Lisbeth Eriksson

Effects and patients' experiences of interactive video-based physiotherapy at home after shoulder joint replacement

Department of Health Science
Division of Health and Rehabilitation

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About wisdom

The beginning of true wisdom is to continuously correct the course. An alert eye, a sense of where you find yourself. It's not about finding the right path but rather, it's about not deviating too far. Wisdom is balancing proximity and distance.

Merete Mazzarella

To me and my beloved ones
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ABSTRACT

Effects and patients’ experiences of interactive video-based physiotherapy at home after shoulder joint replacement.
Lisbeth Eriksson, Division of Health and Rehabilitation, Department of Health Science, Luleå University of Technology, Luleå, Sweden

Physiotherapy is essential to optimize the results of shoulder joint replacement, but requires a close monitoring and co-operation between patient and physiotherapist. The development of telerehabilitation brings opportunities for distance-spanning and home-based physiotherapy interventions. The aim of this thesis is to explore effects and to describe experiences among patients participating in interactive video-based physiotherapy at home after shoulder joint replacement.

A series of 22 patients underwent shoulder joint replacement and initial physiotherapy at the hospital. After discharge, 12 patients were referred to conventional out-patient physiotherapy (control), while 10 patients participated in a telerehabilitation intervention in the form of interactive video-based physiotherapy at home. Shoulder function, activity limitations and health-related quality of life were assessed before surgery and two months after surgery. The experiences of participating in the telerehabilitation were described using open interviews and qualitative content analysis.

Two months post surgery, members of the telerehabilitation group had participated in more physiotherapy sessions (p<.001) and showed significantly better recovery regarding shoulder pain (p<.001), shoulder joint external rotation (p=.002), shoulder function and activity limitations (p<.001) and in two dimensions of health-related quality of life (p=.004 and p=.001) compared to the control group. All telerehabilitation group participants expressed that they were satisfied with the rehabilitation and that they had experienced technique and exercise as safe. In the interviews seven categories of the participants’ experiences were revealed: An odd reinforced communication; Pain-free exercising as an effective routine; The home as an exercising arena; Closeness at a distance; From a dependent patient to a strengthened person; Facilitated daily living; Continuous rehabilitation process. The identified theme was: Achieving prerequisites for recovery competence.

In conclusion, interactive video-based physiotherapy at home after shoulder joint replacement was experienced positively by the participating patients and seemed more effective than conventional post-discharge rehabilitation procedures concerning short-time recovery. This could be explained by the fact that the telerehabilitation group participated in more patient-physiotherapy sessions compared to the control group, but the interviews also indicate that the modality might have promoted continuity and patient participation and competence.

Key words: Physical Therapy. Home Rehabilitation (non MESH). Interactive Videocommunication (non MESH). Telemedicine. Shoulder joint. Controlled Clinical Trial. Interview.
ORIGINAL PAPERS

This licentiate thesis is based on the following papers, which will be referred to in the text by their Roman numerals:


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### CLARIFICATION OF TERMS AND ACRONYMS

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
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<tbody>
<tr>
<td>Telemedicine</td>
<td>The use of electronic information and communications technologies to provide and support health care when distance separates the participants’ (Field, 1996).</td>
</tr>
<tr>
<td>Rehabilitation</td>
<td>Restoration of human functions to the maximum degree possible in a person or persons suffering from disease or injury. Used with diseases and surgical procedures for restoration of function of the individual (National Library of Medicine, 2009).</td>
</tr>
<tr>
<td>ICF</td>
<td>An international framework and multipurpose classification system for use in describing functioning and in relation to a health condition (International classification of functioning, disability and health, ICF, 2001).</td>
</tr>
<tr>
<td>VAS</td>
<td>Visual Analogue Scale (Price et al., 1983).</td>
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<tr>
<td>ROM</td>
<td>Range of motion (Domholdt, 2000).</td>
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</table>
INTRODUCTION

The work presented in this thesis focused on people in rehabilitation after shoulder joint replacement. For an optimal recovery, physiotherapy is essential. However, long distances between patients and the physiotherapist may impede the rehabilitation process in several ways. In this thesis, I present results from a telerehabilitation trial, including effects on shoulder function, activity, and health-related quality of life, as well as patients’ experiences of interactive video-based home physiotherapy.

My context

As a physiotherapist with a long record in orthopaedic rehabilitation, I became very interested in developing the rehabilitation and care for patients who have undergone shoulder replacement by using modern information and communication technology. I was one of the initiators of a telerehabilitation project in which the aim was to offer the patients a continuous rehabilitation at home after discharge with an experienced physiotherapist participating by video-link.

Previously, I had been working as a medical secretary for many years at an outpatient clinic for child psychiatry. My tasks were admitting the families, transcribing medical journals and responsibility for the video-communication of family sessions. My working room had a window against the street where I could see the families visiting the clinic. I reflected over the sight of the families coming to the clinic. They looked burdened as if they were carrying their problems on their shoulders. When the families left the clinic I noticed that even if the meeting at the clinic was successful they still had the same body posture. After 15 years I changed occupation and began to work as a physiotherapist and with my experiences in mind the goal of the work was a patient with a body and mind working as a healthy unit.

In my work as a physiotherapist I have met people with very different problems. Some have had a great importance for my pre-understanding. My first work as a physiotherapist was with young adults with disabilities. I have also been working
with children, adults and grownups in a psychiatric clinic, in intensive care, and with patients with heart failure. My interest in working in a team, together with the patient, increased, and for many years I cooperated in improving the care and rehabilitation of patients with neck injuries. For some years I was a project leader of a project aimed at increasing the palliative routines for people at the end of their lives. The best possible quality of life for the patient is the ultimate goal for all health care and we may achieve success if we are a team of people who work together with the patient. At the orthopaedic clinic I met people with different kinds of pain. It was stimulating to see the patients’ improvement when we did our best to always put the patient in focus with a holistic perspective both bodily and mentally.

In my work at the hospital I have met shoulder patients at all phases postoperatively in intensive care, at the ward as out-patients. After the shoulder joint replacement and the earliest phases of rehabilitation the patients were discharged from the hospital, and returned to their hometown where supervised physiotherapy started. Sometimes the patients and the physiotherapists called me by telephone. They experienced problems as the exercising was difficult due to the patients’ pain and they were insecure about continuing the exercises. This often resulted in the patient revisiting the hospital for an examining of the condition of the shoulder and the pain they experienced during the exercising the shoulder. Waiting for that examination led to interrupting of the rehabilitation and anxiety. Many of the patients had long distances to travel between their home and the hospital and the patients experienced the travelling as time consuming and uncomfortable.

