the patients became motivated by the connection with their daily lives, and in that the tools supported their conversation with their physiotherapist. However, challenges remained in the application of the results in the current distribution of stakeholder roles. The paper discusses the challenges and offers up initial directions for shifts in roles.

INTRODUCTION

This paper reports an exploratory study into tools for patients during orthopaedic post-operation revalidation

from joint replacement. Opportunities for digital tools for patients have arisen because hospital stays are shortening due to innovation and quality improvements in treatments (Hartog, Mathijssen & Vehmeijer, 2013). While that benefits both the patients in that they spend less time away from their normal environment, and the hospitals in that they can achieve gains in cost-efficiency, an undesirable side-effect is that it becomes more difficult for specialists to inform and accompany patients throughout the journey of their treatment (Jimenez, Romero and Keyson, 2011). Digital tools could play a supporting role in this by empowering patients.

DIGITAL TOOLS FOR PATIENTS

Digital tools for patients hold promise for patient empowerment, as part of eHealth (Shaw et al, 2017). eHealth interventions are seen as promising because they are expected to help improve self-efficacy and empower the patient as "an active member of his/her own disease management team", by supporting patient engagement, knowledge, collaboration, commitment and tolerance of uncertainty about the treatment path (Guarneri, Brocca and Piras, 2017). eHealth is expected to help sustain the quality of service of European health systems. The quality of service has come under pressure due to the rise of non-communicable diseases and the ageing of European (and global) citizens (Matheson et al, 2013). Designers can contribute to the development of empowering eHealth: the health community has called upon designers to contribute to healthcare challenges with design thinking, because designers iteratively develop and evaluate interventions in close contact with the context of use (Matheson et al, 2013). This paper presents such an effort for digital tools.

THE CONTEXT FOR THIS RESEARCH

This research is situated within a collaboration reflecting these potential benefits, called the HiPP consortium (Highly individualized Patient Projects). HiPP's aim is to enhance patients' experience of their journey of undergoing joint replacement surgery (Boess et al, 2014). In 2012, HiPP was set up as a partnership

between Zimmer Biomet, the orthopaedic research group at Reinier de Graaf hospital and the Faculty of Industrial Design Engineering at the TU Delft, based on mutual goals and interests. Zimmer Biomet, one of the world's leading medical device manufacturers, is known for an innovative approach to their product-service portfolio. Reinier de Graaf, a leading clinical teaching hospital, is always striving to improve patient care.

The work on this project started with a question from one of the orthopaedic surgeons: how to ensure that patients adhere to revalidation exercises they are given, and increase the surgeon's control over the revalidation process? Currently, the surgeon transfers the patient to a physiotherapist after surgery and discharge. The surgeon would like the revalidation to be carried out in the way the surgeon envisaged. We agreed that digital supports for this revalidation period would be explored. The surgeon arranged contact with a physiotherapist with whom he collaborated. The physiotherapist was the gatekeeper for access to the patients, as well as participant in the research himself. Two junior design teams worked on the project as part of a research assignment. The physiotherapist put the two design teams in contact with one patient each. Each design team worked with a patient to develop and evaluate early concepts for digital revalidation support.

We wanted to approach the orthopaedic surgeon's questions from the patient empowerment perspective mentioned above, which encompasses the medical perspective of adherence checking and also aspects of patient motivation: what would help patients engage and commit to their physiotherapy. For this, the design teams and I reformulated the surgeon's questions into a more open brief: support patient empowerment in physiotherapy. The early concepts that the design teams developed were to provide insights for the HiPP project collaboration, to contribute to our joint exploration of how to support patient revalidation. In earlier work we explored the benefit of linking rehabilitation motivation to the home context, because "(real-life) skills are part of their existing skill repertoire and patients can call on them", and thus connect their current situation with their potential healthy future self (Szaniawski et al, 2015). The research questions addressed here are: how could the patients integrate revalidation better with their lives at home and what options are there for them to influence support? How does this affect the stakeholders' roles in the context, such as doctors and physiotherapists?

