

On The Spot Experiments Within Healthcare

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ABSTRACT

This paper reports the value of On the Spot Experiments with self-produced content and the use of technology within healthcare. On the Spot Experiments are experiments conducted in the setting of on going clinical work and patient care. We begin by relating our work to approaches within ethnography and work place studies which link ethnography and design. Thereafter we describe how we have carried out On the Spot Experiments in two projects where we have explored the possibilities of self-produced learning material. The first project described is within an intensive care unit setting where the staff and designers explored the making of self-produced videos on different procedures and their use in handheld computers. The second project described focuses on patient learning at a hand surgery clinic where we explored the possibilities of individualised video training instructions. In both cases the On the Spot Experiments have shown fruitful results in different aspects of clinical work and how the use of content and technology might affect this work. A key factor has been exploring what relevant content could be. We conclude by outlining some qualities and limits of doing On the Spot Experiments.

General Terms

Design, Experimentation, Human Factors.

Keywords

Ethnography, Interaction Design, Healthcare, Patient learning, Experiments, Usefulness

1. INTRODUCTION

There have been many proposals on how ethnography and the design of information technology can be combined. One way has been to engage ethnographers in the field studies of the context to be designed for it to elicit requirements that are presented to the designers or to evaluate systems in use. Another has been to engage designers together with ethnographers in the field study itself [7]. There has been an increasing acknowledgement of the necessity to understand the context of use, but how ethnography and design could bridge is debated [1]. One fruitful approach has been Karasti's way of joining studies of work practice with participatory design (PD) approaches in cooperative workshops

in the analysis of work practice in what she calls the Change Laboratory [13]. Although drawing partially upon PD approaches, she points out that PD typically focuses on future use and in exploring the imagined future assigns the end user a passive role in the workshops, since the activities enacted are mediated through the prototypes made by the designers. In order to give participants a more active role Hartwood *et al* have explored how the design of IT systems can be taken into the work practice itself, stating that the use of technology is itself a significant source for design [12].

In our study, as interaction designers, we have not worked with ethnographers, but we have conducted ethnographically inspired field studies to get a detailed understanding of the clinical context for which our designs were being made and to study how this new technology might affect the practice. We also conducted cooperative workshops with the end users, discussing with them their work practice and future possible designs for their work. While cooperative workshops appear to be less successful, small scale On the Spot Experiments situated in day-to-day clinical work using existing technology combined with meaningful content in the material being presented has proven to be highly fruitful.

For the last three years we have been working on two projects focusing on informal learning within health care supported by information technology. Throughout the projects we have worked closely with the end users drawing upon the tradition of PD [11,14]. In both projects, we articulated knowledge already present in the work place and involved the staff in the production of learning material to each other and to the patients. The first project was in an intensive care setting focusing on workplace learning that ended up with the staff making their own short movies about different procedures which were made available on handheld computers [4,5,8]. The other project is on-going at a hand surgery clinic focusing both on workplace learning and patient learning where we take the positive experiences of digital video from the first project with us.

2. ON THE SPOT EXPERIMENTS' RELATION TO PREVIOUS RESEARCH

When going from ethnographically inspired field studies to design a key factor in both projects has been small scale, iterative, On The Spot Experiments paying close attention to content and the way off-the-shelf technology is used to affects an individual's work, collaboration and the work practice culture. These kinds of experiments could be seen as a form of ethnography of content and technology -in-use. They resemble what Suchman, Trigg and Bloomberg call "occasioned practice of technology design and use" that are direct and intense ways embodying interaction that "simultaneously reconfigures the work's practice while maintaining its accountability of relevant professional and organizational constituencies." Such an occasioned practice with prototypes does not in any simple way uncover users' needs. Instead, the prototype is "constituted in and inseparable form those interactions" [15]. They are also akin to what *Bloomberg et al* call case-based-prototypes. Case-based-prototypes explore new technological possibilities through real cases that are informed by the users' needs and their practice. In doing so, material from the worksite is incorporated. What is foremost looked for is the system's *usefulness*, i.e.. that the system makes sense and that it adds value to the worksite studied rather than focus on *usability* defined as the systems general readability [6]. Where we differ from this approach in our study is that we look at how new content in new use situation can be created with existing technology. Our experiences in the two projects to be described revealed to us that it is easier for the user to relate to and give feedback about learning content and how and where the content should be presented rather than what kinds of technologies or interfaces are appropriate. With off-the-shelf technology it's easy to produce and present learning content at various places situated in the clinical environments and to study if these activities makes sense. If the content is meaningful to the users and relevant to the learning environment we can go from there and see how and what kind of technology could be used to support this.