When conducting these studies I had a pre-understanding that I had to take into account during my work. We are all humans with a past and we see everything from different perspectives. When we are studying the reality we are never able to wholly stand outside ourselves. When reading about and participating with other humans and experiences, when collecting data, when analysing and reflecting, we may never wholly be in a situation outside our own experiences and judgements. Our interpretation and our understanding will always be based on our experiences. My pre-under-
standing has been of great importance to my work with the shoulder patients in this project.

The human with a painful shoulder

Pain is a common problem among people and has also a central place in our history. Pain is often the patient’s predominating symptom and may be expressed in many ways. The definition of pain according to the International Association for the Study of Pain (IASP) reads: “Pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage” (IASP, 2007).

The shoulder is a complex joint system with a complicated architecture in which bones and fine system of muscles, tendons and ligaments cooperate in order to gain a large range of motion for the shoulder. Dressing one self, managing personal hygiene, taking a cup from a cupboard etc, are all examples of activities requiring a complex coordination of shoulder motion (Solem Bertoft, 2007). Muscle weakness and a decreased range in shoulder motion disturb the normal pattern of movement. Pain will normally lead to a non voluntary interruption of the lifting of the arm. The changed pattern of the movement makes it hard to lift the arm to a high position. The pain and the decreased movement of the shoulder may seriously affect activity performance and health-related quality of life (National Board of Health and Welfare, 2009).

For some persons with shoulder pain adequate physiotherapy will solve the problem while others need surgery (Nationellt kompetenscentrum för ortopedi, 2006).

Shoulder joint replacement

Pain when at rest, as well as at night and pain during shoulder movement, decreased function and destruction of the joint structures are indicators that surgery is necessary for the shoulder (Boyd et al., 1990). Common diagnoses are osteoarthrosis and rheumatoid arthritis. The shoulder joint replacement could be done by either replacing or
resurfacing the humeral head; hemi-arthroplasty, or as a total shoulder joint replace-
ment where both the glenoid and the humeral head are replaced with prosthesis com-
ponents. In Sweden approximately 525 shoulder hemiarthroplasties and approxi-
mately 365 total arthroplasies were made during 2008, more commonly among
women than men (personal communication with Björn Salomonsson, orthopaedic
surgeon Danderyd, and in charge of the The Swedish Shoulder Arthroplasty Register,
2009). The shoulder joint replacement is done in a limited number of few hospitals in
Sweden (The Swedish Shoulder arthroplasty Register, 2009).

Pain and dysfunction after shoulder joint replacement may lead to changes in the
pattern of motions of the shoulder (Brems & Wilde, 1991; Deuschle & Romeo, 1998;
Madhok, 1993; Svendsen, 2005). If these problems are left untreated they may be-
come permanent (Brems & Wilde, 1991; Bruzga, 1999). Pain when resting and pain
at night should disappear early after surgery, even if movement pain may be preva-
Ient during the first four to six weeks (Deuschle & Romeo, 1998). When having se-
vere pain that hinders the progress of the necessary exercise the surgeon should be
contacted (Maybach, 1995).

**Physiotherapy and shoulder surgery**

Many authors point out that a faster recovery relies on the preoperative physiotherapy
including information and instructions to the patient by the physiotherapist (Boyd et
al., 1990; Brems & Wilde, 1991; Deuschle & Romeo, 1998).

All shoulder surgery leads to more or less pain, decreased pattern of motion, de-
creased shoulder movement, swelling, stiffness, loss of muscle strength and de-
creased endurance. Discomfort during physiotherapy and in activities of daily living
continues for the first 4 to 6 weeks (Deuschle & Romeo, 1998). The intention of the
physiotherapy is to minimize complications. Inactivity and immobilization are nega-
tive factor for the recovery of the shoulder and during the initial phases of exercises,
patients tend to perform better when the exercise sessions are broken down into short
sessions performed multiple times a day (Brown & Friedman, 1998). The physiother-

apy programme should proceed in a logical and well defined fashion (Brems & Wilde, 1991). Additional restrictions may be required during the first four to six weeks depending on the intraoperative findings (Deuschle & Romeo, 1998). Early rehabilitation actions with movements of the shoulder should be emphasized in order to achieve the best possible function (Brems & Wilde, 1994; Bruzga, 1999; Deuschle & Romeo, 1998; Maybach 1995; Petrella & Bartha, 2000; van Baar et al., 1998).

Exercising of the shoulder should continue after discharge, by home exercising supervised by a physiotherapist (Brems & Wilde, 1991; Brems, 1994; Bruzga, 1999; Deuschle & Romeo, 1998; Maybach 1995). It is important for the physiotherapist to guide the patient during exercising and to suggest relevant adjustments depending on performance and pain. Knowledge and awareness is also an important tool in the rehabilitation process (Thornquist, 1998). The patients’ learning may include the cause of the symptoms, how to prevent disease and how to decrease the suffering. Physical body awareness exercises and relaxation exercises could be essential after the surgery. If the patient is aware of her/his body and symptoms this will be a help in handling and coping with pain in their daily lives.

Most patients and some physiotherapists are not familiar with the rehabilitation process after the shoulder joint surgery (Burdea, 2000; Deuschle & Romeo, 1998). It is of great importance that the surgeon gives information to the physiotherapist and the physiotherapist to the patient during the rehabilitation after the surgery (Romeo 1996). “The greater knowledge a physical therapist has regarding a surgical procedure the greater the likelihood that an appropriate rehabilitation program can be developed“ (Unverzagt et al., 2006).

The standard Swedish exercise programme after shoulder replacement (Nowak et al., 2001) consists of three phases of shoulder exercises and starts as soon as possible after the surgery. The physiotherapy exercises start at the hospital and are carried out by a multi-disciplinary perioperative care team. The physiotherapy aims at an individualised initiation and progression of the exercises. All patients receive as a usual routine a written exercise programme which is instructed, tried out and adapted to individual conditions together with the hospital physiotherapist. The exercise is to be
continued post discharge at home by the patients themselves and supplemented by supervised out-patient care physiotherapists at the patients’ place of residence. The phases are as follows: Phase IA: Optimize the healing conditions, reduce the pain and obstruct stiffness. IB: Increase active-assisted exercises and gain good muscle control. IIA: Optimize active-assisted movement and the range of motion. Phase IIB: Improved active muscle control and optimize activities of daily living. Phase III: Normalize muscle strength and endurance according to the patient’s need. Normally, phase I is started at the hospital, the other phases will commence after discharge, due to short hospital stays.