METHOD
The research questions were addressed through research-through-design activities. In the project I sought to promote the designing of something *'right'*, a product that transforms the world's current state to the preferred state, as recommended by Zimmerman et al. (2007). More specifically, I promoted a *constructive design research* approach, in which construction becomes the key means in constructing knowledge (Koskinen et al., 2011).

Specifically, in this project I employed a method of previewing future life situations while they are not yet there and not yet finished. They can be summarized under the concept of 'interaction prototyping'. The future interactions expected to arise in a context can be simulated using interaction prototyping (Boess, 2013). A framework was in place for the designers to direct their activities towards the patients' life experience and to analyse what the designers and patients made and saw. With this framework, I sought to direct the design teams' attention to mutual learning between designers, patients, a physiotherapist and an orthopaedic surgeon. The framework consisted of:

- *experiencing:* creating means for stakeholders to immerse themselves into their own current experience of a particular topic. For example, most of us experience going grocery shopping regularly, but may not have the experience readily available to our memory when asked about it. Designers can support this recollection in collaboration with stakeholders.
- *critiquing:* as citizens in daily life we may accept the way things are, without readily being able to reflect on how these really affect our lives and our social relationships. By enquiring into this, designers can direct attention to it.
- *creating:* providing stakeholders with a means to construct the parts of their current situations and subsequently, of desirable future situations so that they can then evaluate these. Designers have tools at their disposal to support stakeholders in such generative activities.

I developed these distinctions based on earlier work on previewing future situations for design (Boess, 2006). In this project, I sought video-based proposals from the design teams, because video has been explored successfully in design for empowerment in various ways (Giaccardi et al, 2012, Ylirisku and Buur, 2011).

RESULTS

PHYSIOTHERAPY
The two design teams first held initial interviews with the physiotherapist to understand the interactions associated with physiotherapy. The physiotherapist stated that an operation introduces a major imbalance in the patient's body. Half of his therapy effort was to help the patient regain this balance as well as strength, through in-practice and in-home exercises. The other half of his therapy effort was about helping the patient learn to manage their own expectations and assess their own improvement (or lack of it) over a period of several months and beyond the period of therapy. The physiotherapist stated that in his experience, patients sometimes had overly high expectations of their recovery, which were partly fed by the surgeon's communication that the operation had been successful.

TWO CONCEPTS

Both concepts featured in this paper were video-based. I first describe the two concepts and how the design teams developed them together with the physiotherapist and a patient, before evaluating them in terms of what they meant for the patients and how they challenged the current roles in the stakeholder context.

CONCEPT 1: UNSCRIPTED VIDEO

This was a patient-led video concept, where a patient wears a video camera during their daily errands on foot and/or by bicycle, and documents their experiences during these trips.

The concept was developed through these steps: first, the physiotherapist brought the designer into contact with a patient who had had a knee replacement. The first meeting was an informal session in which the designers enquired into the patient's life and experience and the physiotherapist's activities in supporting the patient. The patient was offered a small camera that can be attached to clothes unobtrusively (Figure 1). The designers asked the patient to try getting up from a chair. The patient did so, and stated that it was not painful. The designers observed that he had used his hands for support and asked him to try without the help of the hand. When he tried it, he stated that that was difficult and painful, and that he was surprised about it. This example enabled the patient to understand that he could use the video to document and reflect on his real life experiences.
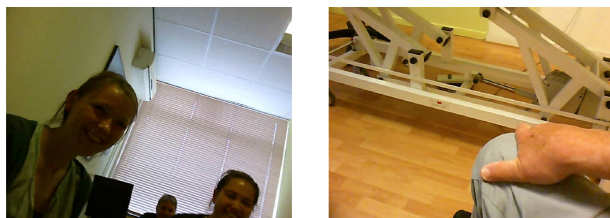

Figure 1. First meeting: the patient trying out the camera.

