Postoperative Recovery

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Development of a Multi-dimensional Questionnaire for Assessment of Recovery

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ABSTRACT

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This thesis aims to present a multi-dimensional instrument for self-assessment of progress in postoperative recovery. The author employs different research paradigms and methodologies to achieve this aim.

Walker and Avant's approach to concept analysis was used to examine the basic elements of postoperative recovery (Study I). The analysis identified different recovery dimensions and developed a theoretical definition showing postoperative recovery to be an energy-requiring process of returning to normality and wholeness, defined by comparative standards.

Fourteen patients and 28 staff members participated in individual and focus group interviews aimed at describing patient and staff experiences of patient recovery (Study II). The essence of the postoperative recovery process was described as a desire to decrease unpleasant physical symptoms, reach a level of emotional wellbeing, regain functions, and re-establish activities.

In Study III, 5 dimensions and 19 items were identified as a part of the operationalization process of the concept postoperative recovery. Fifteen staff members and 16 patients participated in the evaluation of content validity. On average, 85% of the participants considered the items as essential to the recovery process. In a test run of the questionnaire, 14 of 15 patients considered the questionnaire to be easy to understand and easy to complete. Twenty-five patients participated in the evaluation of intra-patient reliability. Percentage agreement (PA), systematic disagreement (RP, RC), and individual variability (RV) between the two assessments were calculated. PA measures ranged from 72% to 100%. The observed disagreement could be explained mainly by systematic disagreement.

In total, 158 patients participated in the evaluation of construct validity, the ability to discriminate between groups, and the investigation of important item variables (Study IV). A rank-based statistical method for evaluation of paired, ordered categorical data from rating scales was used to evaluate consistency between the assessments of the Postoperative Recovery Profile (PRP) questionnaire and a global recovery scale. The number of months needed by participants to be regarded as fully recovered was studied by means of recovery profiles displayed by the cumulative proportion of recovered participants over time. A ranking list based on the participant's appraisal of the five most important item variables in the PRP questionnaire was compiled to illustrate the rank ordering of the items. In comparing the assessments from the PRP questionnaire and the global recovery scale, 7.6% of all possible pairs were disordered. Twelve months after discharge 73% in the orthopaedic group were regarded as fully recovered, compared to 51% of the participants in the abdominal group (95% CI: 6% to 40%). The *pain* variable appeared among the top five most important items on eight measurement occasions, of eight possible, in both study groups.

In conclusion, the PRP questionnaire was developed and support was given for validity and reliability. The questionnaire enables one to evaluate progress in postoperative recovery.

Keywords: Concept analysis, experiences, postoperative recovery, questionnaire, recovery profile, reliability, validity.

ORIGINAL PAPERS

This thesis is based on the following papers, which are referred to in the text by the corresponding Roman numerals:

I. Allvin R, Berg K, Idvall E, Nilsson U. Postoperative recovery: a concept analysis. *Journal of Advanced Nursing* 2007; 57(5): 552-558.

II. Allvin R, Ehnfors M, Rawal N, Idvall E. Experiences of the postoperative recovery process: an interview study. *The Open Nursing Journal* 2008; 2:1-7.

III. Allvin R, Ehnfors M, Rawal N, Svensson E, Idvall E. Development of a questionnaire to measure patient-reported postoperative recovery: content validity and intra-patient reliability. *Journal of Evaluation in Clinical Practice* 2009; 15:411-419.

IV. Allvin R, Svensson E, Rawal N, Ehnfors M, Kling AM, Idvall E. The Postoperative Recovery Profile (PRP) – a multidimensional questionnaire for evaluation of recovery profiles. *Submitted*

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CONTENTS

INTRODUCTION

Every day, worldwide, high volumes of patients undergo surgical procedures of one type or another. Irrespective of the type of procedure, postoperative recovery is an essential part of the patient experience. As a nurse specialized in the care of patients with acute pain, my work to follow up postoperative pain management involves daily meetings with patients recovering from surgery. Conversations during our meetings clearly reveal that they have concerns about several issues associated with postoperative recovery, both during hospitalization and after discharge. The current trend of rapid transition through the healthcare system means that patients are discharged quickly, shifting much of the responsibility for postoperative recovery to patients and their families. My observations of patients' experiences during hospitalization give me reason to question their readiness to handle their post-discharge recovery. To appropriately treat and support patients, according to their personal experiences and needs, we must enhance our knowledge and understanding of postoperative recovery. Assessing the impact of interventions on outcomes of genuine interest to patients requires subjective evaluation of patients' experiences [96]. This is the starting point for my thesis.

BACKGROUND

Postoperative recovery

Patients who require surgery are subject to a wide range of procedures. Every surgical procedure is followed by a period of postoperative recovery involving biomedical issues and personal experiences. Although a wealth of scientific studies on recovery after surgery and anaesthesia have been published, a standard definition of postoperative recovery was elusive at the time of the initiation of this project. In the absence of a standard definition, the concept of postoperative recovery runs the risk of being confused with contiguous concepts. Rehabilitation is often mentioned in the postoperative context, but has not been a focus of the present studies. It has been defined as "the health strategy applied by professionals in the health sector and other sectors that aims to enable people with health conditions experiencing or likely to experience disability to achieve and maintain optimal functioning in interaction with the environment" [114]. This definition is based on the World Health Organization's integrative model of human functioning and disability. In other words, rehabilitation is a comprehensive concept encompassing all strategies of medical, psychological, social, and working life alignments taken to help ill, injured, and disabled persons regain the highest possible functional level. Convalescence is another concept mentioned, but not defined, in the postoperative context. As with rehabilitation, it has not been a focus of this thesis.

Postoperative recovery phases

Postoperative recovery from ambulatory surgery can be divided into three different phases [67]. It has been suggested that the *early recovery phase* lasts from discontinuation of anaesthesia until patients recover vital postoperative reflexes. It passes over to the *intermediate recovery phase* when patients regain stable vital functions and lasts until they reach home readiness from the post-anaesthesia care unit. Finally, the *late recovery phase* begins with discharge and lasts until patients achieve preoperative health and wellbeing. The same phases can be assumed to apply to recovery from inpatient surgery. Although terms such as short- and long-term postoperative recovery are often used, they are seldom defined. In this thesis long-term recovery is defined as recovery from three months to one year after surgery.

Clinical endpoints for measuring postoperative recovery

Studies of recovery after surgery and anaesthesia have focused primarily on clinically oriented endpoints, e.g. length of hospital stay, decrease in physical symptoms, and incidence of postoperative complications. Pressures on hospitals to enhance the efficacy of their care has resulted in development of recovery protocols that have been shown to reduce hospital length of stay, e.g. after colonic surgery [133] and radical cystectomy [10]. However, many patients do not leave the hospital on the day that the predefined discharge criteria, according to the protocol, are fulfilled [77]. The discrepancy between the time when the patient should be discharged, in theory, versus the actual time of discharge has been evaluated [78]. The authors found that the reduction in hospital length of stay was not necessarily related to the use of the recovery protocol, and they discussed whether it related

more to changes in the organization of care and to local policies. Recovery criteria used, e.g. being able to eat and achieve good pain control with oral analgesics, were considered to be superior to length of stay in evaluating an enhanced recovery programme. Hence, it was argued that such criteria would be more suitable for defining patient recovery.

Recent technologies that have enabled surgeons to develop and practice new, minimally invasive, surgical techniques have been shown to accelerate recovery. In the surgical literature, hospital length of stay has been the primary endpoint in comparative studies, e.g. laparoscopic versus open techniques in colorectal surgery [14, 61, 125] and cholecystectomy [16]. The length of stay has been shorter in laparoscopic groups. The surgical literature also includes studies that evaluate recovery time in relation to the types of surgical incisions. A study comparing transverse versus midline incisions for abdominal surgery found no differences in recovery times between the groups [18].

The decrease in postoperative symptoms is another primary endpoint commonly used in recovery studies. Numerous studies have examined the incidence of single symptoms, e.g. pain [8, 28], postoperative nausea and vomiting [126], and anxiety [21] after different surgical procedures. A decrease in these symptoms has been interpreted as progress in postoperative recovery. The anaesthesiology literature includes many studies directed at prevention [20] and treatment of postoperative symptoms. Pain management techniques [51, 98], pharmacological therapies [27, 40, 73], multimodal anaesthetic regimes [55], and strategies for postoperative nausea and vomiting [127] have been studied in an effort to facilitate recovery. Complementary methods such as music interventions and relaxation techniques have also been studied in attempting to reduce postoperative pain and anxiety, and thereby ease the recovery process. Relaxation interventions have been shown to reduce pain at rest after hip and knee replacement [109]. Half of the studies in a systematic review of music interventions after a variety of surgical procedures demonstrated that such interventions had positive effects on reducing patients' anxiety and pain [91]. The incidence of postoperative complications is also an important clinical endpoint in postoperative recovery studies. Outcome measures such as wound infections, abscesses, myocardial infarction, thrombosis, pneumonia, and mortality within 30 days postoperatively have been studied, e.g. in a systematic review of studies comparing early nutrition within 24 hours of colorectal surgery versus a later start in feeding. The results supported early commencement of feeding [6].

This research direction, i.e. using postoperative recovery as an outcome measure for clinical endpoints, has been of substantial value in increasing our knowledge of biomedical issues. However, few studies have examined patient-reported outcomes such as patient preferences and issues related to wellbeing [73].

Patient experiences of postoperative recovery

In general, qualitative studies have placed more emphasis on postoperative recovery as a part of the patient experience related to a specific disease or injury than on the recovery itself. A study of patient experiences after gastrointestinal cancer surgery described recovery as a mixture of feelings between hope and doubt, and a will to break free from the consequences of the disease and treatment [94]. A study

of men's experiences during recovery after radical prostatectomy described adjustments in the weeks after discharge as being the worst aspect of the prostatectomy experience [19]. This was attributed to using a urinary catheter and its negative effects on the lives of these men. Patients recovering from coronary artery bypass grafting distinguished between the recovery from heart surgery specifically and recovery in general [30]. Elderly people who had undergone hip or knee replacement surgery described feelings of becoming familiar with their body and the importance of being able to trust it during the recovery period [41]. Patients recovering from ligament reconstruction described feelings of frustration and loss of self-esteem as they realized that their preoperative goal to reach complete recovery within a specific timeframe would not be attained [46].

Although this research direction has been of substantial value in increasing our knowledge of specific postoperative recovery situations, too few studies have examined and defined postoperative recovery as a concept in its own right.

Health status measurement

The act of measurement is a fundamental part of scientific research, irrespective of scientific discipline. As a formal discipline, health status measurement has been advancing for nearly three decades. It has become internationally established through the efforts of individual instrument developers and research teams supported by different organizations and public-sector agencies [108]. This development work has been preceded by an increased awareness of the impact of health and health care on the quality of life. As a consequence, the healthcare sciences are now increasingly concerned with evaluating patient-reported outcomes (PROs), e.g. patient preferences or functioning, wellbeing, patient satisfaction, and perceived health-related quality of life. Researchers have access to a wide range of generic, self-assessed health instruments, e.g. the SF-36 health survey, the Sickness Impact Profile, the Health Utilities Index, the Quality of Life Index, and the EuroQol Instrument [24, 45]. PROs include any outcome evaluation generated directly by the affected person through interviews, self-completed questionnaires, diaries, or other data collection tools. Compared to clinical outcomes, which remain the primary endpoints for most clinical trials, PROs often carry more meaning for those affected by an intervention [96].