The concept of movement has been seen as fragmented in physiotherapy and the development of the profession leads to a more and more patient-centred focus (Ekenberg, 2000). Encouraging a patient’s sense of control over the problem and improving self-efficiency are of importance (Klaber Moffet & Richardson, 1997). The patients’ self-efficiency may increase or decrease depending on the physicians’ or the physiotherapists’ way of acting and commenting (Thomeé et al., 2009). To reach a successful outcome the physiotherapist must have empathy and an ability to communicate with the patient (Brems, 1994). Thus, the relation and communication between the physiotherapist and the patient are important. One aspect of this is feedback to the patient, aiming at more and better experience of the movement and a reflection of the body. The contact with, and understanding one’s body is expressed in the treatment and influences the confidence and the functioning of the patient (Rosberg, 2000; Thornquist, 1988).

**Telerehabilitation**

Traditionally, only in cases when the patient is too disabled to travel to the physiotherapist, in-home services are made (Burdea 2000; Deuschle & Romeo, 1995). As there are restrictions associated with travel this leads to a situation where in-home-service as an alternative to face-to-face rehabilitation may only take place over small geographical areas (Sandford & Butterfield, 2005).
After discharge, exercises at home are traditionally supplemented with supervised physiotherapy at the local centre (Deuschle & Romeo, 1998). Long distances between the home and the therapist and lack of appropriate rehabilitation and resources can lead to permanent disabilities (Brems & Wilde, 1991; Burdea, 2000; Deuschle & Romeo, 1995; Madhok, 1993; Maybach, 1995).

During recent decades, the development of telemedicine has brought opportunities for distance-spanning health care. In order to entail a broader scope, the term telehealth has evolved and in the beginning of the new millennium the concept of e-health arouse, indicating not only a technical development, but also a networked thinking and state of mind aimed at improving healthcare by using information and communication technology (Eysenbach, 2001; Koch, 2005). When used in a rehabilitation context, telerehabilitation, described by Winters (2002), can be seen as one application of telemedicine or e-health, entailing delivery of rehabilitation services over telecommunication networks and the internet. There are many potential benefits of telerehabilitation, such as improved access to information, special services, reduced travels and reduced costs for health-care (Hjelm, 2005; Huis in’t Veld et al., 2006; Zampolini et al., 2008) and telerehabilitation offers the possibility to deliver these advantages through minimizing the barriers of distance (Winters, 2002). Movement therapy technology will likely play a key role in meeting the challenge of providing optimal intensity and type of therapy (Eysenbach, 2001; Koch, 2006).

By development of information and communication technique health-care at the patients’ home has become more common. Beyond the specialized clinic, specialized health care can be offered at the patients’ home. In addition the patient is in a safe and familiar environment as well as in a physiological home ground (Harrefors, 2009; Zingmark, 2007).

Health-care at the patients’ home has become more common at the same time as the information and communication technique is developed. Beyond the clinic the special knowledge services are used between the special clinic and the patients’ home. The patient is offered delivering of health services and the technique provides consultations and daily support for elderly. Besides that the patient is in a safe and
well-known environment as well as in a physiological home ground (Zingmark, 2007).

Quantitatively designed studies of telerehabilitation showed reduced need for travel, and improvements of physical and functional outcomes (Burdea et al., 2000; Petrella & Bartha, 2000; Russel, 2003; Wong, 2005). Palsbo & Bauer (2000) describe the possibility of telerehabilitation as facilitating the patients’ need. Patients with orthopaedic problems had physical rehabilitation consultation via videoconferencing and all clients were comfortable with, and had confidence in, the tele-consultations (Lemaire et al., 2001). In a study by Russel (2004) patients felt empowered after remote physiotherapy services via low-bandwidth telemedicine after knee replacement. However, they indicated that the physiotherapist was not able to deliver ‘hands-on’ in the treatment. Hughes et al (2003) showed that patients were satisfied with the technology of telerehabilitation. Examining via videoconferencing was compared with the examination of orthopaedic outpatients (Haukipuro et al., 2000). This randomized controlled trial showed that there were somewhat more problems in examining the videoconferencing patients than the clinic patients. The author claims that videoconferencing between primary and secondary care can be used in the examination whenever no demanding imaging technology is needed.

Hjelm (2005) has found a risk of a breakdown in the relationship between health professionals and the patient when using video-link. The risk might relate to communicative skills and lack of formal training when using the technique equipment. The author refers to anecdotal evidence that elderly patients at times do not accept that a physician, appearing on what looks like a TV screen, can see and listen to them properly and requires further research into the interaction between professionals and patients. On the other hand, Sävenstedt et al (2007) consider that it is possible to experience psychological closeness at a distance through video communication, depending on the quality of the technology.
Rationale

Patients who undergo shoulder surgery are at risk that pain and immobilization may prevent an optimal recovery. Patients need to be supported by skilled therapists with specific knowledge of the body and functional and medical consequences of the surgery.

Traditionally, travelling could be a hindrance for the continuity and the availability of this support. Telerehabilitation has been shown to minimize the barriers of distance in the delivery of rehabilitation services, which opens the possibilities of having access to specific knowledge of shoulder exercises when being a patient at home. Previous research has shown the advantages and disadvantages of telerehabilitation in patients with several diagnoses. The current trend towards shorter hospital stays further emphasises the significance of providing skilled rehabilitation in the home.

However, we have not found any studies of interactive video-based home physiotherapy after shoulder joint replacement, a rehabilitation process regarded as especially demanding and requiring careful individualisation. There are also different opinions regarding the consequences of video-link communication for the patient-therapist relation for example due to the fact that the therapist can not approach the patient hands-on.

Therefore, increased knowledge about the effects and the patients’ experiences of interactive video-based home physiotherapy after shoulder joint replacement would be a valuable scientific contribution.
AIMS

The overall aim of this thesis was to explore effects and experiences among patients participating in home-physiotherapy, based on interactive video-communication after shoulder joint replacement.

The aim of study I was to compare a home physiotherapy intervention based on interactive video-communication with conventional post-operative rehabilitation regarding its realization and effects on recovery in shoulder function, activity limitation and health related quality of life.

The aim of study II was to describe the patients’ experiences of participating in interactive video-based home physiotherapy after shoulder joint replacement.
**MATERIAL AND METHODS**

**Design and participants**

The study (Paper I and II) has been conducted within the Tryggve Project, at the Centre for Distance-spanning Healthcare, (CDH), Luleå University of Technology (www.cdh.ltu.se) and the County Council of Norrbotten, Luleå, Sweden. The research methods applied both quantitative and qualitative approaches. The choice of the method was determined by the research question. The design is illustrated in Figure 1.

---

*Before surgery*  *Operation*  *Physiotherapy including a written programme*  *After intervention*

**A. Telemedicine group**

- Equipment installation at the patient's home
- Physiotherapy at the hospital
- Eight weeks physiotherapy at the patient's home at a distance
- ~8 w
- Continuing conventional physiotherapy at the local place
- Referring to conventional physiotherapy at the local place
- Measure 1*
- Measure 2**

**B. Control group**

- Physiotherapy at the hospital
- ~8 w
- Continuing conventional physiotherapy at the local place
- Measure 1*
- Measure 2**

*questionnaires and measurements one week before operation;  **follow-up questionnaires and measurements 8 weeks after operation.

