

Day Surgery

Routines, pain and recovery



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UNIVERSITY OF GOTHENBURG

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To all my day surgery friends and co-workers

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ABSTRACT

Day surgery in Sweden is increasing both in numbers and in types of procedures. Also older and sicker patients are often included in day case surgery programs, which puts an extra demand on good practice.

Methods: Study I: Questionnaires regarding routines used in 2005 were sent to all day surgery clinics in Sweden. Studies II, III, IV: These studies (in 355 patients) were designed as prospective, multi centre, self-assessed follow-up studies, where questionnaires were answered by the patients preoperatively and up to 6 months after surgery. Three typical day surgery procedures were chosen; inguinal hernia repair, arthroscopic procedures, cosmetic breast augmentation. A preoperative health profile was the starting point. An extended 8-item EQ-5d questionnaire was used. The questions focused on quality of life and on pain. Study V: This interventional pain study after hallux valgus surgery was designed as a prospective, randomized double blind study in 100 patients.

Results: In study I was shown that a high degree of standardization is present among Swedish day surgery units with pain being the most common postoperative problem. Study II showed that tobacco use by smoking or snuffing decreased postoperative nausea but had no effect on postoperative pain. In study III, unplanned hospital contacts were recorded for 70/355 patients while 3 patients were readmitted. Postoperative pain was reported in 40%, 28% and 20% of included patients after 1, 2 and 4 weeks respectively. Presence of pain preoperatively was identified as the main predictor for postoperative pain. In study IV, longitudinally changes in 8-item health profile was shown to be different between procedures during 6 months follow-up. In study V we showed that in treating postoperative pain, etoricoxib was more effective with fewer side effects than tramadol.

Conclusions: Day surgery as presently performed is safe and without major morbidity. The preoperative health profile is important for the recovery course. Pain is the main reported postoperative problem followed by mobility problems. Recovery is divergent for different surgery and calls for different follow-up times. In treatment of pain after foot surgery, the NSAID etoricoxib is shown to be more efficient than tramadol without deleterious effects on healing.

Key words: day surgery, postoperative pain, analgesics, tramadol, etoricoxib, postoperative nausea and vomiting (PONV), nicotine, snuff, recovery, EQ-5d, health profile, self-assessed questionnaire, follow-up.

CONTENTS

ABSTRACT	3
CONTENTS	4
LIST OF PUBLICATIONS	6
ABBREVIATIONS AND EXPLANATIONS	7
THESIS AT A GLANCE	8
INTRODUCTION	9
History	9
DS versus in-hospital surgery	10
Benefits	10
Future perspectives	10
Pain treatment	10
The recovery process and tools to assess recovery	11
Follow-up	11
Health profile	11
Guidelines	12
Study I-V	12
AIMS	13
MATERIAL AND METHODS	14
Study I:	14
Study II-IV:	14
Study V:	15
Questionnaires, EQ-5d and 8-item health profile:	16
Statistics:	16
STUDY SUBJECTS	17
Study I:	17
Studies II-IV	18
Study V	18
REVIEW of RESULTS	19
Study I	19
Study II-IV	20
Study V	28
Summary	30
DISCUSSION	31
Hypothesis and aim	31
Background and present status of DS (study I)	31
Selection criteria	31
Preoperative planning	32
Routines	32
The DS unit	33
Information, safety aspects	33
Surgery and anaesthesia	33
Discharge criteria	34
Readmission	34
Quality and safety consideration	34
Postoperative restitution	35
Study II-III-IV-V	35
Management of postoperative pain	35
Acute pain, quantity and scales	35

Multimodal pain treatment	35
Pain and gender differences	35
Acute postoperative pain	36
Individual response	36
Prediction of pain	36
Non-steroid anti-inflammatory drugs	37
Opioids	37
Anti-epileptic drugs	37
Local anaesthetics	38
Treatment of long-lasting pain	38
Continuous delivery of local anaesthesia	38
Analgesic treatment outcome	38
Persistent postsurgical pain	39
Risk factors	39
Prevention of long-lasting pain	39
Postoperative nausea and vomiting	40
Nicotine use	41
Prophylactic treatments	41
Corticosteroids	41
Recovery follow-up	41
Preoperative profile	42
Definitions of recovery	42
Follow-up methods	43
Quality of life	43
Duration of follow up	44
Information, recovery aspects	44
Post-discharge, need for help and contacts	44
Satisfaction	45
Limitations	45
Future perspectives	46
CONCLUSIONS and IMPLICATIONS	48
Patient selection for prophylactic treatment	48
Optimised pain treatment	48
Quality control and methods for follow-up	48
Duration of follow-up	48
Patient information	49
Summary	49
ACKNOWLEDGEMENTS	50
REFERENCES	51
POPULÄRVETENSKAPLIG SAMMANFATTNING	60
STUDIES I-V	
QUESTIONNAIRES	