Development of measurement instruments

Research directed towards measuring subjective experiences, previously thought to be immeasurable, requires methods having a sound scientific base. Qualitative outcome variables are often measured by means of different types of rating scales and questionnaires [113]. An essential aspect of developing a measurement instrument is to conceptualize the underlying theoretical framework, which constitutes the basis for an operationalization process. During this process, attributes or activities that are possible to record are recognized [118]. Dimensions and subdimensions of the concept being studied are identified, and items for all dimensions are generated and formulated into a set of questions [75]. Different instruments, however, vary widely in their methods of development, content, extensiveness of use, and quality. Quality criteria are needed to systematically deter-

mine the methodological quality of studies addressing the development and evaluation of health status questionnaires.

The Medical Outcomes Trust [108] is an organization that promotes the use of outcome measures. Two decades ago, this organization was commissioned to support research and application of outcome assessment, with an emphasis on expanding the use of questionnaires designed to assess healthcare outcomes from the patients' point of view. As a part of this work, the Scientific Advisory Committee (SAC) was organized to review instruments and assess their suitability for distribution by the Medical Outcome Trust. SAC defined eight attributes of instrument properties (conceptual and measurement model, reliability, validity, responsiveness, interpretability, respondent and administrative burden, alternative forms, and cultural and language adaptations) to be used in the evaluation. Other researchers have defined similar, but less comprehensive, quality criteria [7, 35]. The instrument attributes defined by SAC formed the groundwork in attempting to explicitly define quality criteria for the measurement properties of health status questionnaires. Apart from evaluation of validity and reliability, a clear description of measurement aims (discriminative, evaluative, predictive), target population, the concept of interest (theoretical framework), item selection, item reduction, and the workload required from respondents to complete the questionnaire should be provided when developing a new questionnaire [123].

Different types of measurement instruments

A distinction is drawn between general and specific instruments [96]. General instruments measure the range of a subject without focusing on specific areas and are developed for use across a wide variety of populations. Specific instruments, however, are developed for application to conditions, diseases, or populations. The type of measurement instruments also varies from single rating scales to multi-item questionnaires. A concept could incorporate different dimensions. When the items cover different aspects of the same dimension the instrument is considered to be uni-dimensional, while a multi-dimensional instrument covers different dimensions concerning the same concept. Multi-item measurements can be used to reflect different aspects of the same concept, or to identify the most important sign of a certain status. Furthermore, multi-dimensional, multi-item instruments can be used to measure a concept at three different levels; a discrete item level, a dimensional level, and a global level. Data from each level provide an integrated description of the status of the individual. However, the global scores of the concept are important for evaluating treatment effects and making decisions on methods of treatment or care for specific groups of patients [118].

Measurement process

Measuring clinical progress allows clinicians to evaluate the effectiveness of treatment procedures applied to patients. Health status measures can be used to discriminate between individuals or groups, to evaluate change over time, or to predict outcomes or prognoses [63]. Measurements can be performed by experts applying objective instruments, or by affected persons using self-rating scales or questionnaires. Irrespective of the information source, however, all judgements are subjective [118]. The ratings often produce ordered categorical data from a scale with a number of ordered response alternatives [83], e.g. a verbal descriptive scale

(VDS) and a numerical rating scale (NRS) [80], or by a visual analogue scale (VAS) [36]. Irrespective of the type of scaling, the responses indicate only an ordered structure and not a mathematical value [83].

Postoperative recovery-specific questionnaires

In considering the quality of recovery, emphasis has been placed on the importance of evaluating postoperative recovery from the patient's perspective [73]. Several instruments are available to assess and evaluate postoperative recovery. Assessment of aims, dimensions of recovery, and number of items [Table 1] vary, as does the development process [Table 2]. The most frequently cited, and used, recovery-specific instruments are the Quality of Recovery (QoR) [88], the Quality of Recovery-40 (QoR-40) [90], and the Aldrete Score [2, 4]. A variety of studies [17, 52, 71, 72, 87, 92] have used QoR-40 to assess the quality of recovery from one to 90 days after surgery. The QoR has also been used in different outcome studies [31, 44, 68, 89, 136], but these studies assess quality of recovery from one to 30 days after surgery. Over the past three decades, countless studies and clinical assessments of patients in post-anaesthesia care units have used the Aldrete Score.

Recovery assessments distinguish general recovery instruments and more disease-specific instruments. Some of the instruments are used for specific surgical procedures, e.g. gynaecological laparoscopic surgery [49] and nephrectomy [95]. As mentioned above, disease-specific instruments might not comprehensively sample all aspects of recovery across other types of surgical procedures, while general postoperative recovery instruments can be used in a wide range of surgery studies. Awareness of the need to use valid measurement instruments has focused attention on the importance of relevant measurement properties. A systematic review of general postoperative, recovery-specific questionnaires and their measurement properties reported that no fully validated questionnaire was available [66]. However, two instruments – the Post Discharge Surgical Recovery scale [64] and the QoR-40 [90] – were considered to be superior. A review of recovery outcome measurements after ambulatory surgery [47] reported that only the QoR-40 [90] fulfilled all predefined criteria, although it was not specifically developed for ambulatory surgery.

The instruments identified have been developed to measure important aspects of postoperative recovery, but are restricted mainly to the early and intermediate phases of recovery. An extensive search did not uncover any easy-to-use, multidimensional instrument based on a well-defined theoretical framework and constructed to evaluate the progress of postoperative recovery and long-term follow-up of recovery profiles.

Table 1. Characteristics of instruments developed to assess postoperative recovery.

Instrument Author, year	Dimensions/Domains	Number of items	Assessment performed by	Time to complete	Assessment aim
Apgar score for surgery Gawande et al, 2007 [38]	Blood loss, heart rate, blood pressure	3	Staff		To grade the condition of patients at the end of general or vascular surgery
Biophysical health problems questionnaire Susilahti et al, 2004 [115]	Pain, upper gastrointestinal distress, fatigue, elimination, wound healing	27	Patient self reporting		To describe ambulatory patients' perceptions of recovery after discharge.
Surgical Recovery Index (SRI) Talami et al, 2004 [122]	Pain, overall health after operation, resumption of activities	24	Patient self reporting		To assess recovery after surgery (comparison of different surgical techniques)
Home recovery log Horvath, 2003 [49]	Pain, fatigue, function (NRS, Rhoten fatigue scale, Katz ADL index)	10	Patient self reporting		To assess recovery after ambulatory surgery (comparison of different surgical techniques)
Post-anaesthesia Short-term Quality of Life (PASQOL) Oakes et al, 2002 [93]	Physical, psychological, role function	20	Patient self reporting		To assess HRQOL specifically related to the anaesthesia experience after ambulatory surgery
Postoperative Recovery Scale (PRS) Pace et al, 2002 [95]	Pain, ADL, HRQOL	21–31	Patient self reporting		To assess HRQOL during recovery from nephrectomy
24-Hour Functional Ability Questionnaire (24hFAQ) Hogue et al, 2000 [48]	Preoperative expectations about pain, vomiting, nausea, reduced alertness, measure of occurrence of the symptoms, patient satisfaction.	16	Patient self reporting		To assess the ability to return to normal functioning after ambulatory surgery.
Post-discharge Surgical Recovery scale (PSR) Kleinbeck, 2000 [64]	Health status, activity, expectations, fatigue, work ability	15	Patient self reporting	7 min	To assess recovery after ambulatory surgery

Instrument Author, year	Dimensions/Domains	Number of items	Assessment performed by	Time to complete	Assessment aim
Quality of Recovery-40 (QoR-40) Myles et al, 2000 [90]	Emotional state, physical comfort, psychological support, physical independence, pain	40	Patient self reporting	6 min	To assess quality of recovery after anaesthesia and surgery
Postoperative symptoms diary Young et al, 2000 [137]	Symptom measurement scale, symptom management index, discharge information, demographic information	9	Patient self reporting		To assess recovery after ambulatory surgery
Quality of Recovery score (QoR) Myles et al, 1999 [88]	Emotional state, physical comfort, psychological support, physical independence, pain	9	Patient self reporting	4 min	To assess quality of recovery after anaesthesia and surgery (audit for QA pur-poses)
Post-anaesthesia Recovery Score for Ambulatory Patients (PARSAP) Aldrete, 1995, 1998 [2, 3]	Activity, respiration, circulation, consciousness, saturation, dressing, pain, ambulation	10	Staff		To assess recovery from anaesthesia after ambulatory surgery (criteria for street fitness and discharge).
Post-anaesthesia Discharge Scoring System (PADSS) Chung, 1993, 1995 [22, 23]	Vital signs, activity and mental status, pain, PONV, surgical bleeding, intake, output	5	Staff		To assess home-readiness after ambulatory surgery.
Functional status index MacKenzie et al, 1986 [76]	Baseline, transition (assessment of physical, mental and emotional outcomes)	18	Patient self reporting		To assess changes in individual patients physical, mental, and emotional functions after surgery
Post-anaesthesia Recovery Score (PARS) Aldrete & Kroulik, 1970 [4]	Activity, respiration, circulation, consciousness, colour	5	Staff		To assess physical status during PACU stay after surgery
Recovery inventory Wolfer & Davis, 1970 [134]	Physical conditions	9	Patient self reporting		To assess patients' welfare in terms of physical condition after surgery

NRS = Numerical Rating Scale, HRQOL = Health Related Quality of Life, QA = Quality Assurance, PONV = Postoperative Nausea and Vomiting, PACU = Post-Anesthesia Care Unit

Table 2. Postoperative recovery-specific instruments – summary of the development process.

Instrument Author, year	Study population	IGP* described	Validation methods	Reliability methods	Instrument available**
Apgar score for surgery Gawande et al, 2007 [38]	General and vascular surgery n= 869	Yes	Content validity		Yes
Biophysical health problems questionnaire Susilahti et al, 2004 [115]	Mixed ambulatory/ short-stay surgery n=107	Yes	Content and construct validity	Internal consistency	No
Surgical Recovery Index (SRI) Talami et al, 2004 [122]	Mixed laparoscopic /open surgery n=149	Yes	Content and construct validity	Internal consistency	No
Home recovery log Horvath, 2003 [49]	Gynaecologic ambulatory laparo-scopic surgery n=91			Internal consistency (for total scale)	Yes
Post-anaesthesia Short-term Quality of Life (PASQOL) Oakes et al, 2002 [93]	Mixed ambulatory surgery n=46	Yes	Content and construct validity	Internal consistency	No
Postoperative Recovery Scale (PRS) Pace et al, 2002 [95]	Laparoscopic/ open nephrectomy n=71			Test-retest Internal consistency	Yes
24-Hour Functional Ability Questionnaire (24hFAQ) Hogue et al, 2000 [48]	Mixed ambulatory surgery n=2438	Yes	Content and construct validity		Yes
Post-discharge Surgical Recovery Scale (PSR) Kleinbeck, 2000 [64]	Mixed ambulatory surgery n=230	Yes	Content and concurrent validity	Internal consistency	Yes