3. THE ICU WORKSITE

The Intensive care unit (ICU) where we began our study consists of two units: a general intensive care unit and a post-operation unit that staffs 140 people. The different professionals working there include ICU physicians and anesthesiologists, ICU specialized nurses, nurse's aides, physiotherapists and a curator. The post-operative care unit watches over and treats eighteen patients that have been operated or examined. Patients usually stay there from a few hours up to twenty-four hours before moving to a different unit. The general ICU has a capacity to treat ten patients. An intensive care unit patient is a patient that needs

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assistance with upholding life-sustaining functions such as circulation and respiration, but the illness that has lead to that condition varies. The staffing depends on the number of patients and their condition. Most of the rooms have two beds. In some instances, a nurse with the assistance of two nurse's aides can care for two patients. If a patient's condition is more serious the nurse will care for just one patient with the assistance of a nurse's aide. There are three physicians at the ICU per shift. One of the three is a senior physician.

After having studied the ICU, we generated a few central categories:

3.1.1 *The shifting nature of the work*

The shifting nature ICU work fascinated but also distressed the staff. The fascination was that they never knew what met them when arriving at work, i.e., what type of patients they would be treating and what skills that would require. What they found disturbing on the other hand were all the new procedures and routines that they were required to master. These new routines required them to continually learn new skills.

3.1.2 *Contextual configuration of the patient rooms*

Studying the work at the unit we saw that being an efficient health care personnel required the staff to draw upon resources and histories which could be taken from the patients, their relatives, representations of the patients in written journals, short instructions hanging on the medical technical equipment and notes taped on the patient's equipment, or on the walls in the patient room, medicine room, etc. This type of contextual information was placed where it was most needed. With the surrounding artifact, ranging from permanent to fleeting, the staff continually configured the patient's surroundings.

3.1.3 *Developmental projects*

We noticed was that many staff members took initiative to run internal development projects. For example the unit's *patient supervision sheet* had been developed by one of the nurses within the unit.

3.1.4 *Collegial learning*

The staff, besides drawing upon the patient and the physical setting, drew upon each other as learning resources, assisting each other when unsure about procedures. This type of practice-based learning, which was situational and oral rather than textual and 'off-line', was highly appreciated and a preferred way of learning by both the one assisted and the one assisting. This is in line with the qualities inherent in practice-based learning discussed by Josefson [9,10] and Benner [2,3]. Further, the staff stated that they found composing written instructions on how to operate medical technical equipment, (which was done because the standard manuals where too extensive) or on new medical- or nursing procedures difficult and time consuming. Assisting a colleague in a real situation did not demand abstracting the context,

instead they could use the context to assist them in what aspects of the procedure needed to be shed light on.

4. ON THE SPOT EXPERIMENTS AT THE ICU

The ethnographically inspired field studies and several workshops on various topics such as “the roles of artifacts within the ICU”, “learning within the ICU”, and “relevant technologies for the ICU” pointed out that collegial learning and the support of contextual digital information would be of interest to pursue. Also, during one of the workshops, the idea of making self-produced videos on different procedures came up as a possible idea to explore.

4.1 Experiment with using video

To explore what self-produced video could mean at the unit we together with the staff made a few videos. At the same time we were interested in seeing if self-produced video could be used on handheld computers. The idea behind making the videos available on small handheld computers was to see if the videos could more easily become part of the configuration of the room than having them displayed on stationery computers. Our initial concern was, however, if the small screen and the sound would suffice. Also, the general attitude was that the video should be quick and easy to use and should not exceed three-four minutes if they were to be used in daily work. We knew that some of the videos having being made exceeded these limits and speculated that the videos needed to be divided into chapters or have markers. We asked a nurse to use a video, made by the unit’s physiotherapist when mounting a CPAP machine in the medical technical room where the machine often is mounted. The video was about twelve minutes long and the first half was divided into five short sequences of one to two minutes and presented as a play list in the media player.