Besides accessing the experience through *experience*, the designers also developed a means for *critique* for the patient in the form of a reflection sheet with collage elements, to be used as part of a physiotherapy meeting. The sheet posed these questions: What is the difference before and after your operation? How did you feel during this activity (the one you filmed)? How do you experience the difference between the side with your own knee joint and the replaced knee joint? In the session, these additional questions were addressed in a collage, in order to *create* possible situations: How do you feel hindered (or not) in your daily life? What is important for you? What do you want from the future? How do you feel about your physiotherapy exercises?

Insights from unscripted video

The patient had already been in physiotherapy for nine months and had gotten used to the situation. The video tool enabled the patient to regain insight into their daily life experience and to start to critique it. The patient

Figure 2: unscripted user generated video showing how the post-operative patient experiences navigating the city of Delft on a bicycle.

himself chose video segments he wanted to discuss. The patient mentioned that on some scenes he wanted to document, the camera had failed. Initially during the first meeting the patient had not seen the relevance of video, but later offered to re-shoot scenes that had not worked out, wanted to show them to his friends, and expressed hope that it would serve to improve the work of other physiotherapists he had previously not experienced as beneficial. The videos revealed differences in social and solitary activities, as well as the difference between activities while rested and while tired. When viewing the video together with the designers, the patient pointed out physical dimensions, his posture and position and what his daily activities were like, now and before. The patient also used the videos to talk about other health problems and his family situation, suggesting that the technique created a space of trust to promote dialogue. The patient expressed surprise that his handlebar was moving a lot at the moment he cycled up an incline (Figure 2). Through this he realised that he was using his left leg much more than his right one. He noted how a staircase offered him the opportunity to notice he was regaining strength. The recordings then served the patient in his interactions with his physiotherapist to discuss how body balance was coming back, and how much to engage in physical activities.
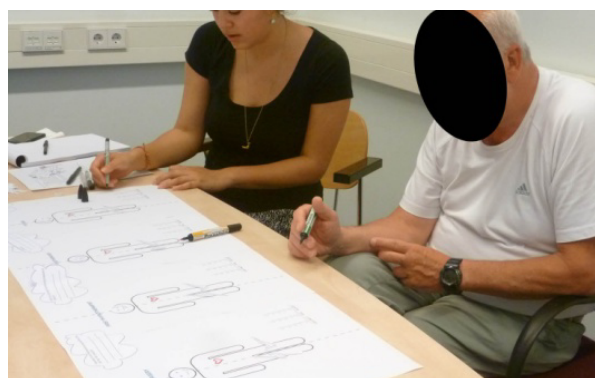

Figure 3: collaging on a reflection sheet to reflect on the experiences with body balance between affected and not affected leg.

The reflection sheet prompted the patient to reflect on his progress from the first revalidation directly after surgery and his contact with the surgeon, through lack

of improvement with a first physiotherapist and the reasons for this, and then improvement with his current physiotherapist and how he came to trust him (Figure 3). In addition, the patient used the collaging to indicate emotion icons that it offered, as well as levels of function, freedom and pain in various situations. The designers noted a change in attitude in the patient from the first session when he indicated he had no problems, to the open talk in the second session after he had recorded videos. This and his eagerness to show the situations of his daily life indicates that he made the video tool his own, and to a degree, also the reflection sheet and collage tool. With the latter he still needed a lot of guidance and facilitation to go through the material step by step. The videos and collages the patient created could in a next step serve as a kind of boundary objects to open a dialogue with different stakeholders on the patient experience.

CONCEPT 2: SCRIPTED VIDEO

The second concept was a scripted video concept. Here, the designers again first met with a patient (a different one) and the physiotherapist to hear about the patient's life and the progress of physiotherapy. The designers then proceeded to develop a tool without much involvement from these stakeholders. The designers created a set of 30 second video segments showing standard situations of daily life, such as climbing a set of stairs. There were three scripted videos showing scenarios for each activity: carrying out the activity with great difficulty, carrying it out averagely, and carrying it out vigorously and sportily (Figure 4). During a joint session between patient, physiotherapist and the designers, the patient watched and selected from the video scenarios their level of ability for each activity. Each video had a corresponding card. The patient arranged the cards on a grid, a shared space for patient and physiotherapist to determine a course of revalidation (game set up in Figure 5, using the game: Figure 6).