Instrument Author, year	Study population	IGP* described	Validation methods	Reliability methods	Instrument available**
Quality of recovery-40 (QoR-40) Myles et al, 2000 [90]	Mixed ambulatory/ inpatient surgery *n*=160	Yes	Convergent and construct validity	Test-retest Internal consistency Split-half reliability	Yes
Postoperative symptoms diary Young et al, 2000 [137]	Mixed ambulatory surgery *n*=225	Yes	Face validity	Internal consistency	Yes
Quality of Recovery score (QoR), Myles et al, 1999 [88]	Mixed ambulatory/inpatient surgery *n*=449	Yes	Content, convergent and construct validity	Test-retest Inter-rater agreement Split-half reliability Internal consistency	Yes
Post-anaesthesia Recovery Score for Ambulatory Patients (PARSAP) Aldrete, 1995, 1998 [2, 3]	Mixed anaesthetic techniques, mixed ambulatory surgery *n*=750				Yes
Post-anaesthesia Discharge Scoring System (PADSS) Chung, 1993, 1995 [22, 23]	Mixed ambulatory surgery, mixed general anaesthesia *n*=247		Concurrent validity	Internal consistency	Yes
Functional status index MacKenzie et al, 1986 [76]	Surgical and internal medicine patients *n*= 83	Yes	Construct validity	Interviewer agreement	Yes
Post-anaesthesia Recovery Score (PARS) Aldrete & Kroulik, 1970 [4]	Mixed inpatient surgery, mixed anaesthetic techniques *n*=352				Yes
Recovery inventory Wolfer & Davis, 1970 [134]	Mixed inpatient surgery *n*=141				Yes

* IGP = Item generation process, ** A complete list of items or a copy of the instrument is available in the article

Postoperative recovery profiles

The *Merriam-Webster Online Medical Dictionary* defines "profile" as: "a graphic representation of the extent to which an individual or group exhibits traits as determined by tests or ratings" [84]. In clinical trials, profiles are appropriate in comprehensively evaluating the intended main effects of different interventions [96]. Studies have used the recovery profile concept to compare recovery characteristics between groups given different interventions, e.g. different inhalation anaesthetic drugs [57], different anaesthesia techniques [42, 79], or different information regarding recovery [99]. The profile has also been used in evaluating a multi-modal anaesthetic regime [55] and different methods of cerebral monitoring during anaesthesia [131]. The recovery characteristics used in these studies have included: decreased symptoms such as pain, nausea, vomiting, fatigue, and anxiety; home readiness and reduced time to discharge from the post-anaesthesia care unit; and reduced incidence of agitation, dizziness, and nightmares. Recovery profiles can be studied on an intra-patient level, involving ratings from each item in a questionnaire, or on a group level, estimating a global population-based profile of recovery.

RATIONALES FOR THE THESIS

Although the concept postoperative recovery is commonly used in the research literature it is difficult to identify a standard definition. Deeper insight into the meaning of recovery is needed to avoid the risk of using the concept inappropriately. Descriptions of subjective experiences and the course of events during recovery should highlight the concerns of prime importance to patients during this period. The literature is lacking in research that measures patient-reported outcomes as primary endpoints in recovery studies.

A valid and reliable measurement instrument can be used to study the impact of different methods, e.g. surgical techniques, nursing and physiotherapist interventions, or accelerated recovery programmes, on outcomes of real interest to patients. Increased knowledge of postoperative recovery profiles should be of value to clinicians in developing clinical guidelines for postoperative care, information for patients and families, and discharge planning protocols.

Hence, there is a need for an easy-to-use, multi-dimensional instrument that allows for self-assessment of the progress of general postoperative recovery in a short- and long-term perspective.

AIMS OF THE THESIS

The comprehensive aim of this thesis was to develop a discriminative and evaluative instrument for self-assessment of progress in general postoperative recovery, as presented in four studies with the following specific aims:

I To present a concept analysis of the postoperative recovery phenomenon.

II To describe patient and staff experiences of patient recovery after surgery.

III To develop a multi-dimensional questionnaire to measure patient-reported postoperative recovery and evaluate its content validity and intra-patient reliability.

IV To further evaluate the Postoperative Recovery Profile (PRP) questionnaire regarding the construct validity and its ability to discriminate recovery profiles between different groups.

To investigate the item variables that patients considered most important during the progress of postoperative recovery.

Table 3 presents an overview of the papers.

Table 3. Overview of the papers

Study	Aim	Design / Data collection	Subjects	Method and analysis
I	To present a concept analysis of the postoperative recovery phenomenon	Theoretical study / Literature review		Walker & Avant's concept analysis approach
II	To describe patient and staff experiences of patient recovery after surgery	Qualitative descriptive / Individual interviews Focus group interviews	Patients (*n*=10) 7 groups: patients, *n*=4, RNs surgical/gynaecological ward, *n*=6+6, RNs primary care, *n*=4+4, surgeons, *n*=4+4 Total, *n*=42	Qualitative content analysis
III	To develop a multi-dimensional questionnaire to measure patient-reported postoperative recovery, and evaluate its content validity and intrapatient reliability	Quantitative evaluative / Questionnaire	Content validity: patients, *n*=16, staff, *n*=15; 8 RN, 7 surgeons Test run: patients, *n*=15 Reliability: patients, *n*=25 Total, *n*=71	Dimensions and items generated from Study I and Study II. Supportive literature. Content validity: expert judgements / descriptive analysis Test run: direct feedback from patients / descriptive analysis Reliability: test-retest / measurement of systematic and occasional disagreement
IV	To further evaluate the Postoperative Recovery Profile (PRP) questionnaire regarding its construct validity and ability to discriminate recovery profiles between different groups To investigate the item variables that patients considered most important	Longitudinal, prospective / Questionnaire	Construct validity: patients *n*=120 Ability to discriminate between groups: patients *n*=158 Most important items: patients *n*=158 Total, *n*=158	Construct validity: a rank-based statistical method for evaluation of paired ordered categorical data Ability to discriminate: Kaplan-Meir curve Most important items: rank ordering / descriptive analysis

RN= Registered nurse

METHODS AND RESULTS

The different specific aims of the four studies were dependent on each other in the meaning that the result from the first study provided the foundation for the second study and so on. To facilitate the understanding of the development of the instrument, and the thesis, the methods and results from each study are presented together.

Study I

Concept analysis intends to clarify over-used or vague concepts that are prevalent in health care practice. The purpose of concept analysis is to examine the structure and function of a concept [129], in this case postoperative recovery.

Procedure (I)

Walker and Avant's concept analysis approach was used to examine the basic elements of postoperative recovery [129]. The MEDLINE and CINAHL databases were searched for English language papers published from 1982 to October 2005 containing the following search terms: *concept analysis*, *recovery*, *anaesthesia*, *post surgical*, *postoperative*, *recovery process*, *post discharge*, *convalescence*, and *rehabilitation* used separately or in combination. Reference lists of all retrieved articles were searched for additional studies. Papers included in the analysis described and highlighted the phenomenon of postoperative recovery, i.e. the meaning of recovery. Some papers were excluded, e.g. intervention and descriptive studies that used postoperative recovery as an outcome measure for various symptoms. Dictionaries and textbooks were also searched for a definition of the concept. Twenty-six publications, one textbook, and two dictionaries were used in the analysis. The concept analysis involved different steps in defining, e.g. the characteristics that were most frequently associated with postoperative recovery, the beginning and the end of postoperative recovery, and empirical referents [129].

Results (I)

Information found in dictionaries defined recovery as "the return to normal health of somebody who has been ill or injured, the return of something to a normal or improved state after a setback or loss, the regaining of something lost or taken away" [33]. Thesaurus-listed synonyms for recovery include recoup, salvage, return, convalescence, and cure [135]. In papers describing and highlighting the meaning of postoperative recovery, the defining characteristics most frequently associated with postoperative recovery were: (a) an energy-requiring process, (b) a return to a state of normality and wholeness defined by comparative standards, (c) regaining control over physical, psychological, social, and habitual functions, (d) returning to preoperative levels of independency/dependency in activities of daily living, and (e) regaining one's optimum level of wellbeing. Furthermore, four recovery dimensions emerged from the literature. A *physical* dimension included improvement of functional status, normalized and controlled bodily functions, loss of pain and fatigue, and conservation of energy. In a *psychological* dimension, patients returned to psychological wellbeing and wholeness, reinstated integrity, shifted from illness to health, experienced loss of depression, anger,

anxiety, fatigue and passivity, and experienced pressures and cues. In a *social* dimension, patients strived to become independent and to stabilize at full social function. Finally, a *habitual* dimension was identified that included stabilizing the full range of activities by taking responsibility for and controlling activities in daily care, normal eating and drinking habits, and return to work and driving.

The concept analysis also produced the following theoretical definition: Postoperative recovery is an energy-requiring process of returning to normality and wholeness as defined by comparative standards. This is achieved by regaining control over physical, psychological, social, and habitual functions, which results in returning to preoperative levels of independence/dependence in activities of daily living and an optimum level of psychological wellbeing.

Study II

In this study patient and staff experiences of patient recovery after surgery were described.

Subjects (II)

Ten patients (5 women and 5 men aged 34 to 76 years) who had undergone abdominal or gynaecological surgery participated in individual interviews three weeks to one year post-surgery. In addition to these interviews, seven focus group interviews were conducted; one with a group of in-patients from a gynaecological ward (4 women aged 43 to 52 years), two with groups of registered nurses from surgical and gynaecological wards (n = 6 + 6; 11 women and 1 man aged 27 to 52 years), two with groups of registered nurses from primary care centres (n = 4 + 4; 8 women aged 39 to 61 years), and two with groups of surgeons from surgical and gynaecological departments (n = 4 + 4; 4 women and 3 men aged 40 to 56 years). Nurses had to have a minimum of six months experience in surgical, gynaecological, or primary health care, and physicians had to be specialized in surgery or gynaecology.

Procedure (II)

In the individual interviews, the participants were asked to describe their experiences from the day of the surgery until the day of the interview. The main question (formulated grammatically as a command) was: "Tell me what it has been like to recover from surgery". Follow-up questions were asked to develop or clarify the narrative further. All interviews were audio taped in the participant's home (n = 4), or in a hospital room (n = 6), depending on the participant's preference. Interviews lasted between 25 and 60 minutes. In the focus group interviews, an interview guide with open-ended questions was used so the moderator could identify topics that had not been discussed and thereby direct participant dialogue to explore these topics. The group discussion was initiated by calling on participants to: "Tell me what it is like for patients to recover from surgery". To help clarify the topic, it was further explored by repeatedly formulating similar questions from slightly different perspectives. The assistant moderator made notes and observed the group dynamics. After each interview the moderator and the assistant moderator discussed their impressions and experiences. The interviews lasted

between 60 and 90 minutes, and were audio taped in secluded rooms at the hospital.

Data were analysed inductively using the principles of conventional qualitative content analysis [50] and carried out in several steps, including the identification of meaning units, codes, categories, and the formulation of an overall theme [39]. Throughout the analysis process there was constant back-and-forth movement between different parts of the text.

Results (II)

Patients and staff described postoperative recovery as an extended process where individuals were striving to gain independence and return to everyday life. In this context, everyday life was defined as the initial condition before surgery. This everyday life was interrupted by the surgical procedure and by the recovery process, which started immediately after surgery. Returning to everyday life after the recovery process did not always lead to a life comparable to the life before surgery.

Pain and nausea were experienced as uncomfortable and considered to complicate the mobilization process. Also, constipation and diarrhoea were problematic symptoms experienced as extremely uncomfortable. Fatigue occurred mainly after participants had returned to regular activities and work. Issues such as wound, drainage and different types of tubes caused anxiety and fear during hospitalization. Most emotional reactions appeared, however, during a later recovery phase when the physical condition was under control. Attention from family and friends could decrease over time to the point where patients felt abandoned.