Fig. 1: A nurse test using a video made within the intensive care unit when mounting a humidifying device and unexpectedly giving the designers a hint at what relevant content could mean.

The results from the test sessions showed that the small screen – (240 x 180 px) - of the video for the most part was adequate. She

commented that it at times was difficult to see which component was shown, but the deficiency was made up by the physiotherapist’s verbal explanations. For the most part the nurse was able to watch long sequences and concurrently mount the machine. Part of the time she was unable to simultaneously mount and watch the video and therefore needed to pause it to ‘catch up’. The smallness made it possible to compare the video up close with what she was doing. Some of the sequences she re-watched to verify that she had done them correctly. The nurse did not find the twelve-minute video too long and that subdividing into parts was perhaps superfluous. The test unexpectedly gave us a hint that a standard length--such as a maximum of three-four-minutes--was not relevant criteria on whether the video would be considered too long. Whether the material was quick and easy to use in the clinical work was a more complex issue than simply time. It was a matter of providing a relevant content. Using in-house production where the content of the video was tailored to the specific needs of the ICU made this twelve-minute video an acceptable length. The situation that the video is being used in also defines whether the video is considered too long or not. The equipment was not assembled in an acute setting but allowed for a decent time frame for assembly usually, thus allowing for a longer than 3 – 4 minute video.

4.2 Experiments with making video

When exploring the issue of relevant content we also experimented with making a range of videos with the staff that were shown at informal film reviews. To explore what level of detail the videos needed we asked a nurse to make a long and a short version of how a booster, (a humidifying device), is connected to a ventilator. In the long version she showed the whole course of action in detail. In the short version, only the critical moments are shown. We also explored if it would suffice in some cases to film procedures on dolls, since it can in some instances be difficult to film patients, we made two similar films on fixation of oral tubes: one on a doll and another on a patient for comparison.

When the videos were shown to other staff members they considered the shorter booster video better since it was directed to experienced staff that already knew the basics. For example, instruction on how to connect the infusion bag to the apparatus was not needed. The time length of the video per se was thus not the defining factor, but rather the presentation of streamlined, non-superfluous information. The videos needed to be succinct, e.g. tailored to the unit’s material and procedural set up and their competence level. This meant that the videos should reveal a known successful reading of how to carry out the task rather than an explanation of all possible features or ways as traditional instructions often do. What was considered rudimentary knowledge should be skipped and what was considered important knowledge gained should be included.

The two videos on fixation of tracheal tubes showed that a longer video was preferred if it contained relevant information. The staff thought that the longer video was better with the tracheal tube

fixation on the patient since it showed the problems that can arise in the real situation even if this meant that the video was longer and that certain aspects of the procedure were clearer in the simulated case. A long video was thus a video containing unnecessary information rather than the length of it per se.

These and other experiments pointed out general rules. Videos should not be made too specific: for example, it is not a good idea to state where you can locate parts of the equipment within the unit since the location would rapidly change. More importantly, the process of making the videos, which would often start with a “rough draught” that would be shown at an informal review, pointed out the necessity and value of a collaborative process. What relevant content meant was not possible to state in advance, but needed to be discussed for each video. The review sessions not only pointed out what could be discarded and added to the videos, but also became occasion for discussing issues of work practice.

4.3 Using video in a patient room

There was ongoing discussion at the unit if the usage of video was legitimate in the patient rooms. Would awake patients and relatives perceive the staff as incompetent when using the videos and could the sound disturb sedated patients or other staff members caring for other patients? To explore film usage in patient rooms we asked two nurses to use the video on ‘Fixation of tracheal tubes’ and ‘Taping of nasogastric tubes.’ One of them was an experienced ICU nurse while the other was an ICU nurse being schooled into the unit. Their task was to change the tapes holding in place the patient’s tracheal tube and nasogastric tube.

The On the Spot Experiment with the nurses showed that it was possible to use the videos as learning-aids in the patient room, but that usage depended on the activities going on in the room. The video did not disturb the sedated patient and the nurses did not find it problematic or to be a sign of incompetence even though there was an awake patient and colleagues close by. Neither was the video perceived to disturb the other staff except when four doctors entered the room to discuss the other patient four-five meters away, which required one the nurse we were studying to pause the video. A few minutes later when the doctors left she finished watching the video. This further point out that the appropriateness of the usage of the video cannot be predefined and depends upon the staff present and what is going on in the room.