Figure 1. Study design
A series of twenty-five patients were selected from the waiting list for a shoulder replacement at an orthopaedic clinic at a hospital in Northern Sweden. To be included they needed to be Swedish speaking adults with either primary osteoarthrosis or rheumatoid arthritis and secondary osteoarthrosis. The exclusion criteria were humeral fracture, cuff arthropathy (irreparable tear of muscles of “rotator cuff”), the presence of medical conditions that precluded safe participation in exercises (e.g. recent myocardial infarction, stroke or severe pulmonary disease), and significant psychiatric or neurological disease, serious impaired hearing or vision, or dementia.

The inclusion of patients continued during four years from February 2003 until January 2007. Patients who met with study criteria mentioned above were consecutively included. It was practically possible to manage three contemporaneous telerehabilitation group patients. If there was such a telerehabilitation facility available, when the patient was scheduled for surgery, she or he was allocated to the telerehabilitation group, if not, to the control group. This was done consecutively for all patients, who met the inclusion but not the exclusion criteria. An overview of the selection of the participants, the data collection and data analysis is presented in Table 1.

Table 1. Outline of the content of the thesis

<table>
<thead>
<tr>
<th>Study</th>
<th>Participants</th>
<th>Data collection</th>
<th>Data analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper I</td>
<td>22</td>
<td>Questionnaires</td>
<td>Descriptive and hypothesis-testing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Test of function</td>
<td>statistics</td>
</tr>
<tr>
<td>Paper II</td>
<td>10 (telerehabilitation group participants from paper I)</td>
<td>Individual interview</td>
<td>Content analysis</td>
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</table>
All patients who were offered participation accepted, however, there were three drop-outs during the study: two patients in the telerehabilitation group and one in the control group. The reasons for discontinuing were post-operative delirium (one in the telerehabilitation and one in the control group) and severe hearing disorder, impeding participation (telerehabilitation group). Thus, 22 patients actually participated in the study; ten in the telemedicine group (median age 70 years, range 53-85, eight women and 2 men) and twelve in the control group (median age 73 years, range 50-86, nine women and three men).

**Intervention**

All patients underwent the same shoulder joint replacement with hemiarthroplasty (with a Bigliani-Flatow prosthesis, and with a standard delto-pectoral approach). All surgeries were made by the same orthopaedic surgeon. After the surgery, all patients, as a standard routine, followed the first step of a written three-phase programme (Nowak et al, 2001) at the hospital instructed by a physiotherapist.

The control patients were, as a usual routine, referred to continue the exercise programme after hospital discharge under supervision by a physiotherapist in the outpatient care at their place of residence, besides progressive home-exercise of their own. The physiotherapy aimed at daily home exercises supplemented by 2-3 individually supervised training sessions a week gradually reduced to once every week or every second week.

The patients in the telerehabilitation group participated in 8 weeks of individually supervised physiotherapy at home including exercising on their own. The physiotherapist who had long experience of treating patients after shoulder surgery was situated at the hospital. The patient was connected by a videoconference system which permitted the physiotherapist to continuously supervise the exercise programme with the patient and they saw and could speak to each other.
Standard commercial video-conferencing units were used in the patient’s home and the clinic (Tandberg 800, Sony PCS-50, Polycom VSX 3000). In the home, the equipment was connected via the patient’s broadband service. Initially, the connection in the clinic was via ISDN (Integrated Service Digital Network) and then later, a secure IP (Internet Protocol) connection was used in stead. The connection bandwidth varied from 256 to 768 kbit/sec.

Data collection

Assessments were made at baseline, during the week before the surgery and at the end of the intervention (week 8) in both groups (n=22) (Fig. 1, page 17). The methods of assessment that we have used in paper I and paper II are described and also their relation to the International Classification of Functioning, Disability and Health (ICF) (World Health Organization, 2001) in Table 2 (next page). Interviews with the participants of the telerehabilitation group (n=10) were carried out at the end of the intervention. Demographic data, the length of stay at the hospital and the number of physiotherapy sessions during the rehabilitation period were derived from the medical records. All clinical assessments were made by the same physical therapist.

Self-rated shoulder pain was assessed as perceived pain on a Visual Analogue Scale (VAS) with the endpoints from none to extreme pain (Price et al, 1983).

Maximum active pain-free shoulder range of motion (ROM) was assessed using a manual goniometer with the patient in a sitting position; external rotation around the long axis of the humerus was recorded with the arm hanging by the side of the body and the elbow flexed 90°; body segment references were the trunk, the humerus and the ulnae. Forward flexion was recorded with the humerus in the sagittal plane (Della Valle et al., 2001; Domholdt, 2000; Youdas et al., 1994).
Table 2. Data collection used in paper I and paper II

<table>
<thead>
<tr>
<th>Method of data collection</th>
<th>Related ICF domain</th>
<th>Data target</th>
<th>Target group</th>
<th>Type of data collection</th>
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<tr>
<td>Paper I</td>
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<tr>
<td>Visual Analogue Scale (VAS)</td>
<td>Body functions</td>
<td>Pain</td>
<td>Person with pain</td>
<td>Self-rating formula</td>
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<td>Body structures</td>
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<tr>
<td>Range of motion (ROM)</td>
<td>Body functions</td>
<td>Maximum active pain free motion of the shoulder</td>
<td>Not disease specific</td>
<td>Test of function</td>
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<td>Body structures</td>
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<td>Constant score</td>
<td>Body functions</td>
<td>Shoulder function</td>
<td>Person with disease of the shoulder</td>
<td>Test of function Global questionnaire</td>
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<td>Body structures</td>
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<td>Activities Participation</td>
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<td>SRQ-S</td>
<td>Body functions</td>
<td>Shoulder condition</td>
<td>Person with disease of the shoulder</td>
<td>Self-rating questionnaire</td>
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<td>Body structures</td>
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<td></td>
<td>Activities Participation</td>
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<tr>
<td>Health related quality of life</td>
<td>Activities Participation</td>
<td>Health related quality of life</td>
<td>Not disease specific</td>
<td>Self-rating questionnaire</td>
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<td>SF-36</td>
<td>Health related quality of life</td>
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<td>Interviews</td>
<td>Activities Participation</td>
<td>Experiences</td>
<td>Not disease specific</td>
<td>Individual interviews</td>
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<td>Context</td>
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Shoulder function was assessed by using the Constant score, combining self-rating and objectively measured functional assessment by items covering pain, ability to perform activities of daily living (ADL) and active ROM. The basis of the score is a 100-point scale. Muscle strength was not measured due to the short period of time after the surgery. That excluded 25-points from the score. Consequently the maxi-
The higher the score rating, the less severely affected was the shoulder (Constant & Murley, 1987; Kuhn & Blasier, 1995; Romeo et al., 1996).