LIST OF PUBLICATIONS

Original studies

This thesis is based on the following studies, which will be referred to in the text by their roman numerals:

- I. Segerdahl M, Warrén-Stomberg M, Rawal N, Brattwall M, Jakobsson J. Clinical practice and routines for day surgery in Sweden: results from a nation-wide survey. *Acta Anaesthesiol Scand.* 2008 Jan;52(1):117-24.
- II. Brattwall M, Warrén Stomberg M, Rawal N, Segerdahl M, Houltz E, Jakobsson J. Postoperative impact of regular tobacco use, smoking or snuffing, a prospective multi-center study. *Acta Anaesthesiol Scand.* 2010 Mar;54(3):321-7.
- III. Brattwall M, Warrén Stomberg M, Rawal N, Segerdahl M, Jakobsson J, Houltz E. Recovery after day surgery; a prospective questionnaire survey during the first 30 days. Epub ahead of print. *Acta Anaesthesiol. Scand.* 2010 Oct.
- IV. Brattwall M, Stomberg MW, Rawal N, Segerdahl M, Houltz E, Jakobsson J. Patient assessed health profile: a six-month quality of life questionnaire survey after day surgery. *Scand J Public Health.* 2010 Aug;38(6):574-9.
- V. Brattwall M, Turan I, Jakobsson J. Pain management after elective hallux valgus surgery: a prospective randomized double-blind study comparing etoricoxib and tramadol. *Anesth Analg.* 2010 Aug;111(2):544-9.

ABBREVIATIONS AND EXPLANATIONS

APP	acute postoperative pain
AS	arthroscopy surgery
ASA	American society of anaesthesiologists
CBA	cosmetic breast augmentation
Coxibs	subclass of non-steroidal anti-inflammation drug
Cox-2-inhibitor	cyclo-oxygenase inhibition drug
CPSP	chronic postsurgical pain
DS	day surgery
EQ-5d	euro quality 5 dimensions
5-HT3-blocker	5-hydroxytryptamin subtype-3-blocker
HRQOL	health related quality of life
HVS	hallux valgus surgery
IAAS	international association of ambulatory surgery
IASP	international association for the study of pain
IHR	inguinal hernia repair
In-hospital	procedure with patient staying at hospital
In-patient	procedure with patient staying at hospital
MMPT	multi modal pain treatment
NNT	number needed to treat
NSAID	non-steroidal anti-inflammatory drug
NRS	numerical rating scale for pain assessment
Outpatient	procedure performed as day surgery
PACU	post-anaesthesia care unit
PCA	patient controlled analgesia
PON	post-operative nausea
PONV	post-operative nausea and vomiting
POP	postoperative
PPSP	persistent postsurgical pain
QoL	quality of life
Recovery	the process of recovery from illness
SFAI	“svensk förening för anestesi och intensivvård”
Snuff	moist powder tobacco
VAS	visual analogue scale

THESIS AT A GLANCE

	Aim and focus	Study size	Study period	Methods	Results
Study I	Inventory of routines in Sweden	92 hospitals	One year (2005)	Questionnaire	Standardized regimes. 50% day surgery. Pain the main symptom
Study II	Impact of tobacco use on PONV and pain	n=390	Until 1 week post-surgery	Prospective questionnaires Multi-centre	Smoke and snuff reduce PONV. Age and gender influence PONV.
Study III	Recovery Readmissions Contacts Pain	n=390	Until 4 weeks after surgery	Prospective questionnaires End-points: improved recovered	Pain the main symptom. Day surgery is safe. Recovery is procedure specific.
Study IV	Health profile Quality of life	n=390	Until 6 months after surgery	Prospective questionnaires End-point: fully recovered	Preoperative profile is important. Different follow-up times required.
Study V	Choice of analgesics Coxib or Tramadol after hallux valgus	n=50 + 50	1 week 2 weeks 16 weeks	Prospective randomized double-blind Phone and visits	Etoricoxib most effective and less side-effects. No impaired healing.