Fig. 2: *Two nurses use a video in the midst of their work negotiating how it should be made to fit within their ongoing activity.*

An unexpected discovery from our study in the ICU showed that the video as a learning-aid was often used in a collaborative setting and that such a setting required the staff to find new ways to coordinate their activity and to relate to each other. In some instances two colleagues have watched through the whole video together giving them a shared view of the procedure. When performing the procedure they return to video where both have equal access to the content and the control of the video. In other collaborative situations the video has become to belong more to one nurse than another. For instance when the two nurses tested using the video instruction on nasogastric tube and tracheal tube the experienced nurse moved back and forth from the student nurse that mainly used the video and controlled the handheld computer. The experienced nurse came closer when the student nurse was unsure and he could fill in with information that the video did not contain: explaining for example how she more easily could cut the tape. Most of the time he was not involved in watching the video and this gave the student nurse a better insight into how the procedure according to the video should be carried out.

What happened during the experiment was not only a consequence of who controlled the PDA. How they coordinated their activity during the experiment to a large extent depended on the content of the video, which had an authoritative tone. In the video a nurse’s aide emphasises the importance of using a narrow tape when taping the nasogastric tube. This is accomplished by dividing a broad tape instead of using the narrowest tape available. The student nurse took this instruction seriously and explained to the other nurse that the tape that he had just brought should not be used. This upset him, but he went to get the correct tape that he hastily divided as shown in the video. The student nurse however also divided a strip of tape where she carefully followed the instructions: laying one strip of tape over the other to see which was the slimmest. When they were ready to tape the nasogastric tube the student nurse insisted on using her tape since his tape

was still too broad in her view and she quoted the video to legitimize her decision. The experienced nurse accepted this, but thought that either strips of tape would have worked. He was reluctant to accept the video as the authoritative way of performing the procedure. Although their collaboration was somewhat uptight they were able to resolve the tension and their collaboration did not fall apart. What the experiment made clear was that the video becomes an active element when collaboratively used where how it should be watched and who should have the control needs to be worked out. Had the two nurses seen the whole video together they could have had a shared view of how to perform the task and perhaps avoided the tension. It is however not possible to do more than suggest how the video could be used. How it will be used and how they will relate to the content of the video in the end is beyond the control of the designers.

5. MOVING QUICKER TO THE QUESTION OF RELEVANT CONTENT

In early 2003, we began a research project in the hand surgery clinic at the University hospital in Malmö. The project focuses both on workplace learning and patient learning. In this report, we will focus on patient learning. Our goal was to take the positive experiences of digital video and learning from the ICU project and apply it into this new clinical situation. Our focus in this project has been on the question relevant content in patient care rather than focusing on the technology that could be its mediator.

The project is in cooperation with four IT companies involved in learning consultancies and the Interactive Institute. The design of our study and its material is driven by cooperative design workshops with researchers, representatives from the participating companies and a group of staff members representing the different wards and employees at the hand surgical clinic. The group has stable core members as well as occasional participants. To get materials into the workshops we have done ethnographic inspired field studies of the different wards at the clinic. We will start by describing the setting and how the field studies pointed out relevant experiments we could do.

6. THE HAND SURGERY CLINIC

The department serves a population of about 1.5 million people in southern Sweden, and all major upper extremity traumas from this region are referred to the clinic. The staff consists of about 100 people, among them, twelve hand surgeons, nurses, occupational therapists, physiotherapists and social workers. Although the main interest is focused on hand trauma and reconstructive hand surgery, all kinds of elective hand surgery are covered. There are four units in the clinic on four different floors: the surgical ward, the patient ward covering 19 beds, the Hand Rehabilitation Unit and the outpatient ward.

6.1 Ethnographic snapshots of the clinic

Due to time limits we have not done any extensive ethnographic research of the clinic. We have, however, done a kind of ethnographic snapshot to get an overview of the different wards. This together with material and scenarios generated through the workshops have helped to point out relevant features of what we think will have implications on possible design suggestions and use of future technology, as well as what kind of experiments that could be relevant to conduct in this setting.