The condition of the shoulder was self-rated by the Swedish version of the standardized Shoulder Rating Questionnaire (SRQ-S), covering health related to the shoulder rated on a VAS 0-10 cm scale, and pain, ADL, recreational and athletic activities and work on a five-point scale. The higher the score (17-100 points) the better was the condition of the shoulder. The score also had two additional questions pertaining to shoulder satisfaction and areas for improvement (not used to calculate the overall SRQ-S score) (Dahlgren et al, 2002; L'Insalata et al., 1997).

The Short Form 36 Health-Related Quality of Life (SF-36); self-rating questionnaire covers the eight domains: physical functioning, role limitation due to physical problems, pain, general health, energy/fatigue (vitality), social functioning, role limitation due to emotional problems and mental health perceptions. The minimum score is 0 and the maximum 100, with a higher score representing better health (Sullivan et al, 1995).

Qualitative research interviews (Kvale, 1997) were carried out at the end of the intervention period in the telerehabilitation group in connection with the revisit to the hospital. All interviews were made by the author, a physiotherapist with long experience of interacting with patients with shoulder problems. An interview guide providing a general framework of the experience of interactive home physiotherapy through videocommunication was used. The interview was encouraged via supporting and clarifying questions; for example: “could you please tell me a little more about that?” The interview lasted between 35 to 95 minutes, was tape-recorded and transcribed verbatim including notations of nonverbal expressions such as silence and laughter.

The transcribed interviews were sent to the patients for corrections and acceptance. The purpose was to give the patients the opportunity to improve clarity and supplement the content of the interviews. The patients did not make any corrections. "Member check" of the interpretation of the data was not used in this study. According to Krippendorff (1980), member check is not a presupposition for content analysis. Downe-Wamboldt (1992) adds that the researcher may have a broader under-
standing of the historical context of social structures and may have developed a broader understanding in the findings in addition to the understanding that the researcher share with the participants. Finally, the author emphasised that “Multiple meanings are always present in data – there is no right meaning, only the most accurate meaning from a particular perspective”.

**Analysis**

Because of small numbers, the non-parametric Mann-Whitney U-test was used for between-group comparisons. The significance level was set at p<.05. Due to the disparity of initial values at baseline, the differences between the values at baseline and the values after follow-up were calculated and used for the analysis of the effect of the treatment. Standard software (SPSS version 15.0) was used for the analysis.

A power calculation was made, based on a Mann-Whitney test of Constant score results of the first six patients. Based on the differences between baseline and follow-up, the calculations showed that for 90% statistical power of detecting a significant difference (p<.05), nine persons in each group were needed.

The interviews were analysed by qualitative content analysis according to the concepts of Graneheim and Lundman (2004), Lundman and Graneheim (2008) completed with the conventional content analysis approach according to Hsieh and Shannon (2005). Manifest and latent content analysis were used and the interpretations varied in depth and level of abstraction (Graneheim & Lundman, 2004). During the first three steps of the analysis we chose to work with manifest interpretations, i.e. near by the text without trying to interpret. The coding was a way of labelling a condensed meaning unit, and gain a new thought on the data. When creating the categories, we looked for a thread throughout the codes, answering the question “What?” (Graneheim & Lundman, 2004). The analysis was made in several steps in a dialectic movement between understanding and explanation, between parts and the whole of the text.
The co-workers read independently of each other the whole text to gain a sense of the whole. Parts of the text that could identify the person and were not meaningful according to the aim were removed. The interview text was divided into meaning units, i.e., words or meanings related to each other and identified corresponding to the aim. Those meaning-units were condensed through shortening the text while still preserving the core. The codes describing the content of the meaning-units were then developed. Categories were identified and sorted by similarities and differences. Definitions of the categories were developed. A recontextualisation was made to confirm that the results from the decontextualised material still agreed with the original context (Malterud, 1998). Thus, I and my co-workers validated the parts in relation to the whole.

Finally, the underlying understanding through the condensed meaning-units, codes and categories was emerged by a theme. In the final step, the whole text, the theme and the categories were reflected in the interpretation in relation to the co-workers’ pre-understanding and relevant literature.

**Ethical considerations**

All patients provided written consent to participate. However, as the research implied a relatively novel technology-based physiotherapy intervention in the patients’ home the ethical considerations were essential.

The patients were treated by a registered physiotherapist who followed the professional ethical rules and healthcare regulations. The research was carried out following research ethics regulations.

Considerations were made about being connected by image and voice communication in the home. The therapist was “coming in to” the home of another person which could be experienced as insulting. The participants were given information that they could decide and control the situation by switching on and off the video communication equipment. They also took part in placing the technical equipment. The equipment at the clinic was placed in a separate room in order to give the participants
the opportunity to see and identify the person to whom they communicated, mostly
the physiotherapist involved in the rehabilitation.

There have been many questions of reflection during the project. Is the patients’
possibility to autonomy compromised? Is personal integrity or human dignity threat-
ened? Do I think of the patients’ rights during the work? Do I know what is best for
the patient? Is the work based on moral grounds that lead to good actions? Can I as a
researcher understand all consequences of the actions in the study? In practise it is
very hard to notice and foresee the consequences of the decisions that are made.

The basis of the research work is mostly scientific facts, as well as experiences or
old traditions, together with common sense. When considering and analysing, com-
mon sense and ethical and moral judgement has formed the basis for the work. Dif-
ferent experiences also play a role such as attitudes in the health care. Open discus-
sions and the intention of doing good and preventing harm or risks have been
considered carefully throughout the whole process of the work.

The heads of the Department of Orthopaedics and Department of Rehabilitation
units at the hospital involved gave their permission for undertaking the studies. The
study was approved by The Regional Ethical Review Board in Umeå, Sweden, Dnr
06-034M.
RESULTS

There was no significant difference between the groups regarding sex, age, length of stay in hospital after surgery, or prevalence of osteoarthritis and rheumatoid arthritis.

There was no delay in the post-discharge rehabilitation for the telerehabilitation group; they all participated in the first remote-session in one or two days after the discharge. For the control group, the delay was 7-15 days after discharge, median 11 days.

Median number of post-discharge physiotherapy sessions was 21.5 (range: 11-36) for the telerehabilitation group as compared to 3.5 (range 0-12) for the control group, p<.001. Three members of the control group had no documented post-discharge physiotherapy sessions. The sessions varied from 10 min to 60 min sessions for the telerehabilitation group and were estimated to last for 30 min for each session for the control group.