Figure 4: Scripted video scenarios. This example shows four conditions: climbing/descending stairs with great effort, speedily, leisurely and gingerly. Each condition is a 10 second clip, resulting in 40 seconds of clips per activity. The patient and physiotherapist can view these clips together to help them envisage the patient's mobility.
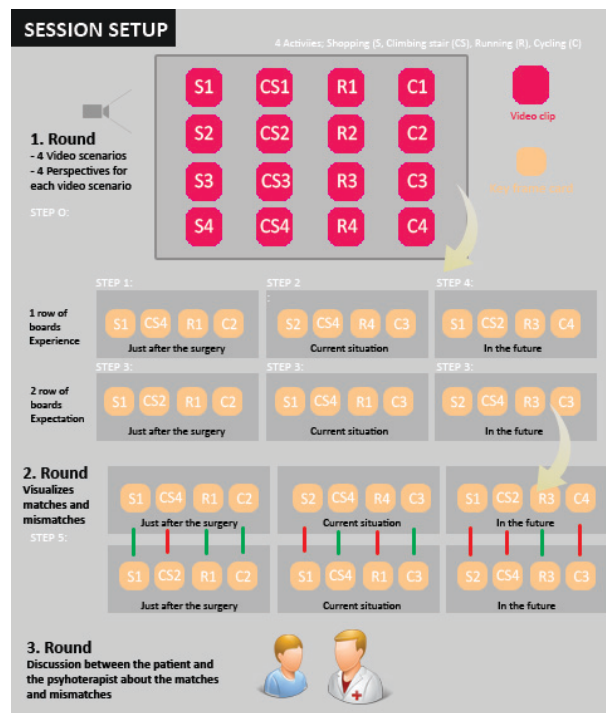

Figure 5: The set-up for a session with physiotherapist and patient. This session took the form of a normal session that a physiotherapist and patient would have with each other, but now augmented by a game involving video scenarios. The session concluded with an evaluation of the inclusion of this game.

Insights patient:
- "With the running you realize what you are doing and what you wanted to do (...) That's what helped me to make a choice."
- Patients looked carefully at the key-frame cards, indicating that they were putting themselves back into the situation.
- Placing the cards stimulated them to go into a reflecting and critiquing mode.

Insights physiotherapist:
- "You are confronted with the fact that there are more possibilities. That is one of the strong points of doing an interview with a person using the tool".

Figure 6: Physiotherapist (right), patient (left) use the game, supported by one of the designers (middle) who guides them through it.

Both the patient and the physiotherapist were enthusiastic about the insight that the tools offered. They discussed whether these should be a one-time or a regular activity. They felt that the principle itself was

useful to reflect in this way and use the video scenarios and cards in a conversation about the treatment progress and the patient's real life coping. They did not feel that they needed to use the tool permanently during the period of the physiotherapy. It was already useful to them as a one-time thinking tool, to change how they talked about the revalidation and what was relevant in it. They saw the game as a useful support for their conversation. The question remains how such a game could be integrated in the service provision of physiotherapists.

DISCUSSION

This was an exploratory study, which limits the reach of the conclusions on real-world effects of the video tools. However, I have shown that the patients used both video tools to enhance their revalidation journey. In the unscripted video case, the patient made the video tool his own and was able to use the videos he took of his real-life activities to reflect on his revalidation progress. In the scripted video case, the patient reflected on his revalidation progress in a more structured manner, which also supported the conversation with the physiotherapist better. The unscripted video tool seemed to open a potential role for peer sharing and even sharing one-s life experience with one's own social network. It opens up a possibility for patient empowerment that may not even need to be connected to the work with the medical professionals. The early concepts presented were evaluated very positively by patient and physiotherapist in each case. They agreed that the concepts supported the physiotherapist in sharing knowledge with the patient, and supported the patient in indicating and finding their own motivation through reflection on their revalidation. For the patient-led concept, practical issues need to be resolved: patients would need access to a body-worn camera. Abstracting and selecting from video material would be time-consuming and perhaps not easy. A patient's motivation for it might not be sustainable. The scripted video tool, on the other hand, had a more associative function for the patient-physiotherapist team: it served both to come up with stories on real-life situations and to discuss these in relation to revalidation.