The regaining of functions was more like a passive course of events that was out of the individual's control, whereas re-establishing activities entailed conscious acts. Regaining functions was described as a prerequisite to re-establishing preoperative activities. During hospitalization this mainly included basic functions such as urination, bowel function, and intake of fluid and food. After discharge, the descriptions related more to regaining muscle strength that enabled patients to engage in exercise and outdoor activities. Regaining social functions, such as returning to the role of parent, spouse, or workmate was emphasized. For some individuals, the recovery process led to improved functioning. Other patients never fully regained their preoperative functions. The re-establishment of activities had to be adjusted to coincide with the patients' actual capacity. During hospitalization, this mainly involved the areas of mobilization, toileting, and personal hygiene. After hospital discharge, other activities were performed, starting with indoor activities. Regaining functions and re-establishing activities took place over an extended period that involved successive weaning from dependency on the support of others.

Several factors were described as important in influencing recovery. The importance of being discharged when individuals felt ready to return home was stressed, as was having the option of taking sick leave. During hospitalization, support came mainly from staff members. After discharge, encouragement and support came chiefly from family, friends, and colleagues. Staff members were

reported to have limited experience with the later phase of postoperative recovery. The possibility of maintaining contact with healthcare providers was considered important to patients' inner sense of security after discharge. The recovery process took place in different environments. In hospital, patients were allowed to identify themselves as being ill, which made it easier to get the peace and quiet needed for recovery. However, others considered the hospital as a place where it could be difficult to relax. Adequate information, given according to individual needs and the person's ability to understand, was thought to be of utmost importance for successful postoperative recovery.

Study III

In this study a multi-dimensional questionnaire to measure patient-reported postoperative recovery was developed, its content validity and intra-patient reliability was evaluated.

Subjects (III)

Staff members and patients participated as key informants in judging the relevance of the identified items. Staff members were selected on the basis of their area of responsibility, interest, and experience regarding patients' postoperative recovery. In selecting patients, a purposeful sampling [97] was used to identify respondents according to type of surgery, gender, and age. Different sample groups were used in different parts of the study (Table 4).

Table 4. Participant demographics in Study III

Participants	**Content validity**			**Test run**	**Test-retest reliability**
	Patients (n=16)	Registered Nurses (n=8)	Surgeons (n=7)	Patients (n=15)	Patients (n=25)
Female	9	7	2	7	13
Male	7	1	5	8	12
Age (years)					
Median	62			62	61
Range	18-76			21-86	18-78
General surgery	6	2	1	3	8
Gynaecology	2	2	2	2	4
Orthopaedic	5	2	2	6	11
Urology	3	2	2	4	2

Procedures and results (III)

Development of the instrument involved four steps. The procedure and result of each step are presented separately.

Conceptualization and item definitions: The operationalization process included the theoretical framework and identifying measurable indicators [119] of postoperative recovery. Dimensions and potential items for the questionnaire were generated from the concept analysis (I) and from patient and staff descriptions of patient postoperative recovery (II). Current literature was also used to illustrate each item.

Five dimensions and 19 items were identified as being part of the operationalization process of the postoperative recovery concept (Figure 1). Table 5 presents rationale for each item.

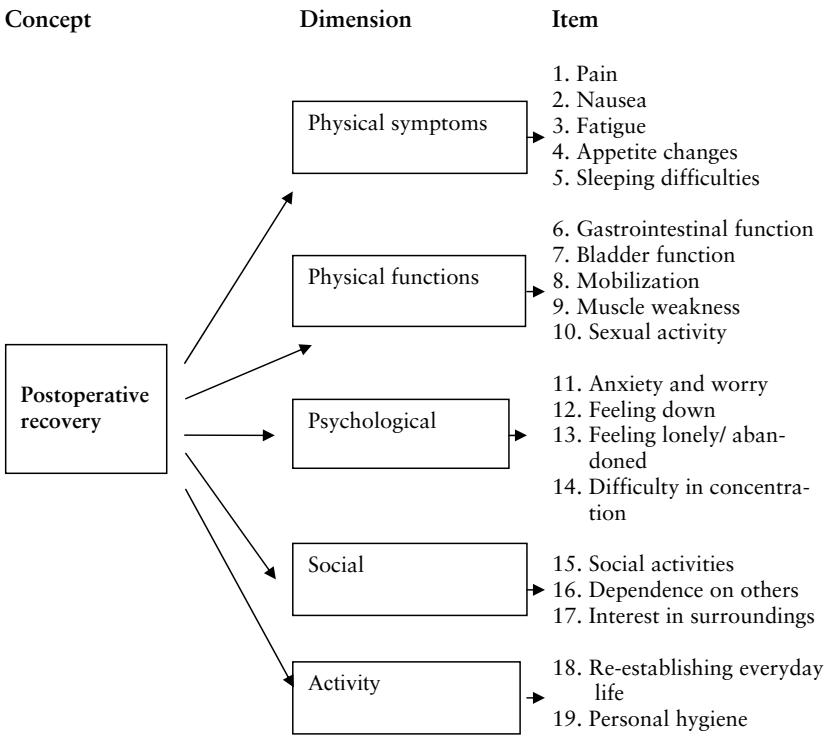

Figure1. Diagram of operationalization of postoperative recovery

From Allvin R, Ehnfors M, Rawal N, Svensson E, Idvall E. Development of a questionnaire to measure patient-reported postoperative recovery: content validity and intrapatient reliability. *Journal of Evaluation in Clinical Practice 2009*; 15: 411-19.

Table 5. Items and rationale

Item	Rationale*
Pain	Pain is a commonly reported symptom after surgery. Effective pain relief is a prerequisite for postoperative recovery and convalescence [21, 29, 136, 138].
Postoperative nausea and vomiting (PONV)	PONV is considered to be a major problem and an inconvenience after surgery. Avoiding PONV is a key concern for postoperative patients [28, 126, 132, 136].
Fatigue	Postoperative fatigue is common and remains for a longer period after surgery. Fatigue has a negative influence on the recovery process [26, 106, 128, 138].
Appetite changes	Problems with eating have been reported during the first days after surgery [13, 25].
Sleeping difficulties	Reduced or fragmented sleep is a prevalent symptom during postoperative recovery [102, 132].
Gastrointestinal function	Resuming normal functioning of the digestive system is reported to be troublesome. Bowel dysfunction can delay recovery and nutritional intake [59, 128].
Bladder function	Having a urinary catheter is reported to absorb energy. Urine leakage and incontinence cause frustration [19].
Mobilization	Efforts should be made to enforce postoperative mobilization. Bed rest increases muscle loss and weakness. Being mobilized is part of re-establishing activities in the early recovery phase [9, 25, 60].
Muscle weakness	Postoperative muscle atrophy plays an important role in postoperative fatigue and in overall recovery. It takes time to regain the preoperative level of muscle strength [58, 60].
Sexual activity	Patient's express worries about the impact of the surgery on sex life [19, 105, 128].
Anxiety and worry	Patient experiences anxiety after surgery. Anxiety has an impact on the experience of pain [21].
Feeling down	Depression is reported during the later recovery phase. Depression is related to patient's self-perception of recovery and functional status. Depression is implicated in the experience of pain [21, 138].
Feeling lonely/abandoned	Patients report feelings of being left on their own [94].
Difficulty in concentration	Decreased concentration level has been reported during the first postoperative days. Postoperative cognitive dysfunction exists for a longer period after surgery [1, 43, 85].
Social activities	Being able to communicate and spend time with family and friends is a part of regaining preoperative social functions [13, 62].
Dependence on others	Regaining independence is a key factor in postoperative recovery [9, 25].
Interest in surroundings	Taking part of events in the surroundings is a part of regaining preoperative social functions
Re-establishing everyday life	Going back to work, domestic work and/or leisure activities are a part of re-establishing everyday life after surgery[13].
Personal hygiene	Taking care of personal hygiene is a part of re-establishing activities during the early recovery phase [9].

*Based on the result from Study I and II, supported by literature which has been limited to maximum four papers per item

Content validity of items: Content validity concerns the degree to which a sample of items constitutes an adequate operational definition of a concept [97]. Fifteen staff members (8 registered nurses, 7 surgeons) and 16 patients participated as key informants, systematically judging the relevance and usefulness of the items [97]. Participants were informed about the purpose of the questionnaire and the intent to use it for repeated measurements during the recovery process. The participants were asked to assess whether the items seemed to cover essential aspects of the postoperative recovery process by choosing one of the response alternatives: *strongly disagree, disagree, uncertain, agree,* or *strongly agree*. Data were analysed through a descriptive evaluation with frequency and range.

On average, 85% (range 71% to 97%) of the participants chose the alternatives strongly agree/agree in their assessments of 18 items (out of 19), and thereby considered them essential in the postoperative recovery process. One item (*interest in surroundings*) was considered to be essential by 52% participants. Seven staff participants made one or more comments, each concerning the following items: *sexual activity*, *muscle weakness*, *feeling lonely/abandoned*, *dependence on others*, *social activities*, *difficulty in concentration,* and *interest in surroundings*. These seven participants reported having limited or no experience regarding these items during the part of the recovery process that they could observe during hospitalization. At this stage in the process it was decided to retain all items in the questionnaire.

Test run of the questionnaire: Fifteen patients were asked to fill in a draft of the questionnaire on day two or three after surgery and to document the time it took. We wanted to know whether; a) the items were realistic to carry out, b) the layout was easy to use, and c) the workload required was acceptable. Data were analysed through descriptive evaluation.

Fourteen of 15 patients considered the questionnaire to be easy to complete. Seven participants suggested revising the layout to avoid misunderstanding. Five participants considered the items on *sexual activity* and *re-establishing everyday life* to be irrelevant during hospitalization. Since the questionnaire is intended for longitudinal use during the recovery process, these items will be transferred to the follow-up assessments after discharge from hospital. Participants needed nine minutes (range 6 to15 min) to complete the questionnaire. After scrutinizing the data from the test run, the questionnaire was revised and its layout was refined.

Evaluation of reliability: To evaluate the stability of the instrument in test-retest assessments, 25 patients participated in the intra-patient reliability study that was performed three to four days after surgery. Based on the results in step three, two items (*sexual activity* and *re-establishing everyday life*) were excluded. The postoperative recovery questionnaire was administered twice. The first assessment was conducted in the morning and the second in the afternoon. This time interval was considered to be sufficient [97]. Participants were not informed in advance about the retest assessment.

Percentage agreement (PA) was calculated in analysing intra-patient reliability. The level of disagreement was explained in terms of systematic disagreement

(bias) in common for the group of patients and additional individual variability when present [116, 120]. Disagreement in position of the scale assessments between the two assessments was calculated, i.e. relative position (RP) and relative concentration (RC), which measures systematic disagreement in how the assessments were concentrated on the scale in the two assessments. Possible values range from –1 to 1. Zero values for RP and RC indicate a lack of systematic disagreement in position and in concentration, respectively. The RP value expresses the difference between the proportions of overestimated and underestimated retest assessments when compared with the first test. Hence, a positive RP value indicates that the group has used higher categories on the second occasion than on the first. When central categories tend to get higher proportions of assessments on the second than on the first occasion, the RC value is positive. The relative rank variance (RV) is a measure of additional individual variability that cannot be explained by the measures of systematic disagreement. Non-zero RV indicates the presence of individual variability, and the higher the RV value the more dispersed the test-retest assessments, which is a sign of uncertainty in interpreting the items. The measures and the 95% confidence intervals (CI) of the measures were calculated by means of an open software programme www.oru.se/esi/svensson. Statistically significant RP, RC, and RV values on at least a 5% level are indicated by 95% CI that do not cover zero values.