INTRODUCTION

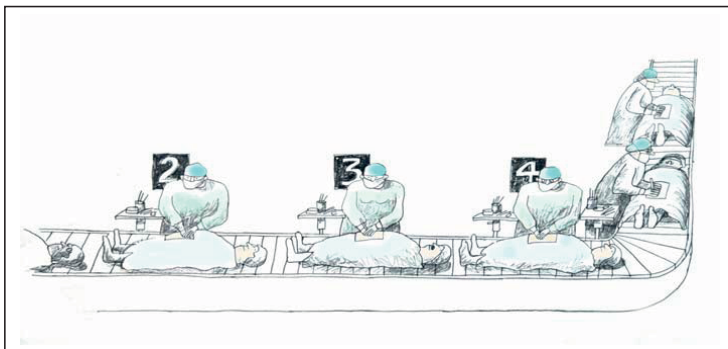
The concept of day surgery; i.e. to permit a patient to arrive in the morning and after a surgical procedure return home in the evening is not new. James Nicoll (1864-1921) is considered the father of day surgery. At the Sick Children's Hospital in Glasgow, he performed nearly 9000 paediatric day surgery cases that he reported in the British Medical Journal 1909 (1). During evolution of day surgery many different names have been used, for example: day surgery, ambulatory surgery, same day surgery, 23 hours surgery, extended day surgery, out-patient surgery and office-based surgery, to name a few (2). A general trend is reduction in the length of hospital stay (3). Traditional day surgery is always elective surgery. Terminology and definitions have been suggested by the International Association of Ambulatory Surgery (IAAS, <http://iaas-med.com>). In Sweden, day surgery usually means that patients leave the hospital the same day as the surgery and sleep in their own bed at home. In this thesis, the term day surgery (DS) will be used in that sense.

History

DS started with short procedures performed at the same unit as the in-hospital operations. In the era of general anaesthesia, meaning ether or chloroform, these DS procedures were limited to regional or local anaesthesia. No specific procedures were designed for the DS cases. Not until 1962 did the first specific hospital based DS unit start at UCLA (University of California at Los Angeles), USA (4).

The first units in Sweden, called DS units, started early in the 1980's, although many hospitals still do not have separate DS units. In these hospitals DS patients and in-hospital patients are mixed, making it difficult to optimize routines to suit DS cases. If the same standard routines are used for both in-house and DS patients, these routines will not be optimized for the DS patients.

During the last 20-30 years, the Scandinavian development of DS has focused on safe routines, short acting anaesthesia and specific processes for DS patients. The Swedish Day Surgery Association started in 1999. In this forum standards for Swedish DS are developed.



DS versus in-hospital surgery

Less invasive surgical procedures, new short acting anaesthesia agents and better management of postoperative pain and nausea have facilitated the increase in DS. Analysis by van der Oever et al and Rosen et al showed DS to be cost-effective, as the short hospitalization time and decreased staff reduce costs (5-6). However, DS puts increased demands on patient selection and optimized routines, in order not to negatively affect patient safety. Previous investigations have not found complication rates to be higher for DS compared to in-hospital surgery, if patients are carefully selected (7-8). Careful preoperative evaluation and patient information are fundamental for minimizing deviations from optimal course after DS.

Deficits in DS processes are cancellation, non-planned hospital admission or need for readmission which all are negative for quality, safety and costs. Readmission rates or other postoperative healthcare contacts are normally low and not higher than for patients discharged after in-patient surgery (9). During the recovery period at home, the patients may need to contact the DS unit, general practitioner or other health care providers. Information regarding whom to contact if needed has to be supplied before discharge (10).

Benefits

There are also benefits for the DS patients such as fewer infections, reduced risk for thrombo-embolism due to the early ambulation and less anxiety and confusion in the elderly (11).