6.1.1 Getting a picture of the forthcoming recovery

One of the most relevant points that have been revealed so far in the project concerns patients' learning of what kind of process they should expect during their recovery and what their daily life may look like after the recovery. According to the staff this could be explained by the fact that the patients condition, being in a stressful situation, affects their perception and they only retain in memory a small amount of what is told them. Many patients also feel anxious when they go home and feel unsure about what they are allowed to do in their home environment without aggravating their injury. Could it, for example, be a risk to button ones trousers?

6.1.2 Meetings between the staff and the patients

The clinic has brief brochures about the treatment of the most common injuries. Most of the information the patient receives comes from conversation with the staff. What kind of information the patient is provided with about their recovery process depends on what kind of meetings the staff and patient have. The contact between staff and patient differs between the wards of the clinic depending on how they organize their work. What kind of roles the diverse employees have during the different stages of a patients recovery, as well as the patients condition, also affect what kind of meeting they will have and what information they will provide. At the patient ward where patients have their own beds, the work is done by ongoing prioritizing of the most needy patients. Meetings can happen randomly in a corridor with a nurse or with a doctor who had planned to speak with a patient in the next bed. At the outpatient ward, the work is organized in a more scheduled way where the physicians have pre-planned 15 minutes meeting with each patient. The case is similar at the rehabilitation unit where the meeting between physiotherapist and patient is about 15-20 minutes. Professional roles sometimes overlap, for example, a nurse at the patient ward may share some knowledge with the physiotherapist and sometimes gives the patient simple instruction on how to exercise their hand. In the same way, a physiotherapist may provide the patient with similar information as a physician. We will take a closer look on what happens during a meeting between a physiotherapist and a patient at the rehabilitation unit, what information the patient is provided with and how this led to a fruitful experiment.

6.2 The rehabilitation unit

At the rehabilitation unit, physiotherapists, occupational therapists, a social worker and a craftsman work, often in close collaboration, but also alone with patients in their respective rooms. The physiotherapists usually meet with their patients in one of their combined office and treatments room, which is about 3*4 meters wide. Occasionally a physiotherapist may go to the computer at his desk to check for the next appointment, to check the schedule or get written instructions to the patient, but a session almost entirely takes place around a small leather coated table about 30*60 cm wide. The physiotherapist sits on one side and the patient on the other with his or her hand on the table. Depending on whether the patient's left or right hand is injured they position themselves slightly differently in the room.

6.2.1.1 The physiotherapist's different roles

The physiotherapist has several roles when meeting the patient. During a session the physiotherapist typically tries to assess the condition of the hand and progression of the rehabilitation. He asks questions and examines the patient. He explains what kind of injury the patient suffers from, what the surgeons have done and what chances there are for rehabilitation. Further he coaches and instructs the patient on how to perform his rehabilitational exercises and tries to get a picture of the patient's overall situation. He encourages further training and successful progression. A key role for the physiotherapist is to coach the patients and to get the patient motivated to do their exercises.

6.2.1.2 Embedded learning

There seems to be a certain structure where each session typically starts with some sort of diagnosis and then becomes more focused on training instructions. To some extent the process is interwoven and unfolds depending on the situation. The physiotherapist can quickly go from examination to an explanation triggered by a question from the patient and then go back for further examination. What kind of explanatory information about the injury the patient is provided with depends not only on the injury but also a combination of different factors that make most cases quite specific. It's often triggered by what the patient think is troublesome and asks about:

Physiotherapist: *You have had swelling? Has it been like this since Thursday?*

Patient: *Yes, it has been swollen on the top all the time.*

Physiotherapist: *It looks okay at this point, but it is swollen here.* (The physiotherapist points at the patient's finger and gently squeezes it.)

Patient: *There is something hard, is it the bone?*

Physiotherapist: *You mean this? It's scar tissue that has become hard... everything is in layers when you are not injured. After injury and the bones are repaired with the tendons and skin, healing doesn't occur in these subtle layers. Instead, the scar is like a lump. Some*

people get harder scars than others - it depend genetics.

Your scar will gradually soften; it will take about a year.

In this case, the patient's question about the firmness of his scar triggers the physiotherapist to switch from an examination to an explanation. After that he continues with his examination.