Table 6 presents the results of the measures of agreement and also systematic and occasional disagreement. PA measures ranged from 72% to 100%, which means that at least 18 of 25 patients were completely stable in their test-retest assessments. The RV values of occasional disagreement were negligible, except for *dependence on others*. The observed disagreement could be explained mainly by systematic disagreement. The highest levels of systematic disagreement in position (RP) were found in the test-retest assessments of *sleeping difficulties*, *muscle weakness,* and *dependence on others*. The concentration in paired assessments of *pain* and *sleeping difficulties* on the two occasions differed systematically, RC – 0.12 and 0.22 respectively. This difference in the concentration of scale categories explains the observed disagreement in the test-retest assessments by seven (28%) of the patients.

Disagreement in the assessment of *muscle weakness* could be explained mainly by the negative RP value, indicating that the patients tended to use higher categorical levels on the first than on the second occasion. The opposite holds for the test-retest assessments of *dependence on others* and *sleeping difficulties* with positive RP values. Regarding *sleeping difficulties*, the assessments again tended to concentrate more on the first than on the second occasion, RC = 0.22. In most items the 95% CI covered zero value asymmetrically, due to the small number of patients.

Table 6. Results from test-retest analysis, displayed by percentage agreement (PA) (number of participants), relative position (RP), relative concentration (RC) and relative rank variance (RV). Figures in parentheses are 95% confidence intervals (CI) of the measures

Item	PA % (n)	RP (95% CI)	RC (95% CI)	RV (95% CI)
Pain	88 (25)	-0.03 (0.12 to 0.07)	-0.12 (-0.25 to 0.01)	
Nausea	100 (24)			
Fatigue	84 (25)	0.08 (-0.05 to 0.22)	0,07 (-0.10 to 0.24)	0.05 (0 to 0.16)
Appetite changes	72 (25)	-0.06 (-0.16 to 0.06)	-0.12 (-0.30 to 0.06)	
Sleeping difficulties	80 (25)	0.14 (0.009 to 0.27)	0.22 (0.034 to 0.40)	0.01 (0 to 0.04)
Gastrointestinal function	84 (25)			0.0015 (0 to 0.004)
Bladder function	96 (25)	-0.002 (-0.005 to 0.003)		
Mobilization	80 (25)	0.07 (0.01 to 0.15)	0.03 (-0.12 to 0.18)	0.001 (0 to 0.003)
Muscle weakness	80 (25)	-0.12 (-0.26 to 0.02)	-0.03 (-0.19 to 0.25)	0.03 (0 to 0.50)
Anxiety and worry	92 (25)	0.08 (-0.02 to 0.18)		
Feeling down	100 (25)			
Feeling lonely/abandoned	96 (24)	-0.04 (-0.12 to 0.04)		
Difficulty in concentration	92 (25)			0.0008 (0 to 0.002)
Social activities	92 (25)	-0.02 (-0.05 to 0.01)	-0.10 (-0.22 to 0.03)	
Dependence on others	80 (25)	0.22 (0.04 to 0.40)	-0.06 (-0.22 to 0.10)	0.13 (0 to 0.31)
Interest in surroundings	100 (25)			
Personal hygiene	84 (25)	0.03 (-0.10 to 0.15)	-0.06 (-0.18 to 0.05)	0.002 (0 to 0.008)

From Allvin R, Ehnfors M, Rawal N, Svensson E, Idvall E. Development of a questionnaire to measure patient-reported postoperative recovery: content validity and intra-patient reliability. *Journal of Evaluation in Clinical Practice* 2009; 15: 411-19

Study IV

In this study the Postoperative Recovery Profile (PRP) questionnaire was further developed regarding the construct validity and its ability to discriminate recovery profiles between different groups. Furthermore, the item variables patients considered as most important during the progress of postoperative recovery were investigated.

Subjects (IV)

Patients undergoing elective lower abdominal and orthopaedic surgery were consecutively included in the study during September 2006 to July 2007. Patients were excluded if they had poor Swedish comprehension, cognitive dysfunction that precluded complete cooperation, or any severe pre-existing medical condition that limited objective assessment after surgery. In total, 172 patients were approached for participation.

Procedure (IV)

All participants were asked to complete the PRP questionnaire developed in Study III. The operational definition of the level of recovery was based on the number of items (indicator sum) given a *none* response (corresponding to having no problem or difficulty). The criterion for fully recovered was the indicator sum of 19 (all items given a *none* response). To evaluate construct validity, an alternative global assessment of recovery was used. Participants were asked to rate their overall postoperative recovery using a single global recovery scale with the five verbal descriptive categories *fully recovered, almost fully recovered, partly recovered, slightly recovered* or *not recovered at all.* A ranking list was compiled to evaluate the item variables that participants valued as most important during the recovery process. On each measurement occasion, participants were asked to value five of the 19 item variables in the PRP questionnaire as most important.

The study included six measurement occasions; before discharge, day three, day ten, one month, two months, and three months after discharge. In addition, the ranking list was completed on the day before surgery. Participants who, according to the PRP questionnaire assessment, were not regarded as fully recovered three months after discharge completed the same questionnaires monthly until they were assessed to be fully recovered, up to a maximum of twelve months. Data were collected between September 2006 and July 2008. The data sets from the three-month assessment were used in evaluating construct validity, and the one- to twelve-month follow-up occasions in evaluating the ability to discriminate between groups. In evaluating item variables valued as most important the data sets from before surgery, before discharge, day ten, months one, three, six, nine, and twelve were used.

A rank-based statistical method [117] developed for evaluating paired, ordered, categorical data from rating scales was used to evaluate consistency between the assessments on the PRP questionnaire and the global recovery scale at the three-month- follow-up occasions. This method is based on a bivariant ranking approach, i.e. observations are regarded as tied only for identical pairs of observations. In case of complete rank order consistency between the PRP assessments

and the global scale of recovery the two sets of bivariate ranks will be identical. In that case, the plot of the paired classifications shows that the ordering of all pairs is unchanged when changing scales. This is the so-called rank-transformable pattern of agreement (RTPA). The measure of disorder (D), which is the ratio of the proportion of disordered pairs among all possible combinations of pairs, was calculated. Possible values range from 0 (total order) to 1 (total disorder).
Recovery profiles were used to study the number of months that participants needed for being perceived as fully recovered according to the assessments on the PRP questionnaire. The recovery profiles of the diagnostic groups were displayed by the cumulative proportion recovered participants over time (Kaplan-Meier curve) [5]. When participants drop out before complete recovery, or before the study ends, information about their recovery time is missing. The only information given is that the recovery period exceeds the participation period. Such participants are called censored observations. The Kaplan-Meier analysis takes account of the information from these participants up to the time they were censored. The difference in proportions of recovered patients between the two profiles on twelve-month follow-up occasions was evaluated by means of the 95% CI.

A ranking list based on the participant's appraisal of the five most important item variables in the PRP questionnaire was compiled to illustrate the rank ordering of the items.

Results (IV)

Study IV included 158 patients (Table 7). The evaluation of agreement between the indicator sum of recovery and the assessment with the global recovery scale included only the participants that responded to all 19 items in the PRP questionnaire and the global recovery assessment (n=120).

Table 7. Patient demographics (IV) displayed by median (range) or number (%)

	Orthopaedic surgery (*n*=75)		**Abdominal surgery (*n*=83)**	
Age (yr)		66 (36-87)		61 (18-88)
Sex (M/F) (% male)		27/48 (36)		43/40 (52)
Type of surgery (*n* (%))	Hip replacement	48 (64)	Hysterectomy	17 (21)
	Knee replacement	27 (36)	Prostatectomy	21 (25)
			Colorectal	45 (54)

Figure 2a shows the pattern of observed agreement. Three months after discharge, 44 (37%) participants of 120 were regarded as fully recovered according to the indicator sum criterion, and 48 (40%) according to the global assessment. Of these 48, the indicator sum showed that 33 (69%) participants were assessed as fully recovered. The agreement in ordering between the PRP assessment and

the global recovery assessment was not unambiguous (Figure 2a). The distribution of participants whose global assessment indicated *almost fully recovered* varied in indicator sums from 7 to 19, which substantially overlaps the distribution of the category *partly recovered*.

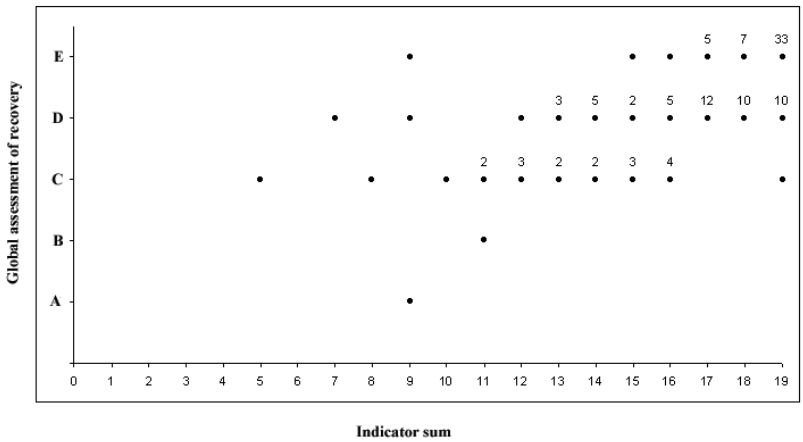

Figure 2a. *Assessment 3 months after discharge. Agreement between the indicator for level of postoperative recovery (0-19) and a global assessment of level of postoperative recovery (E = fully recovered, D = almost fully recovered, C = partly recovered, B = slightly recovered, A = not recovered at all) n=120.*

Figure 2 b shows the pattern of agreement (RTPA) expected in the case of complete order consistency between the two different ways of recovery assessment. The observed pattern of agreement (Figure 2 a) is dispersed from this RTPA. The measure of disorder was 0.076, i.e. 7.6% of all possible pairs were disordered when comparing the two methods of measuring postoperative recovery. Hence, according to this study it can be expected that the indicator sum 19 will correspond to assessments of *fully recovered* on the global recovery scale. Correspondingly, *almost fully recovered* will correspond to indicator sums between 15 and 18, and the range of sums from 8 to 14 will correspond to *partly recovered*, 7 with *slightly recovered*, and <7 with *not recovered at all*. (Figure 2 b). The limits are not mutually exclusive.

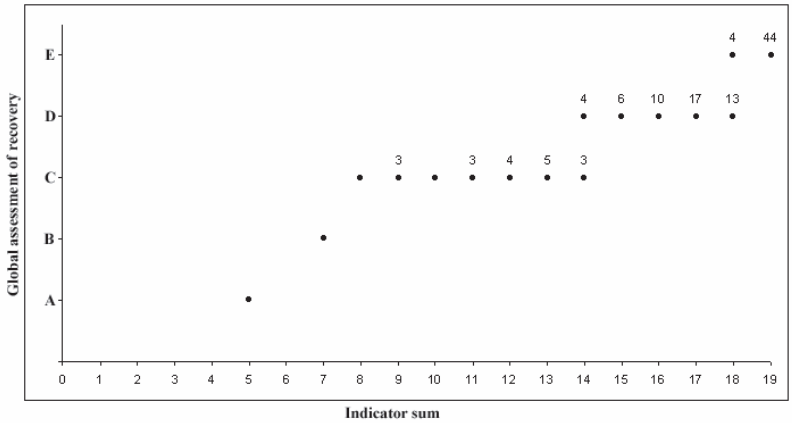

***Figure 2b**. Assessment 3 months after discharge. Rang-transformable pattern for agreement between the indicator for level of postoperative recovery (0-19) and a global assessment of level of postoperative recovery (E = fully recovered, D = almost fully recovered, C = partly recovered, B = slightly recovered, A = not recovered at all) n=120.*

The Kaplan-Meier curve illustrates the postoperative recovery profiles according to the PRP assessments during the twelve months after discharge for the groups of abdominal and orthopaedic patients (Figure 3). The greatest increase in the proportion of recovered participants was observed between the two-month and the three-month follow-up occasions; from 21% (SE, 5%) to 36% (SE, 6%) in the abdominal group, and from 13% (SE, 4%) to 31% (SE, 5%) in the orthopaedic group, respectively. Twelve months after discharge a larger proportion of patients, 73% (SE, 6%), in the orthopaedic group were fully recovered according to the indicator sum, as compared with the 51% (SE, 6%) of participants in the abdominal group. The 95% CI of this difference was wide, but significant, ranging from 6% to 40%.