Future perspectives

DS is increasing both in Sweden and in the rest of the world. In Sweden in 2008, about 60% of all surgery was performed as DS according to statistics from the Swedish National Board of Health and Welfare (Socialstyrelsen, www.sos.se). A further expansion in DS can be expected, the potential is estimated to be as high as 75% of all surgical procedures (12). This increase in DS requires well coordinated process based routines and trained staff focusing on patient safety, while still making it possible for the patient to be discharged the same day as surgery. Aspects like general health, daily living, psychosocial status and type of surgery have to be addressed prior to decision of DS instead of in-hospital surgery. For safety reasons, the patient must be able to cope with transport, be able to stay at home and have to have an adult to help if needed the first night after surgery (13). In order to safely transform in-house cases to DS cases it is necessary to develop and establish high quality DS facilities and routines that are subject to continuous follow up procedures.

Pain treatment

Already Hippocrates and Descartes described pain treatment as important. In spite of all efforts in the field of pain control, the patients still suffer from severe pain after surgery. Dolin et al studied the effectiveness of pain control after surgery and found that many patients have moderate or severe postoperative pain (14). The

International Association for Study of Pain (IASP) in a follow-up of this work, observed no improvement 5 years later. The recently developed multimodal approach of pain control is a method of combining different analgesics in order to improve pain treatment and to reduce its side effects (15). Methods of better pain control during the whole postoperative period and less invasive surgical procedures are the major parts of future development of DS.

The recovery process and tools to assess recovery

The recovery process may be separated into different stages:

- **Early** recovery means restoration of vital functions, which can be assessed by the Aldrete score (vital signs, ambulation and mental status, pain and postoperative nausea and vomiting (PONV), surgical bleeding, intake and output) (16).
- **Fast track** is when the patient by-passes the post-anaesthesia care unit (PACU) after short acting anaesthesia and goes direct to the recovery phase (17).
- **Discharge eligibility** is when the patient is able to drink, void and ambulate without major pain and/or nausea, (18-20).
- **Street fit** means that the patient can resume normal activity without any procedure related interferences (21).

Follow-up

Previous studies of postoperative effects of surgery on daily living have described the recovery process (21). These results have led us to believe that studies of postoperative recovery after DS may benefit from a longer perspective than the immediate postoperative period. As a matter of fact, the International Association of Ambulatory Surgery (IAAS), have recently suggested that follow-up of recovery after DS should cover 30 days after surgery (<http://www.asahq.org/publicationAndServices/outcomeindicators.pdf>). As DS is performed upon various patient groups and includes a wide variety of surgical procedures it seems reasonable that the time to full restitution after DS may be variable within wide time limits.

Health profile

The factors influencing the recovery process are incompletely investigated. As mentioned above, individual patient factors as well as factors being part of the surgical procedure may influence recovery. Presumably the postoperative course may be related to the preoperative status of the patient, an issue investigated in this study. Preferably this could be achieved by relating to a standardised preoperative health profile submitted by the patient. The relevance of such a health profile should be evaluated for several different surgical procedures in order to investigate whether a reliable prediction of the postoperative process could be made.

Guidelines

Rapid return of vital functions, resumption of activities of daily living and patient satisfaction are important for the improvements in DS care. The post-discharge recovery process is not well defined or studied. Appropriate procedure specific programs addressing such questions as how, when and for how long the patients should be followed-up are not developed or coordinated. Swedish DS routines such as self-assessed health check up lists, preoperative routines, prophylactic pain treatment, and follow-up programs are not coordinated. The ambition to further increase quality in Swedish DS would probably benefit from more cooperation, such as locally gained experiences could be utilized and coordinated in the development of national guidelines.

Study I-V

In order to evaluate the present status of DS in Sweden, a questionnaire study, involving all Swedish hospital, was designed. The questions in this study covered DS volumes, DS routines, and follow up of the postoperative course after DS (study I). One purpose of this thesis was to investigate the characteristics of different procedures, by investigating the postoperative course after DS, with special regard to time of recovery and problems arising during the recovery period (study III-IV). A thorough knowledge of these matters is a pre-requisite for designing follow-up programs tailored to individual surgical procedures. Previous investigations have shown that some of the key points for good results after DS are the evaluation and treatment of pain, nausea and vomiting, dizziness and of mobility problems (20).

One of the challenges of the early recovery phase is to what extent nausea and pain endanger the possibility for the patient to return home. From study I, it became clear that a large number of different approaches to these problems are used at different hospitals.