6.2.1.3 Patient specific war-stories

One role of the physiotherapist is to tell "war-stories", to stress the importance of training or carefulness in the patient's everyday life, depending on what they think the patient needs the most. Some patients are too careful with their training while others hurry to get back to work. For example, the consequences of a tendon tear could be quite severe to the patient and may require several months more of rehabilitation. To be able to have convincing arguments of why a patient should be careful with daily activities and rehabilitation, the physiotherapist needs to know a lot about how different activities in each patient's private and working life can worsen the injury. This repertoire of examples is something they have gradually learned from experience. These arguments are often specific to the patient's situation:

Patient: *When do you think I can go to work?*

Physiotherapist: *What is your profession?*

Patient: *I'm a welder, but I will get a different job.*

Physiotherapist: *I can firmly say that your job as a welder will require to not work for three months; if you were working in an office then you might be able to return to work even today.*

Patient: *But I could be as a foreman and instructor.*

Physiotherapist: *Even so, you will need to grasp things in order to instruct.*

Here the physiotherapist has to have some knowledge of what it means to work as a welding instructor. The argument he gives the patient for why it is necessary to be careful is related to the injury itself and the nature of the patient's work. Often, there is a combination of advice that relates to both a patient's work as well as his activities at home.

6.2.1.4 Patient specific instructions

Another example of the situational character of the session concerns giving training instructions to the patients. Injuries can be classified into categories but a lot of the time it is individual differences between patients with the same category of injury that affect the treatment in different directions. The unit has written instructions of how to do certain exercises that each patient brings home. In some cases, it's not possible to perform the exercise strictly according to these templates. For example, one of these brochures ask patients to put their hand on a table and to slowly move the hand sideways. One patient that we observed said that he was unable to even put his hand on a table to get it straight. Thus, the physiotherapist showed him how to do the exercise in a different way where he instead puts his hand on his leg where it doesn't have to be straight.

6.2.1.5 *The hand as a communication tool*

Throughout the sessions the physiotherapist points and squeezes the patient's and his own hands. The hand is an important communication tool and reference point when discussing a patient's condition and to describing injuries and possible treatments. Hand surgery has the advantage, compared with other medical specialties, of having always a visible and modifiable "replica" of a patient's injury. Physicians easily discuss complicated surgical procedures in the corridor pointing and drawing on their own hands. In their communication with the patient, it's also used all the time. Sometime the staff points at the patient's hand to make an explanation but a lot of the times they use their own hands. The accessibility and visibility of the hand makes it possible to record treatment on video.

7. Individual physiotherapy training instructions videos

During our workshops, some suggestions in regards to relevant experiments were suggested. One of these was the use of video. Building on the experiences we had from our previous project, we felt that it would be possible to provide the patient with an individually tailored training video from their physiotherapist. This kind of video production differs from the one we worked on previously in that it has many impermanent qualities as each patient encounter differed from the previous. This raised a lot of questions: Will it be worth the effort to make a unique movie for every single patient? Or would it be sufficient enough to make a non-personalized movie for a couple of different training categories? Could these video be adequate, regarding angles, lights and the necessary instructions? Who would hold the camera? How do you edit the movie? Do you need to divide it into chapters and will the physiotherapist be able to do that on the fly? In what format will the patient get the video, VHS, DVD or CD-ROM? Maybe the most important question was whether the video's quality would be good enough and whether the patient would consider it relevant enough to re-watch the training session?

7.1 On the spot experiment with making individualized training instructions

In collaboration with one of the physiotherapists, we decided to film his meeting with three patients who had injuries demanding extensive training instructions. He informed us of two parts of each training session that he felt was most relevant to film. The first part focused more on explanations and the second one on training instructions. The patients were presented with the idea to get filmed and to get a copy of the video to take home with them and all agreed to participate. The physiotherapist and patient sat around a small table for these sessions as described above and this made it easy to use a stationary DV-camera. All interesting moments took place narrowly around the table. The physiotherapist helped to zoom-in with the camera and decided upon the proper angle and then we let the camera be in that position during the whole session.

At the explanatory part of the session, the physiotherapist normally leaves the table to go to a poster depicting the hand that is hanging on the wall, which he uses to describe the anatomy of the hand. To let the camera be able to stay in its fixed position he instead brought the poster to the table and positioned it so it was visible from the camera angle. The camera was connected to a computer, which the video could be transferred to and directly burned on to a CD-ROM or a DVD without further editing.