Figure 2. Median differences after-before intervention for telerehabilitation and control groups. Statistical significance is indicated as: ns: no significance, *: p <.05, and ***: p <.001.
As can be seen in Figure 2, there were significantly greater improvement two
months after surgery in the telerehabilitation group than in the control group regard-
ing pain, shoulder function (Constant score and SRQ-S) and external rotation range
of motion of the affected shoulder. Regarding flexion, no significant difference was
seen between the groups.

Change in health related quality of life (SF-36) were significantly greater in the
telerehabilitation group concerning the pain and vitality dimensions (p<.01). No sig-
nificant difference between group effects were seen on physical function, role-physi-
cal, general health, social functioning, role-emotional and mental health dimensions.

The findings of the analysis of the interviews indicate that all patients participat-
ing in the telerehabilitation group were highly satisfied with the physiotherapy ser-
VICES at home. Seven categories and one comprehensive theme emerged and are pre-
sented in Table 3.

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<th>Table 3. Theme and categories of the analysis of the intervention</th>
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The participants felt safe, competent and empowered in their daily exercises rou-
tine as a result of frequent continued supervised physiotherapy and collaboration in
exercises with an experienced physiotherapist by video-link. Factors contributing to
the good outcomes of the participants’ treatment were the access to daily specific,
adjusted physiotherapy at home without having to travel directly after returning
home. They initially experienced the view of themselves at the TV-screen as odd.
During the communication via the video-link they experienced being in focus and expressed a high degree of attention and they expressed a way of respectful and considerate communication. They experienced closeness although they were at a distance. Their participation developed their knowledge about the surgery, the body and shoulder movements, how to handle the pain and manage the technical equipment. This competence became finally a routine at home where they were motivated to pain-free exercise. To be at home was important and contributed to a flexible and active living.

The participants expressed advantages with the continuous rehabilitation process from the hospital to the home and to the out-patient care physiotherapist through the video-link to the hospital-physiotherapist. However they emphasized that they saw telerehabilitation as a supplement to the conventional physiotherapy and that personal meetings could not be replaced.
DISCUSSION

To my knowledge, this is the first study to describe the effects and experiences of interactive video-based physiotherapy at home after a shoulder joint replacement.

Feasibility of the video-based physiotherapy intervention

Compared to conventional physiotherapy rehabilitation, this telerehabilitation intervention resulted in more physiotherapy sessions with an earlier start. There was a greater recovery two months after surgery regarding pain and shoulder function as well as pain and vitality dimension of health-related quality of life. The interviews revealed that all patients participating in the telerehabilitation were highly satisfied with the remote-technology provided physiotherapy services at home. Factors contributing to this were the daily access to specific, adjusted physiotherapy at home starting without delay after their homecoming. The participants also described a high degree of participation, which was expressed as an important factor of recovery competence.

These findings are in accordance with Sanford and Butterfield (2005) who showed that remote-technology services to underserved elders provided access to the patient in his or her own home and enabled the physiotherapist to observe in order to make adjustments, change and provide new prescriptions for adaptive methods and modifications that otherwise would not have been possible. Nilsson et al (2006) described how older people with chronic illness living at home were satisfied with the use of information and communication technology when receiving nursing care at home. Demiris et al (2000) described that an initial fear of using such a technology seemed to reduce with time. These positive findings are however in contrast to Mair and Whitten (2000) who described that 11 out of 22 patients expressed concerns about telemedicine communication because the physician was not physically present with them.
The higher recovery degree in the telerehabilitation group could obviously be explained by the fact that the intervention resulted in more patient-physiotherapist sessions, more total therapy time and an earlier onset than was the case with the conventional post-discharge treatment. This was, of course, one of the purposes with the intervention in itself. However, as can be seen in the discussion below, there were also indications from the participants’ experiences that the telerehabilitation physiotherapy and the way in which it was delivered might have contributed to a qualitative rehabilitation process.

**Telerehabilitation as a support for the recovery process**

The findings of this study are in several respects supported by other findings in the literature regarding positive factors for recovery after shoulder surgery. This includes early onset of mobilization and avoidance of immobilization (Brems, 1994; Brown & Friedman, 1998), patient and therapist competence (Deuschle & Romeo, 1998; Brems, 1994). Maybach and Schlegel (1995) and Brems (1994) stated that discussing the patient’s goal and expectations in order to make the patients to see themselves as an active and not a passive receiver, is a way to gain a fast recovery. The role of the physiotherapist being available to support patients exercising at home is emphasized by Smith et al (2005). Sluijs et al (1991) pointed out that the greatest drop in compliance with exercise regimes was associated with the time of discharge, and Melander-Wikman (2006) also found that patients in rehabilitation thought that most support was needed when they were tired of the exercises and wanted to give up.

The participants’ experience of a high degree of participation could be explained partly by the initial careful information and the interplay with the physiotherapist, including acknowledgement, reassurance and confidence. The findings indicated that the patients were learning about how to handle exercises, how to handle the body, and how to handle the technical equipment. This competence helped them to be active and responsible. They saw the physiotherapist as an expert in consultation and this contributed to a feeling of safety while being remote-guided at home. Lundvik
Gyllensten et al (1999) showed that the quality of the interaction between patient and physiotherapist may have a great effect on the patient outcome. Melander Wikman et al (2008) and Lindberg et al (2009) emphasise the importance of users’, feeling of control over the technique.

The fact that the exercises were performed at the patients’ home may have shifted the balance of power between the patient and the physiotherapist in favour of the patients’ voice. Zingmark (2007) and Harrefors (2009) mean that to be home represent safety, power and freedom for the person. The remote-physiotherapy could be integrated by the activities at home in a simple way. The rehabilitation process as well as the daily living was facilitated by being at home. This differs from a conventional treatment context where the patient goes to the physiotherapists’ office were the physiotherapists are seen as being the most powerful (Edward, 2004).

Our findings indicated a reinforced communication with a focus of attention on oneself and on the body when receiving feedback and support from the physiotherapist at the TV-screen. A changed communication via telemedicine may require special methods of giving information and special skills of communication as this may alter the meetings and the relationship between the therapist and the patient (Currel et al, 2007). When conversing in a video-communication session participants have to listen without interruption which was obvious in the present study. The participants adapted to the delayed sound in the conversation of the physiotherapist by the video-link. They waited for the other person that was speaking to finish before starting to speak themselves. This is in accordance with one ground rule for trustful therapy or teaching: listening with close attention and no interruptions of each other’s ideas (Levitt & Goldschmied, 1990). Perhaps the delayed replies lead to a better ability to listen, greater concentration and more time for reflection, which, in turn, may improve the communication.