A key finding in this regard lay on another level: that of the roles of the larger stakeholder group. After the cases had been worked out, the design researcher presented the findings to the orthopaedic surgeon co-leading the research collaboration. Although the surgeon valued the physiotherapist's knowledge, the surgeon could not identify a benefit to treatment that such a video-based tool could have. To the designers the empowerment aspect seemed evident from the data, leading to an assumption that this would be beneficial to revalidation. The surgeon had three key caveats about such tools:

- they do not help health professionals categorise patients, which he saw as the key challenge

- they still rely on a patient's personal contact with the physiotherapist, as part of their collaboration, which he did not see as an efficiency win
- there is no clear ownership defined as yet of these support tools. As a medical professional he would not drive the further development and implementation since this is outside of his purview in the hospital. The question remained open who could drive it.

This last finding adds a case from revalidation to Knutz et al's (2014) finding that the renegotiation of roles is complex within the constellations of interests here. It seems that this type of tools cannot be of benefit in the current distribution of roles between surgeon, physiotherapist and patients. The surgeon's time is extremely short. It would not be of benefit to a surgeon to hear more about the citizens' lives. The surgeon is in many ways in the lead in terms of the type of treatment that patients get, including the physiotherapy. If anything, the surgeon would like to get more control of the physiotherapy process so that he can use it more to optimise and streamline the treatment. However, the healthcare customer may change, because new perspectives target not only individual patients but local societal networks. We should enquire further how medical and technology partners contribute to how the user is configured in their services (Oudshoorn et al, 2004).

This research inadvertently brought up differences in perspective between a surgeon and a physiotherapist. The former tended to suggest to patients - albeit indirectly or implicitly - that the operation solved their joint mobility problems, in order to give patients confidence in its success. The physiotherapist, on the other hand, noted that the imbalance that has come into the patient's body, persists even after the operation and revalidation period. The physiotherapist tempers the patient's expectations of their recovery - a 'reality check' - while still motivating them to exercise in order to improve (Figure 7).
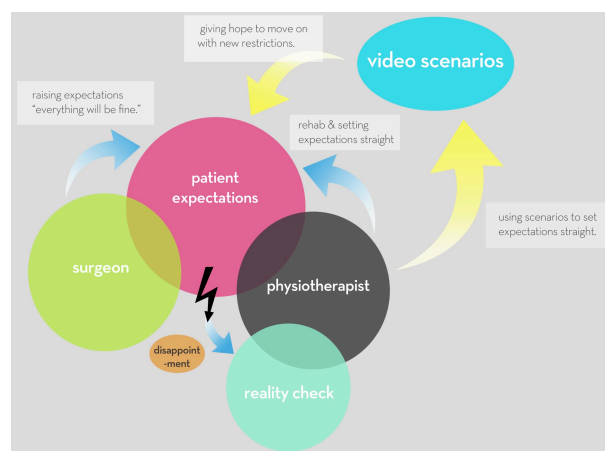

Figure 7: stakeholder dynamics in the field of orthopaedic revalidation, from the perspective of a physiotherapist, and how the explored video scenarios can mediate in this.

This leaves open the question which stakeholder could take ownership of tools that enable patients to learn better about their condition and take more control of it. There is a potential for new communities of interest in this field, such as apps being developed directly for patients, supported by patient organisations, or patient organisations developing supports for patient communities to have exchanges about video-supported experiences. Another possible route is the opportunities of citizens to affect their local environment. It is conceivable, for example, that patients and municipalities work together offline or online to make small improvements to the local environment on their daily routes (Van der Hoeven & Van der Spek, 2011), which would benefit the patients themselves and the wider community.

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