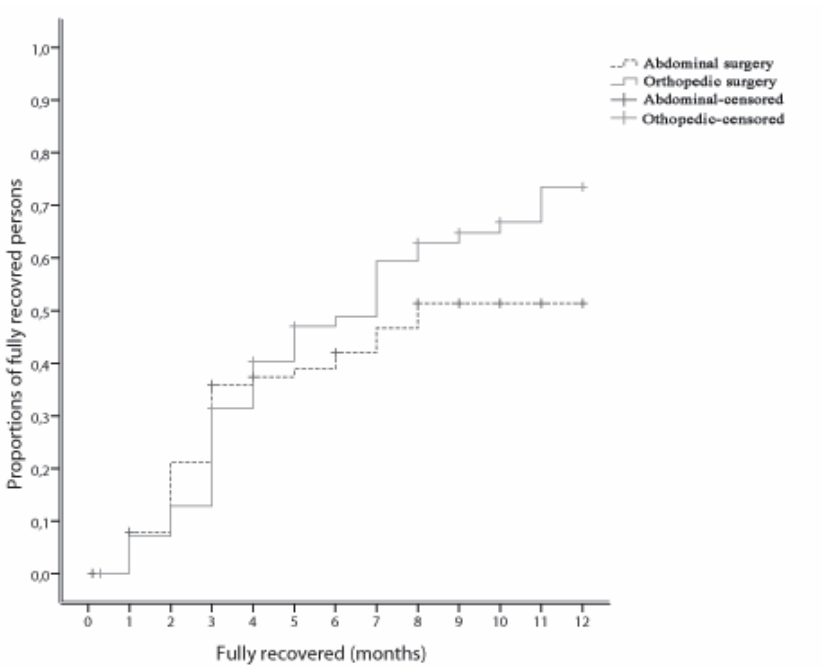

Figure 3. *Kaplan-Meier curve illustrating postoperative recovery profiles divided in abdominal- (n=83) and orthopaedic surgery (n=75)*

The result of the participant's assessments of the five most important item variables during the recovery process demonstrated that all 19 item variables were covered on all measurement occasions. The ranking lists, compiled from the participants' judgements, showed that each of the five recovery dimensions contained item variables ranked in the top five. All participants that completed the ranking lists were included in the analysis. The variable *pain* appeared in the top five on eight measurement occasions of eight possible in both study groups. Other variables ranked in the top five on eight occasions were *gastrointestinal function* in the abdominal group and *mobilization* and *personal hygiene* in the orthopaedic group. Apart from *pain*, the occurrence of item variables in the top five varied between the two study groups (Table 8).

Table 8. Item variables ranked as top five (1= highest to 5) during the progress of recovery

Item	Measurement occasion orthopaedic surgery								Measurement occasion abdominal surgery							
	Pre n=73	BD n=69	D 10 n=72	M 1 n=68	M 3 n=67	M 6 n=28	M 9 n=19	M 12 n=11	Pre n=83	BD n=72	D 10 n= 75	M 1 n=72	M 3 n=65	M 6 n=37	M 9 n=29	M 12 n=23
Pain	2	1	1	1	1	2. 5	1	1. 5	1	1	1. 5	1	1	2	1	2. 5
Nausea										5						
Sleeping difficulties	5. 5	4	4	3	4			4			3	4		4		
Gastrointestinal function	4	5							2	2	4	2	2	1	3. 5	2. 5
Sexual activity															3. 5	4. 5
Mobilization	1	2	2	2	2	1	2	3	4	3	1. 5	3	3. 5		5	4. 5
Anxiety and worry	5. 5						5		3			5	3. 5	5	2	1
Feeling down														3		
Feeling lonely /abandoned									5							
Social activities													5			
Dependence on others			5	5	5	2. 5										
Re-establish everyday life						5										
Personal hygiene	3	3	3	4	3	4	4	1. 5		4	5					

Pre= Preoperative, BD= Before discharge, D= Day, M= Month

Summary of results

In this thesis, the Postoperative Recovery Profile questionnaire has been developed for self-assessment of general recovery after surgery (Figure 4). The following text summarizes the results (I to IV).

Postoperative recovery was identified as an energy-requiring process of returning to normality and wholeness as defined by comparative standards. The core of the recovery process was described as a desire to decrease unpleasant physical symptoms, reach a level of emotional well-being, regain functions, and re-establish activities. Five dimensions (physical symptoms, physical functions, psychological, social, activity) and 19 items were identified as being part of the operationalization process of the postoperative recovery concept.

In the analysis of content validity, 85% of the participants considered the items essential. This was further supported in the assessments of the five most important item variables, showing that all 19 items were covered on all measurement occasions during the recovery process. The variable *pain* appeared in the top five on all measurement occasions, in both the abdominal and the orthopaedic groups. Acceptability of the questionnaire was found to be good, and the respondent burden low. Evaluation of intra-patient reliability showed that PA measures ranged from 72% to 100%. The observed disagreement could be explained mainly by systematic disagreement. Evaluation of construct validity showed that 7.6% of all possible pairs were disordered when comparing the assessments from the PRP questionnaire and the global recovery scale. Twelve months after discharge statistical significance was found for the ability to discriminate recovery profiles between the abdominal and the orthopaedic groups.

Figure 4. *Development of the PRP questionnaire – a discriminative and evaluative instrument for self-assessment of recovery after surgery*

Ethical considerations

All studies were planned and implemented based on common ethical principles applied in clinical research. The regional Research Ethics Committee approved all projects, except for Study I, which was a theoretical study that did not directly involve participants. All respondents were given oral and written information about the study and were informed that participation was voluntary. They were clearly informed that they could leave the study at any time without giving any explanation. None of the studies involved any dependent relationships, e.g. patient – caregiver. All participants gave their informed consent to enter the study and were guaranteed confidentiality.

Potentially the interviews, or some statements in the questionnaire, could be perceived to intrude on participants' privacy. However, the interviewer asked open-ended questions, which gave participants an opportunity to decide what they wanted to communicate. In the questionnaire studies, participants had the opportunity to decide whether or not to answer the questions.

DISCUSSION

Discussion of results

Postoperative recovery was described as a process of returning to everyday life, which is in agreements with previous studies [12, 30, 70, 124]. Lawler for example, describes recovery as returning to independence [70]. However, it must be argued that those who need assistance in activities of daily living can also be recovered – not to a level of independence, but to their former level of dependence. Although the starting point for postoperative recovery can be easily defined, a question that should be addressed is whether it is possible to define a standard endpoint. The condition achieved after recovery could involve changes, both desired and less desired, compared to the initial preoperative condition (II). For instance, patients who have undergone hip or knee replacement hope to achieve a level of physical function far superior to that before surgery [41]. In some cases, however, the patient might never return to the initial condition.

Postoperative recovery has been studied mostly in a short-term perspective through measuring clinical endpoints. However, in accordance with qualitative studies describing patient experiences [30, 37], the results from Study II and Study IV indicate that the postoperative recovery process can extend over a period of several months. The major part of the recovery process takes place after discharge [10, 14], implying a shift in the responsibility for recovery to the patients and their families. Hence, the need for appropriate information [19, 30] and discharge planning [81, 103] has been emphasized. If patients are expected to be active in their own recovery, rather than hand over control to professional caregivers, then they need ongoing support during the recovery process. Studies have highlighted the importance of providing information about the surgical intervention itself [41] and about what constitutes recovery [30]. Study II reported that repeated information, adapted to individual needs, is of utmost importance for successful recovery. However, it was shown that staff participants possessed limited experience with the progress of recovery after discharge (II, III), which could be assumed to limit their potential to supply adequate support. The organizational structure of health care systems varies between countries. In Sweden, we do not have developed a general system that allows for a thorough follow-up of postoperative recovery after discharge.

Identification of recovery dimensions

The studies identified different recovery dimensions (I, II) and found that each dimension included item variables judged by the participants to be among the top five in the investigation of most important items (IV). This supports the need to take a comprehensive perspective when studying postoperative recovery. Lawler describes a general recovery trajectory, but also multiple specific trajectories [70] corresponding to the overall process of regaining control over everyday life. If we consider the different recovery dimensions as specific trajectories, each recovery dimension is important and should be included in the evaluation of patient-reported postoperative outcomes. The concept analysis (I) identified four postoperative recovery dimensions (*physical, psychological, social* and *habitual*) by reviewing how postoperative recovery was highlighted in the literature. The empiri-

cal data in Study II supported this. However, the results in Study II demonstrated that the classification of dimensions in the concept analysis was not detailed enough. Hence, it was considered necessary to divide the physical dimension into two dimensions: *physical symptoms* and *physical functions*. The subcategories *experiences of unpleasant physical symptoms* and *experiences of a period of regaining functions* both constituted core aspects in recovery, as demonstrated in Study II. The subcategory *regaining functions* included both physical and social functions, whereupon the latter was placed in the *social* dimension of recovery. Furthermore, the expression *habitual recovery* was considered to be incomplete. The concept analysis included it as an expression of an ordinary or regular life, which dealt largely with ordinary activities. Hence, *activity* was considered to be a more accurate name for the dimension. Understanding a concept should be considered an ongoing process that is responsive to new knowledge and experiences [82]. An evolutionary concept analysis approach, employed by Rogers, considers changing perspectives to achieve a clearer and more useful repertoire [104].

Evaluation of instrument properties

In the evaluation of content validity (III), the vast majority of participants judged 18 of 19 items as essential for the postoperative recovery process. This could be explained, in part, by the rigorous definition of postoperative recovery (I) and the cautious examination of patient and staff experiences (II). Although the judgement of one item differed compared to the other items, it was retained at this stage of the questionnaire development. The investigation of the five most important item variables (IV) showed that all items were covered on all measurement occasions. This indicates that no item variable was considered unimportant, lending further support to content validity and support for the previous decision to retain all variables in the questionnaire (III).

Results from the test-run of the PRP questionnaire (III) indicated that it was easy to understand and did not place much of a burden on respondents. Any variations could probably be explained by individual variances in reading skills, the ability to absorb information, and the time needed to reflect before answering a question, or they could be age-related. On average, nine minutes were needed to complete the PRP questionnaire. This could be misleadingly high as the respondents were also asked to appraise whether the items were realistic to carry out and if the layout was easy to use. Measurement instruments must be acceptable to those for whom they are administered [34]. An instrument's acceptability, e.g. by not putting a heavy burden on the respondent, is essential for a high response rate [35]. The test-run of the questionnaire also demonstrated that the items *sexual activity* and *re-establish everyday life* were considered to be irrelevant during hospitalization. Hence, these items were excluded in the test-retest assessments (III) performed during hospitalization. As the PRP questionnaire is intended for longitudinal use during the recovery process, these items were kept in the follow-up assessments after discharge (IV). The vast majority of items showed a high level of test-retest reliability, indicating that the questions in the PRP questionnaire are clearly formulated and that the participants understood the questions.