7.1.1.1 *Individual differences*

The explanatory section of each session was to some extent similar between the three cases. The physiotherapist describes the rehabilitation processes, the anatomy of the fingers and so on. There were also differences though. For example, when talking to one of the patients, who is a professional athlete, the rehabilitation process was discussed in relation to his sport.



Fig.3: A patient and a physiotherapist participate in exploring the possibility of individualized video training instructions.

During the instructional part of the training session, there was also an overall similarity between the three cases and they contained almost the same elements, though not necessary told in the same order. More instruction elements were interwoven with more explanatory ones. For example, the physiotherapist may give instructions to the patient on how to bend the healthy fingers passively and then explains different ways on how this may be accomplished. However, there were also differences that included comments on the status of the individual patient's hand or as we have seen earlier, explanations triggered by a question from the patient.

Patient: It feels like its stings in the finger, it is very painful to touch.

Physiotherapist: Yes, the circulation gets interrupted, partly because of the swelling and also because you have nerves on both sides of the finger. They are not damaged but it is due to the swelling and the surgery. That's why it stings and you can feel that in your finger. It will get better soon.

One of the patients also expressed worries about his injured fingers when asked to perform an exercise, which triggered the physiotherapist to emphasize (more than in the other cases) that there was no danger in doing the exercise.

Patient: *Now its time for the worst exercise*

Physiotherapist: *It's no problem, just bend the finger and hold still.*

Patient: *I'm almost too afraid to touch it.*

Physiotherapist: *It's not a problem when you are relaxed—when you are relaxed there are no muscles actively pulling the tendon.*



Fig. 4: *The video instruction experiments revealed differences between the three movies: what they contained depended on individual variations in the injury and more importantly the individual concerns of the patients.*

All three patients received a CD-ROM with their training session in an mpeg-format. The professional athlete also got a tablet-pc with the movie easily available on the desktop. All the patients expressed careful optimism about receiving the video and thought that they would review it maybe one or two times. As one of them said, the instructions were not so complicated to follow but the videos would possibly be valuable to elderly people. We where not able to study how the patients used the videos in their homes instead we had to rely on interviews with them later on.

7.1.1.2 Feedback from the patients

Two of the patient said that they used their videos about three times, which they considered sufficient. One of the patients said that he used the video at least fifteen times—as soon as he felt insecure. He did his exercises in the same pace as on the video following the instructions in real-time.

Patient1: *When you first meet the people in the hospital and you are under stress, you think you will remember all the instructions but you won't really. When you watch the video at home, you are more relaxed when you hear Fredrik say that there is no danger with the passive*

motions and that it would not cause injury.... Positive definitely, it feels good that it's me doing it, it feels personal; it's me and my fingers.

Patient 2: *When you sit there the first time and get the instructions, you can get caught up by a detail and miss the rest. When I reviewed the video, there were many aspects that were new to me and I wondered whether he [the physiotherapist] had said that as well.*

All of patients used the videos not only as support in their training but to communicate to relatives about their experiences at the hospital. Two of the patients shared the video with their families and the third with his friends. The professional athlete also showed the video to the physiotherapist at his work.

Patient 2: *I saw the movie directly when I came home together with my wife. I wanted to tell her about my experiences. Everything that the physiotherapists told me, she heard, nothing was lost.*

Patient 3: *The whole family watched - everyone was curious. It was interesting for the kids to see what the doctors had said. Everyone in the family appreciated it and benefited from it.*

Two of them used the movie as a reference to compare their progress with what they saw in the movie. One of them unhappily stated that the mobility of his fingers actually got worse when he came home compared with what he could see in the movie. When he later revisited the rehabilitation unit, he met with another physiotherapist and he then used the movie to show this decline.