Another factor that may have influenced the reinforced communication was the gaze of the TV-screen. Normally, the use of gaze and bodily position are basic means of creating joint attention (Kendon, 1990). The gaze does not focus during the majority of the time during normal conversation. It alternates between different points and
focusing often serves as a mark of the end of the conversation. Sävenstedt et al. (2005) found, in a study of establishing joint attention in remote talks, that both nurses and participating older people maintained their focus by gazing at the screen almost the whole time. In the present study, the participants expressed a feeling of being seen when they spoke and when they exercised remotely with the physiotherapist. The gaze of the TV-image was expressed as a feeling of being in the centre of the physiotherapist’s attention.

Participants expressed confidence with the physiotherapist as well as self-confidence during the telerehabilitation process. Presumably, the reinforced communication and management of the technique contributed to this confidence.

In conventional physiotherapy the hands of the physiotherapist appeared to be a perpetual source of communication to the patient as well as used for therapeutic intervention (Jensen et al, 1990). The participants in the actual study experienced that they did not miss hands-on treatment as they expressed the remote-physiotherapy so intensively. This is in line with Jensen et al (1990) who found that therapists, who were experienced, were more responsive and listened intensely compared to inexperienced physiotherapists.

The variation in the duration of the remote physiotherapy sessions imply that there were individual judgements by the physiotherapist, and possibly, by the patients themselves, of each patient’s needs. The patients described efficiency in time-usage as they were prepared and dressed in suitable clothes when they met the physiotherapist through the video-link.

In the present study, patients had met the physiotherapist at the hospital before meeting through the video. This could explain why they emphasized that telerehabilitation physiotherapy at home was seen as a supplement to the conventional physiotherapy and that personal meetings could not be replaced. Similar findings are also reported by Sanford and Butterfield, (2007) and Lindberg, (2009).
Methodological considerations

When interpreting the differences in recovery between telerehabilitation and control groups, I must emphasize that the study was not designed to compare the effects of the telerehabilitation intervention to conventional face-to-face physiotherapy in itself, but to conventional post-discharge treatment conditions.

The quantitative findings are strengthened by the facts that all patients asked to participate accepted, that groups were reasonably similar regarding important characteristics, that all patients received the same treatment during surgery and hospital stay, that there were few dropouts and that reliable, valid and well-known assessment instruments were used by experienced staff, following standardised procedures. Power calculations showed that the size of the groups were sufficient for the purpose. However, the most important study limitations are that the study was not randomised and that assessors were not blinded for group allocation. This was the consequence of practical and financial limitations. It is also reasonable to assume a positive attitude and expectancy among those who were included in the telerehabilitation group. The result of between-group analyses must therefore be interpreted with caution and results be seen as indicative of a possible feasibility, which should be confirmed in randomised and blind trials. I would suggest that the novelty of the intervention justifies the trial despite its limitations.

Throughout the whole research process I tried to be aware of my experiences and of my pre-understanding. My pre-understanding might have been an advantage as I knew the context of the patients’ situation. This may have led to an easier way to meet and relate to each other. The participant knew that I was aware of the context which may have made it easier to tell me about her/his experiences.

On the other hand I must be aware that my pre-understanding may have been a hindrance in the work. During fieldwork with earlier interviews (Eriksson, 2004), I became aware of my pre-understanding depending on earlier experiences and competences of physiotherapy and of patients who had undergone a shoulder joint replacement.
This made me encourage the participants with attendant questions during the interviews. The intention was to invite the participants in an explicit way to narrate their valuable experiences, both advantages and disadvantages. The purpose was to gain a rich content of the interviews. The interviews have been carried out during a time of four years and the experiences of interviewing were changed the more I learnt about the interview technique.

As the world is complex the reality can be interpretive in various ways. However, it was important that the interpretation always was in concordance with the interview text. My co-workers had another pre-understanding which contributed to new critical views towards the work and we found the interpretation as a balancing act with interesting discussions lasting many hours which improved reflecting and understanding.

I and my co-workers have tried to obtain knowledge about patients of both sexes, of different ages, and representing the two common underlying diagnoses. We assume that these participants had various experiences and that this knowledge should contribute to a richer variation of participants’ experiences of video-based physiotherapy at home. The findings are primarily valid for people who undergo shoulder replacements because of joint destructive processes related to osteoarthrosis and rheumatoid arthritis, however I deem that the findings could reasonably be extended to other patient groups in similar situations.

How could I further minimize the risk of influencing the participants? I questioned my pre-understanding; did I really know what they were talking about? When I was aware of my pre-understanding I tried to put it away and my intention was to be as open-minded as possible in my work of the interviews and the analysis of the interviews.

I believe that the use of both quantitative and qualitative approaches strengthen the study. The quantitative findings may serve as indicators of the effects on patient recovery in important function and ability dimensions, while the qualitative findings may teach about the participants’ own understanding and explanation of their experiences, something that is important for development of the rehabilitation.
Conclusions and implications

Interactive video-based physiotherapy at home after a shoulder joint replacement was experienced positively by the participating patients and seemed more effective than conventional rehabilitation procedures after hospital discharge concerning short-time recovery. This could be explained by the fact that the telerehabilitation group participated in more patient-physiotherapy sessions compared to the control group, but the interviews also indicate that the modality might have promoted continuity and patient participation and competence. Continuity, collaboration, reinforced communication, body knowledge and being at home emerged as aspects contributing to an experience of recovery competence.

The findings indicate that telerehabilitation approaches might be of great value in the development of physiotherapy practice. This may be of value in order to increase accessibility, but another aspect, important on its own, seems to be the use of the patient’s own home as an arena for the rehabilitation. The findings further emphasise the importance of the quality of patient-therapist interplay and control of the technology, and it seems possible that the interactive video-communication might promote this in certain aspects.

Further research could preferably include randomised controlled trials with blind assessments of outcome variables, cost-effectiveness analyses, and studies of long-term effects. Comparisons of experiences of participants in telerehabilitation and standard procedure therapy would be of value to further investigate the properties of telerehabilitation approaches. There could also be a further development of remote technology, besides audio-visual communication and information accessibility. Today, there is no possibility to make a physical hands-on examination; e.g., palpation, at a distance. This would add important qualities to the distance-spanning-meeting between the patient and the physiotherapist.
SUMMARY IN SWEDISH – SVENSK SAMMANFATTNING

Effekter och upplevelser av interaktiv videobaserad sjukgymnastik i hemmet efter skulderledsoperation

Introduktion

Denna avhandling fokuserar på personer som blivit opererade med skulderledsplastik och den efterföljande sjukgymnastiska rehabiliteringen. Smärta och immobilisering kan förhinder ett optimalt tillfrisknande och patienterna är i behov av stöd från specialiserade sjukgymnaster i sin rehabilitering. Tillgängligheten till rehabilitering kan störas av avstånd mellan patienten och terapeuten efter utskrivningen från sjukhus och kortare vårdtider ställer ytterligare krav på möjligheterna att kunna erbjuda rehabilitering i hemmiljö.