In analysing the correspondence between scale categories in the PRP questionnaire and the global recovery scale (IV), the definition of *fully recovered* as indi-

cator sum 19 was a strict definition. Nevertheless, it was decided to use this limit in comparing the assessments. In identifying the cut-off between comparable sets of categories, two indicator sums were not univocally related to a certain recovery category (IV). It was decided to place these indicator sums in the lowest category in the overlap. When using the PRP questionnaire in forthcoming studies, it might be preferable to include fewer scale categories, and hence a less stringent definition of *fully recovered*. However, as many as 31% of the participants regarded as *fully recovered* according to the global recovery scale were not assessed as *fully recovered* according to the indicator sum. The findings indicate that the patient's perception of fully recovered might contain individual factors not easily covered by a questionnaire. Different personality types have been shown to engage different strategies in dealing with postoperative recovery [128].

It was shown that the PRP questionnaire could be used for follow-up in a longer perspective. To date, few studies have evaluated patient-reported postoperative recovery longer than three months post-surgery [65, 72, 87]. Of the instruments found, only one had been used in twelve-month follow-up, in that case after nephrectomy [95]. Repeated measurements in follow-up studies must be able to detect clinically important changes over time [113]. The PRP questionnaire was shown to discriminate recovery profiles at a group level (IV). Previous studies presenting recovery profiles have commonly measured different recovery characteristics, not a global recovery profile. Some studies measuring recovery profiles have defined a complicated recovery as the occurrence of severe complaints (pain, nausea, or vomiting) with more than five treatment interventions in the post-anaesthesia care unit, or a length of stay exceeding two hours [55, 56].

No other multi-dimensional questionnaire that classifies different levels of recovery (from *not recovered at all* to *fully recovered*) has been found in the literature. This global measure of recovery is an alternative to sum scores or indexes used in previously developed recovery instruments [48, 49, 64, 88, 90, 93, 95, 115, 122]. Referring to the discussion above concerning recovery dimensions, only the QoR [88] and the QoR-40 [90] include all the dimensions of recovery identified in this thesis. However, they measure a dimension called *psychological support*, which is more focused on influencing recovery than assessing progress in the recovery process.

Pain was ranked as top five on each measurement occasion in both the abdominal and the orthopaedic groups. Pain has been shown to cause major concern in patients prior to surgery [8]. Furthermore, efforts have been made to inform the general public about the importance of, and options for, treating pain. Hospitals in several countries have established acute pain services [100], and numerous scientific studies have investigated postoperative pain and pain treatment modalities [101]. The results also show that the item variables ranked in the top five varied during different periods of the recovery process. For example, the item *anxiety and worry* was not among the top five until the one- to twelve-month measurement occasions in the abdominal group. This finding is interesting since most of the recovery process takes place in the home environment without the presence of healthcare professionals. It also supports the importance of measuring all recovery dimensions suggested in the PRP questionnaire.

Methodological Considerations

Since different research approaches target different types of questions, two research paradigms were applied in this work. In the naturalistic paradigm, qualitative research emphasizes understanding human experiences as they are lived. In the positivist paradigm, however, quantitative researchers examine a phenomenon through precise measurement and quantification [97]. The use of different approaches, with different assumptions about the nature of reality, has enriched the work with this thesis.

Study I and II

Findings from the concept analysis (I) could have been used solely as a starting point to design Study II, but the lack of qualitative studies examining experiences of postoperative recovery gave a fragmented picture of the phenomenon. Hence, an empirical study and an inductive content analysis of the data were considered to be important [32]. Study I and Study II complements each other in the effort to increase our knowledge and understanding of postoperative recovery, and they constitute the theoretical framework for the instrument development.

Different approaches are available for concept analysis. Walker and Avant's approach was selected in Study I because of its systematic method. Critics have argued that this systematic approach, using case illustrations, is an expression of casuistry, i.e. outcomes of one case set an example for judgements involving other cases [15]. However, casuistry is supportable when the aim is to reach consensus about outcomes. Furthermore, the cases used to illustrate what postoperative recovery is, or is not, should be a means to clarify the complexity of the concept for clinicians. Concept analysis was a valuable first step in this thesis as it generated basic elements of postoperative recovery to incorporate into the PRP questionnaire. According to Avant, development of an instrument based on a concept analysis should be considered as a strength in the validity process [11]. Valuable information might have gone undetected in papers not found in the literature search. Another problem concerns synonyms, e.g. convalescence [54] and similar concepts, such as rehabilitation [114]. Comparison of the concepts is necessary to clearly define the boundary between them.

A qualitative, descriptive method is suitable when no highly abstracted rendering of data is required and no prior commitment to any single theoretical view of a phenomenon is used [107]. To acquire a wide variety of experiences of postoperative recovery in Study II, both the subjective experiences of patients and the professional knowledge of various staff members were taken into account. Some people might raise objections against staff members describing patient recovery. However, although patients are the only ones having subjective experiences, staff members may be the best observers of the outward manifestations of postoperative recovery. Since few studies have examined postoperative recovery in a long-term perspective, the individual interviews used a wide timeframe, ranging between three weeks and one year after surgery. Given this wide timeframe, participants were able to describe their experiences during the recovery process in detail. The combination of individual interviews and focus groups has been shown to

enhance data richness [69], and previous studies have used this approach to explore personal experiences and examine opinions and beliefs about a phenomenon [86].

To ensure trustworthiness [39], credibility was achieved through the combination of individual interviews and focus groups. Participants with various experiences enhanced the potential to ensure that different aspects of postoperative recovery were clearly understood. Furthermore, the co-authors maintained a dialogue on how to label, sort, and interpret the data. Collecting extensive data over an extended period presents a risk for inconsistency [39]. Hence, in an effort to achieve dependability and maintain focus throughout the entire interview process, data were collected during a period that was as short as possible. To help readers decide whether the results are transferable to other contexts, the ambition was to clearly describe the characteristics and selection of participants, the collection of data, and the analysis process.

The analysis of interaction between members in the focus groups was not exhaustive. Studies often justify focus groups in terms of the benefits that participant interactions could produce. Even if the focus group technique is common and guidelines address certain aspects of the analytical process [112], scientific articles rarely report on or discuss the interaction in focus groups [130]. In this study, the group members were asked if they had the possibility to present their thoughts and opinions concerning postoperative recovery. They were also asked if they had learnt anything from the group discussion. Although the moderator and the co-moderators discussed the group interaction after each interview, it was not systematically analysed.

Study III and IV

Data from rating scales do not have the mathematical properties of well-defined size and distance, this means that one ordered set of labels can be replaced by another, e.g. numerals by letters or vice versa. [119]. Hence, a statistical method taking the non-metric ordinal properties into account was used to analyse pairs of ordered categorical data [74, 111, 120, 121] in Study III and Study IV. When analysing data with a new method it is difficult to compare the result with other studies. The quality criteria proposed for measurement properties of health status questionnaires [123], previously used to systematically review recovery-specific instruments [66], mainly recommend statistical methods that require mathematical properties. If the assumptions of measurement properties are inaccurate, one could question whether the results of statistical evaluations in that case could be considered valid. Altman highlights the importance of taking ethical considerations into account when choosing statistical methods [5].

There is no consensus on the number of experts needed in the evaluation of content validity. Some authors recommend three participants [75] while others suggest between 10 and 20 [110], or even more [53]. Study III aimed to include the number of experts considered necessary to acquire detailed information. To capture the core of the postoperative recovery process, it seemed important to include both patients and staff as content experts. There could be objections against using staff members as experts when developing a patient-oriented measurement tool. However, as discussed earlier, staff members are good observers of the outward mani-

festations of postoperative recovery. As only hospitalized patients participated in judging content validity, their ability to judge the relevance of items across the entire recovery process might be questioned. They were, however, informed that the questionnaire had been developed for repeated measurements over a longer period, and it was not restricted to the specific time when they responded to the questions. Furthermore, the description of patients' recovery experiences in Study II, which constituted the base for developing the questionnaire items, included experiences up to one year after surgery. All patients and staff included in the study were affiliated with orthopaedic and abdominal surgery departments. It could be argued whether or not this restricts the results of the content validity process to patients that have undergone orthopaedic and abdominal surgeries. The PRP questionnaire was developed to measure general postoperative recovery. However, there might be a need for a supplementary disease-specific part of the questionnaire.

The rank-invariant method [116] used in the test-retest assessment in Study III made it possible to measure the systematic disagreement (group level) in categorization separately from the disagreement in individual classifications. It is important to consider both systematic and individual disagreement because their influence on the quality of scales differs. Systematic disagreement can be reduced by clarifying the category descriptions, while individual disagreement inconsistency occurs when the rating scales permit disturbing factors in the test situation to affect the recordings [116]. Correlation measures are used widely in agreement studies. However, the correlation coefficient measures the degree of association between two variables and not the level of agreement between two assessments. Thus, a strong correlation does not indicate that two assessments produce equivalent results. [119].

Study IV focused on group-related recovery profiles in evaluating the time that participants needed to be considered fully recovered. It could be argued that important information from the assessments of each item was lost. However, the study aimed to evaluate whether the PRP questionnaire had the ability to discriminate recovery profiles between different groups, which is important to know before evaluating intra-patient profiles. The follow-up period extended over a long timeframe. Therefore, a careful effort was made to give participants detailed information, emphasising that the questions exclusively concerned experiences that resulted from the surgical procedure.

CLINICAL IMPLICATIONS AND FUTURE RESEARCH

To adequately prepare and support patients in returning to normal, recovery must be understood from the perspective of those experiencing it. Today's short length of stay in hospital after surgery and the patient's recovery period at home present new challenges for patients, families, and the staff involved in postoperative treatment and care. Findings regarding the course of events during recovery, and the possibilities to influence the progress of recovery, could hopefully constitute a knowledge base for health professionals in their daily practice. Such a base could help clinicians support their patients during the recovery process and could be valuable in developing patient information strategies and discharge planning protocols. Knowledge about recovery profiles could assist clinicians in referencing patient progress and in determining the critical time points for measuring change.

Forthcoming studies will evaluate PRP assessments of changes in intra-patient profiles, and the importance of each item variable in the questionnaire will be further investigated. The PRP questionnaire allows for evaluation of the progress of postoperative recovery and should be useful in assessing patient-reported recovery. The questionnaire could be used at the group level to define endpoints in follow-up studies. It could also be used as a tool in assessing outcomes of importance for individual treatment planning. In the future, it can be investigated whether the PRP questionnaire should be supplemented with a disease-specific part. It could also be interesting to test the questionnaire in other countries and contexts.

CONCLUSIONS

Patients' perspectives must be considered in evaluating changes in practice, or supposed advances in care. In this thesis knowledge about what recovery is was achieved by data derived from the literature and directly from those who had experienced it. Postoperative recovery was found to be a process where individuals were striving to regain an everyday life comparable to the life before surgery. The recovery process extended over a period of several months, and several factors were shown to be of importance in influencing its progress. Different recovery dimensions and 19 items were identified in operationalizing the postoperative recovery concept.

The multi-dimensional PRP questionnaire was developed for self-assessment of general recovery after surgery. Support was given for content validity, construct validity, intra-patient reliability, and the ability to discriminate recovery profiles between different patient groups.

Assessments of the five most important item variables during the recovery process demonstrated that all 19 items were covered on all measurement occasions, which indicates that no item was considered as unimportant in the assessment of postoperative recovery.