Fig.5: *All of the patients used the videos not only as support in their training but to communicate to relatives about their experiences at the hospital; two of them with their families and the third with his friends. The professional athlete also showed the video to the physiotherapist at his work.*

7.2 Experiment of usefulness

We have ongoing studies to evaluate the usefulness of this method of personalized video instruction. Because the setting of the sessions take place at a small table, it is easy to record on video important information of each session. It is also possible with, off-the-shelf technology to provide a patient with a personalized video without doing any complicated editing. Exactly how this will be done, we will investigate further, but before doing that we think there are more important questions concerning the content that needs an answer: What could be relevant to each video? In the training sessions described above, the physiotherapists were not focusing on complicated instructions but they still seemed to be informative on an individual basis to the patients. Perhaps some of these individualized instructions could also be of value to other patients. Are there cases at the outpatient-ward that are worth filming? Is it possible to film all sessions or if not what would be the criteria in selecting which cases to film? Would this depend on which stage the rehabilitation process is in - early vs. late? Why is it worthwhile for the staff to make these videos? What could the staff learn from them?

8. QUALITIES OF ON THE SPOT EXPERIMENTS

The occasioned practice, created by the on-the-spot experiments, drawing upon the practitioners' experiences, the physical environment and its artifacts, in combination with the learning-aid, helped to mediate what it can mean to use content and technology. The experiments being embedded within clinical practice makes the stories that are generated around the occasioned use of the artifacts believable. The first video test session at the ICU pointed out how the content of the videos could be shaped. The patient room experiment showed that it was possible to use the videos in patient-centered work. It also showed that common sense should be used rather than predefined rules concerning the appropriateness of its use. It pointed out that a learning-aid needed to be placed within the clinical practice as a whole. Furthermore, the experiments were done within clinical practice and with a large part of the members of the work practice, which meant that we were simultaneously testing how the technology and its content might impact not only the individual but also collegial collaboration and the community at large. Lastly, an important feature of On-the-Spot Experiments is that they generate good stories, though not always stories with happy endings. Problematic stories are good stories because help to move forward the design process and point out new ways a practice may evolve.

Compared to our experiments in the ICU, the work we are doing in the hand surgery clinic moved quickly in the direction of investigating relevant content for the patients and much less so on the technology that would be used. Off the shelf technology makes it easy to "cheat" by assimilating unspecified (or vaguely specified) technology and tailoring this for content that is genuinely on the spot. We think that the content that we explored

in these experiments have at least as large an impact if not larger compared to our studies on the usefulness of technological specifications. Content, not technology, adds value to the patient encounter.

A closer look at the three individualized videos made at the hand surgery clinic revealed individual variations in terms of the injury and more importantly the individual patient's concern. The individualized videos were used as a reference point by the patients to document their progress. This is something a generalized movie wouldn't allow. The social role of the movie, where it was used to share experiences with relatives, were not something we had expected but is, we believe, are, a strong argument for making the effort of producing individualized videos.

8.1 Limits of on the spot experiments

One of the limits of the On-the-Spot Experiments is that although successful they do not guarantee that the usage of the new content and technology becomes an integrated part of clinical practice although there are strong indicators that they will be. At the ICU, much effort went into anchoring the project in daily clinical work. It was considered central that everyone had the possibility to make instruction videos and become acquainted with the handheld computers (and not only a small specialized group). Three full day workshops were arranged where staff had the opportunity to get hands-on experience with making videos, use the handheld computers and discuss how to make this a part of their practice. The discussions showed that it was necessary to establish a film group that other staff members could turn to for assistance as well as a film review group that guaranteed that the videos were of adequate quality. In our case, a film group was established to explore the production process with us, and discuss suitable programs. The film review group grew out of the informal film reviews that were arranged to get feedback on the content of the movies initially being made.

The On-the-Spot Experiments are in no way a future contract of how this technology will be used. They can only hint at ways that technology can be used, but these ways are open-ended and changeable. We are exploring ways in which these experiments are not only a new technological aid, but also more importantly, new ways of learning and gaining knowledge for clinical practice. We can provide with technology a repertoire of examples where relevant content helps the use of technology make sense in everyday clinical practice.

9. CONCLUSION

Looking back at the ethnographic fieldwork and the on-the-spot experiments, we can see a strong relationship between them. The ethnographic fieldwork has been an invaluable source in pointing out relevant areas to perform design experiments within. The design experiments in turn have been invaluable in making features of work practice more visible. Grounding the experiments in the midst of the work practice and maintaining an ethnographic

sensibility focusing on usefulness rather than usability has been central. Throughout the experiments we have not only gotten answers about concerns that we thought were relevant, but also answers on more important questions regarding the usefulness of content and technology that we could not foresee.

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