Telerehabilitering med hjälp av interaktiv videokommunikation mellan patienten i sitt hem och sjukgymnasten på sjukhuset kunde därför vara en möjlighet, men det saknas studier över sådan rehabilitering för den aktuella patientgruppen. Det finns också motstridiga uppfattningar om konsekvenserna av telerehabilitering för samarbete mellan patient och terapeut och när det gäller betydelsen av att sjukgymnasten ska kunna använda sina händer som redskap i rehabiliteringen.

Syfte

Det övergripande syftet med denna avhandling var att utforska effekter och beskriva patienters erfarenheter av interaktiv videobaserad sjukgymnastik i hemmet hos personer som genomgått skulderledsplastik.
**Material och metod**

Studien genomfördes inom ett e-hälsoprojekt; Centrum för Distansöverbyggande Hälso- och sjukvård, (CDH), Luleå Tekniska Universitet, Luleå, i samarbete med Norrbottens Läns Landsting, Luleå, Sverige.


Vid utskrivningen från sjukhuset remitterades kontrollgruppens patienter till individuell vägledning av sjukgymnast på hemorten och successivt utökad egenträning i hemmet enligt det påbörjade programmet. Telerehabiliteringsgruppens patienter deltog efter utskrivning från sjukhuset i träning i hemmet med individuell vägledning av sjukgymnast från sjukhuset på distans samt successivt utökad egenträning i hemmet. Distansträningen skedde via en video-kommunikationsutrustning, där patient och sjukgymnast såg och pratade med varandra.

Mätningar av skulderfunktion, aktivitetsförmåga och hälsorelaterad livskvalitet gjordes före operationen samt två månader efter operationen i båda grupperna och resultaten jämfördes mellan grupperna. För att få kunskap om hur deltagarna i telerehabiliteringsgruppen upplevde interaktiv sjukgymnastik i hemmet på distans gjordes individuella intervjuer med dem efter distansperiodens slut.

**Resultat**

Resultatet visade att det inte var några avbrott i den postoperativa sjukgymnastiska träningen för telerehabiliteringsgruppen. För kontrollgruppen varierade den första träningen med sjukgymnast från 7 till 15 dagar efter utskrivning från sjukhuset.
Antalet möten mellan sjukgymnast och patient var i medeltal 21,5 i telerehabiliteringsgruppen, jämfört med 3,5 i kontrollgruppen. För tre deltagare ur kontrollgruppen fanns inte några dokumenterade vägledda träningstillfällen med sjukgymnast. Tiden för mötena mellan sjukgymnast och patient i telerehabiliteringsgruppen varierade mellan 10 och 60 minuter, för kontrollgruppen var den beräknade tiden för mötena mellan sjukgymnast och patient 30 min.

Två månader efter operation och träning visades signifikant större förbättringar för telerehabiliteringsgruppen jämfört med kontrollgruppen när det gällde smärta, skulderfunktion och utåtrotation i skuldran. Mellan grupperna sågs inga signifikanta skillnader när det gällde flexion. Förbättringar i hälsorelaterad livskvalitet var signifikant större i telerehabiliteringsgruppen när det gällde dimensionerna smärta och vitalitet. För dimensionerna fysisk funktion, rollfunktion-fysiska orsaker, allmän hälsa, social funktion, rollfunktion-emotionella orsaker och psykiskt välbefinnande sågs inga signifikanta skillnader mellan grupperna.


operationen, om kroppen och skulderrörelser samt hur de skulle hantera smärta. Tekniken upplevdes som användarvänlig och de lärde sig att hantera tekniken i hemmet på distans. Slutligen växte kompetensen till en rutin i hemmet där de var motiverade till smärtfri träning. Att vara i hemmet var viktigt och bidrog till flexibilitet och att vara aktiv.

Deltagarna beskrev den kontinuerliga rehabiliteringsprocessen utan avbrott; från sjukhuset till hemmet och därefter till träning hos sjukgymnast i öppenvården, som positiv. Detta var möjligt tack vare tekniken som sågs som ett viktigt hjälpmedel men deltagarna betonade att det personliga mötet inte kunde bytas ut helt mot tekniken.

**Avslutande reflektion**

Att träna hemma med sjukgymnast via videolänk, efter genomgången operation med byte av axelveden, upplevdes positivt av de deltagande patienterna. Skillnaden efter två månaders postoperativ träning via telerehabilitering i hemmet, jämfört med traditionell sjukgymnastik efter skulderledsbyte, indikerade att telerehabilitering visar på ett effektivt sätt att träna på jämfört med traditionell träning. Detta kan bero på att telerehabiliteringsgruppen deltog i fler sjukgymnastledda träningar jämfört med vad kontrollgruppen gjorde. Intervjuerna visade även att träna i hemmet på distans ledde till kontinuitet och att patienterna kände en hög grad av delaktighet och kompetens efter träningsperioden. Kontinuitet, samarbete, förstärkt kommunikation i träningssituationerna och att samtidigt vara i hemmet och träna på distans, var aspekter som bidrog till upplevelsen av ”recovery competence”. Resultaten pekar på att telerehabilitering kan vara av stort värde vid utvecklandet av den sjukgymnastiska professionen.

Telerehabilitering ökar tillgången till sjukgymnast med specifik kunskap och en annan viktig aspekt verkar vara att patienten kan träna i sitt hem. I resultaten betonas även vikten av hög kvalitet i relationen och samspelet mellan sjukgymnast och patient samt att videokommunikationstekniken kan ha bidragit som en stärkande faktor till detta.
Det vore intressant att se framtida forskning med randomiserade, kontrollerade studier med ”blindad” undersökare samt studier för att undersöka kostnadseffektiviteten och långtidsresultat av patienter som tränar i hemmet via telerehabilitering. Jämförelser av erfarenheter av telerehabilitering och standardprocedurer inom sjukgymnastik vore av värde vid framtida studier. Ytterligare utveckling av informations- och kommunikationsteknologin förutom bild- och ljudtekniken vore av intresse att genomföra. Idag finns inte möjlighet att utföra undersökningar, ”hands-on”, palpation på distans. Vore detta möjligt skulle det kunna tillföra viktiga kvaliteter i distansöverbryggande möten mellan patient och sjukgymnast.
ACKNOWLEDGEMENTS

This study was carried out at the Division of Health and Rehabilitation, Department of Health Science, Luleå University of Technology in cooperation with the Department of Physiotherapy and the Department of Orthopaedic at Sunderby hospital, Luleå, Sweden. I wish to express my sincere gratitude to all of you who helped and supported me in so many various ways. The following persons have contributed in their own special way:

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