SVENSK SAMMANFATTNING (SWEDISH SUMMARY)

Postoperativ återhämtning utgör en viktig del av patientens upplevelse i samband med en operation. Återhämtning efter kirurgiska ingrepp har huvudsakligen studerats genom att mäta kliniska parametrar, t ex vårdtid, förekomst av symtom såsom smärta och illamående samt förekomst av eventuella komplikationer. Under det senaste decenniet har vårdtiden efter en operation reducerats kraftigt. Detta har i sin tur resulterat i att en stor del av återhämtningen sker i hemmet, utan närhet till hjälp och stöd från sjukvårdspersonal. För att få en helhetsbild av hur det postoperativa förloppet utvecklas efter olika typer av operationer bör återhämtning även utvärderas med hänsyn tagen till patientens subjektiva upplevelser. Det övergripande syftet med avhandlingsarbetet har varit att utveckla ett instrument som gör det möjligt att mäta patientens egen bedömning av återhämtningen. Både kvalitativa och kvantitativa metoder har använts i form av litteraturgenomgång, intervjuer och frågeformulär. Insamlade data har analyserats med hjälp av begrepps-, innehålls- och statistisk analys.

I studie I gjordes en litteratursökning i syfte att hitta artiklar och böcker som beskriver vad återhämtning efter en operation innebär. Materialet analyserades med hjälp av Walker och Avants metod för begreppsanalys. Olika dimensioner med typiska karakteristika för postoperativ återhämtning identifierades och en teoretisk definition formulerades. Enligt denna definition är postoperativ återhämtning en energikrävande process med målet att återgå till det som före operationen betraktades som ett tillstånd av normalitet och helhet. Detta mål uppnås genom att (i) patienten återfår kontrollen över fysiska, psykologiska, sociala och vardagliga funktioner, (ii) återgår till preoperativa nivåer av oberoende/beroende i samband med dagliga aktiviteter, samt (iii) når en optimal nivå av psykologiskt välbefinnande.

I studie II beskrev patienter, sjuksköterskor, distriktssköterskor och läkare sina erfarenheter av patienters återhämtning. Både enskilda intervjuer och fokus grupp intervjuer genomfördes. Patienterna som deltog i studien hade opererats på kvinnoklinik och kirurgisk klinik, där även sjuksköterskorna och läkarna arbetade. Distriktssköterskorna arbetade vid olika vårdcentraler. Intervjuerna analyserades med kvalitativ innehållsanalys. Kärnan i postoperativ återhämtning beskrevs som att (i) minska obehagliga fysiska symtom, (ii) uppnå ett känslomässigt välbefinnande, samt (iii) återfå de funktioner och återuppta de aktiviteter som varit en del av vardagslivet före operationen. Smärta, illamående, förstoppning, diarré och utmattning var exempel på fysiska symtom, medan känslomässiga reaktioner handlade om oro, ängslan, nedstämdhet och en känsla av att vara övergiven. Fysiska funktioner som beskrevs var t ex att kunna äta och dricka, sköta magen, tömma urinblåsan och återfå muskelstyrka och kondition. Förutom fysiska funktioner betonades vikten av att fungera i rollen som förälder, make/maka eller arbetskamrat. Postoperativ återhämtning beskrevs som en utdragen process där beroendet av hjälp och stöd från omgivningen successivt minskade. Att ges tid för återhämtning (både på sjukhuset och under sjukskrivning), att få hjälp och stöd från andra (sjukvårdspersonal, anhöriga och vänner) samt att få upprepad information anpassad efter individuella behov var exempel på faktorer som rapporterades ha stor betydelse för återhämtningsprocessen.

I studie III utvecklades ett frågeformulär avsett att mäta patientens självskattning av postoperativ återhämtning. Formulärets validitet och reliabilitet utvärderades. Studien genomfördes i fyra olika steg. I steg ett utgjorde resultaten från begreppsanalysen och intervjustudien en teoretisk bas där fem dimensioner av återhämtning och 19 item identifierades.

Postoperativ återhämtning

Dimension	Item
Fysiska symtom	1. Smärta
	2. Illamående
	3. Trötthet
	4. Aptit
	5. Sömn
Fysisk funktion	6. Mag-tarmfunktion (t ex förstoppning och diarré)
	7. Blåsfunktion
	8. Vara uppe och i rörelse
	9. Muskelsvaghet
	10. Sexualliv
Psykologisk	11. Oro och ängslan
	12. Nedstämdhet
	13. Ensam och utlämnad
	14. Koncentrationsproblem
Social	15. Socialt liv (t ex umgås med familj och vänner)
	16. Beroende av andra
	17. Följa med i vad som händer i omvärlden (t ex tidningar, radio)
Aktivitet	18. Vardagsliv (t ex hushållsarbete, fritidsaktiviteter, arbete)
	19. Personlig hygien

I steg två utvärderades validitet hos samtliga item av sjuksköterskor, läkare och patienter från kirurg, ortoped, urolog och kvinnoklinik. En majoritet av deltagarna bedömde 18 item av 19 som betydelsefulla i samband med postoperativ återhämtning. I steg tre formulerades samtliga item som ett påstående, t ex ”Just nu upplever jag *ingen, lindrig, medelsvår,* eller *svår* smärta”. Frågeformuläret pilottestades av patienter på dag två eller tre efter bukkirurgi och ortopedisk kirurgi. Formuläret bedömdes vara lätt att förstå och lätt att besvara. Patienterna behövde i genomsnitt nio minuter för att fylla i formuläret. I steg fyra utvärderades frågeformulärets reliabilitet (stabilitet). Patienter som hade genomgått bukkirurgi och ortopedisk kirurgi fyllde i två identiska frågeformulär, med fyra till fem timmars mellanrum, på dag tre eller fyra efter operationen. En statistisk metod användes för att analysera procentuell enighet mellan mättillfällena, samt beskriva systematiska förändringar för hela gruppen skilt från individuella avvikelser. Den procentuella enigheten mellan mättillfälle ett och två varierade mellan 72 % och 100 %. Detta innebär att flertalet patienter var helt stabila i sina test-retest mätningar, vilket i sin tur indikerar att frågorna var tydligt formulerade och lätta att

förstå. De förändringar som uppmättes förklarades av en systematisk förändring för hela gruppen. Resultatet i studie III gav stöd för frågeformulärets validitet och test-retest reliabilitet.

I studie IV vidareutvecklades frågeformuläret genom att jämföra det med en global återhämtningsskala och genom att utvärdera dess förmåga att diskriminera återhämtningsprofiler mellan olika patientgrupper. Dessutom undersöktes vilka item patienterna värderade som mest betydelsefulla under återhämtningen. Patienter som hade genomgått bukkirurgi och ortopedisk kirurgi deltog i studien genom att fylla i frågeformuläret, samt en fem-gradig global återhämtningsskala och en rangordningslista. Upprepade mätningar gjordes upp till tolv månader efter hemgång från sjukhuset. Jämförelsen mellan frågeformuläret, som mäter fem olika dimensioner av återhämtning, och den globala skalan visade att resultatet från mätningarna med frågeformuläret kunde konverteras till en global återhämtningsskala (*inte alls återhämtad, lite återhämtad, delvis återhämtad, nästan helt återhämtad* eller *helt återhämtad*). Vidare visade det sig att frågeformuläret kunde diskriminera återhämtningsprofiler mellan ortoped och buk kirurgi grupperna tolv månader efter hemgång från sjukhuset. Den rangordningslista som sammanställdes, grundad på patienternas val av de fem item de betraktade som mest betydelsefulla, visade att samtliga fem återhämtningsdimensioner innehöll topp-fem item. *Smärta* rangordnades bland topp-fem vid åtta mättillfällen av åtta möjliga i båda studiegrupperna. Andra item bland topp-fem vid samtliga mättillfällen i buk kirurgi gruppen var *mag-tarm funktion* och i ortoped gruppen *vara uppe och igång* och *personlig hygien*.

Korta vårdtider efter en operation samt det faktum att en stor del av återhämtningen sker i patientens hemmiljö utgör en utmaning för både patienter, anhöriga och sjukvårdspersonal. Resultaten i den här avhandlingen kan utgöra en kunskapsbas för personal involverad i postoperativ behandling och vård. Beskrivningen av händelseförlopp och faktorer som kan påverka återhämtningsprocessen kan vara till hjälp vid utformningen av strategier och material för patientinformation. Frågeformuläret som utvecklades kan användas för att mäta återhämtningsprofiler efter olika typer av kirurgiska ingrepp, men också vidareutvecklas för att användas till specifika grupper. Det kan även användas för att mäta effekter av sjukgymnastiska behandlingsmetoder och omvårdnadsinterventioner efter en operation. Kännedom om återhämtningsprofiler kan hjälpa vårdpersonal att förutsäga utvecklingen av återhämtningsprocessen samt att fastställa lämpliga tidpunkter för att mäta förändring.

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Till sist,

Min bror *Tomas* som har gett mig en gåva så ofattbar stor.

Min härliga familj, *Ingemar*, *Elin och Karin*, som är min bas och trygghet. Vad vore allt det här värt utan er? Tack för all kärlek och omtanke och för allt vi har gjort tillsammans som inte har med forskning att göra.

A questionnaire to measure patient-reported postoperative recovery (in Swedish).

Based on the items developed in Allvin et al, *Journal of Evaluation in Clinical Practice* 2009.

Nedan följer en rad påståenden. Läs igenom dem noga och välj de svarsalternativ som passar bäst in på hur Du har det efter Din operation.

Just nu upplever jag en/ett ..... som är:		
1	**smärta**	□ svår □ medelsvår □ lindrig □ ingen
2	**illamående**	□ svårt □ medelsvårt □ lindrigt □ inget
3	rubbning i min **mag-tarmfunktion** (t ex förstoppning, diarré)	□ svår □ medelsvår □ lindrig □ ingen
4	**orkeslöshet**	□ svår □ medelsvår □ lindrig □ ingen
5	**muskelsvaghet**	□ svår □ medelsvår □ lindrig □ ingen
6	påverkan på min **aptit**	□ svår □ medelsvår □ lindrig □ ingen
7	**sömnsvårighet**	□ svår □ medelsvår □ lindrig □ ingen
8	**oro och ängslan**	□ svår □ medelsvår □ lindrig □ ingen
9	**nedstämdhet**	□ svår □ medelsvår □ lindrig □ ingen

Just nu upplever jag en/ett …… som är:		
10	inskränkning i mitt **vardagsliv** (t ex att orka med hushållsarbete / fritidsaktiviteter/arbete)	□ svår □ medelsvår □ lindrig □ ingen
11	påverkan på mitt **sexualliv**	□ svår □ medelsvår □ lindrig □ ingen
12	inskränkning i mitt **sociala liv** (t ex att orka umgås med familj och vänner)	□ svår □ medelsvår □ lindrig □ ingen
13	svårighet med att sköta min **personliga hygien**	□ svår □ medelsvår □ lindrig □ ingen
14	svårighet med att följa med i **vad som händer i omvärlden** (t ex genom tidningar och TV)	□ svår □ medelsvår □ lindrig □ ingen
15	problem med att **tömma urinblåsan**	□ svårt □ medelsvårt □ lindrigt □ inget
16	problem med att vara **uppe och i rörelse**	□ svårt □ medelsvårt □ lindrigt □ inget
17	känsla av att vara **ensam och utlämnad**	□ svår □ medelsvår □ lindrig □ ingen
18	beroende av **hjälp från andra**	□ svårt □ medelsvårt □ lindrigt □ inget
19	**koncentrationsproblem**	□ svårt □ medelsvårt □ lindrigt □ inget

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