Previous studies have shown that smokers have lower incidence of postoperative nausea and vomiting than non-smokers (22). It has, however, not been clear whether this phenomenon is related to the nicotine content of cigarette smoke, or if some other constituent is responsible. A study of postoperative pain, PONV and analgesic use and the relation to these variables to the preoperative health profile was designed (study II). Since it is possible that the extent of nausea and pain as well as other postoperative problems might be influenced by the preoperative health profile, we analysed the impact of preoperative pain, analgesic and nicotine use on the early recovery phase.

The question has been raised whether opioid-based postoperative pain control is necessary after DS or if satisfactory pain control may be achieved in selected cases with analgesics of other kinds (23-24). In order to investigate this, we analysed pain control after hallux valgus surgery. We compared two different pain regimes; either tramadol or etoricoxib, evaluating efficacy and patient satisfaction in the early postoperative period. The patients were followed up to 16 weeks after surgery and outcome was assessed both by the patient and by the physician (study V).

AIMS

The general aim:

To investigate routines of DS, pain and recovery in DS patients and to improve knowledge of the postoperative course for different typical DS procedures

Study I:

To gain insight into DS routines and to explore the present volume of DS in Sweden

Study II:

To evaluate the early recovery phase (first week) after DS and to study the impact of tobacco use on postoperative pain, nausea and vomiting

Study III:

To investigate patients' self-assessed recovery, focusing on development and restoration of health related quality of life during the first 30 days after DS

Study IV:

To explore longitudinal changes in self-assessed health profile related quality of life during 6 months after DS, including description of the normal course of resolution of pre- and post-operative symptoms

Study V:

To study the efficacy of a structured pain management program and to compare, in a prospective randomized double-blind design, the effect of two different pain medications, coxibs vs slow release tramadol and to study recovery in EQ-5d after DS

MATERIAL AND METHODS

See questionnaires in appendix

Study I:

In 2006, an extensive questionnaire was supplied to 92 Swedish anaesthesiology departments, who were asked to answer 30 questions regarding clinical practice and routines for DS during 2005 (the questionnaire is not supplied in the appendix due to its extent). This questionnaire contained questions about organisation, number and type of procedures, evaluation, risk-stratification, pre-medication, postoperative routines for pain and PONV treatments, discharge, information, escort, follow-up, readmission, new procedures and about pre-defined procedures if such were performed as day case surgery.

(The questionnaire also included questions concerning 3 typical paediatric DS procedures and 3 typical adult DS procedures. These results are presented in 2 separate articles not included in this thesis).

Study II-IV:

Data for these prospective multi-centre questionnaire follow-up studies were collected from autumn 2006 until spring 2008. The studies involved 3 different centres: Arvika hospital for inguinal hernia repair (IHR), Sahlgrenska University Hospital/Mölndal for arthroscopy procedures (AS) and Falköping Cosmetic Surgery Centre for cosmetic breast surgery (CBA).

After giving and signing an informed consent form, the included patients were required to answer a preoperative questionnaire (appendix 1). In the PACU, specially designated nurses registered pain, nausea, medications and side effects. At discharge the patients received questionnaires to fill in at home, the first day after surgery and after 1 week (appendix 2). Questionnaires at predetermined occasions; after 2 weeks, 4 weeks, 3 months and 6 months (appendix 3), were sent to the patients together with pre-prepared envelopes to be returned by mail (table 1).

Two reminder telephone calls or mails were sent in case of no reply. When the patients were fully recovered, the end-point was reached and no more questionnaires were sent. All questions had the structured alternatives “yes” and “no”, together with a possibility to leave comments.

Table 1: Time points for patient assessed questionnaires in studies II-IV.

Time: Study no:	Pre-operative	Recovery room	Day 1	1 week	2 weeks	4 weeks	3 months	6 months
3								
4								
5								

The major anaesthetic method was general anaesthesia with laryngeal mask. Pain was treated using the multimodal approach; preoperative paracetamol to all patients, NSAID to some, steroids per- or post-operatively only if nausea, and local anaesthesia at the surgical site. Post-operative analgesics were given as intravenous opioid if needed at PACU, paracetamol and a weak opioid if needed at home together with an NSAID.

Study V:

Patients scheduled for hallux valgus surgery were randomised to 2 different oral analgesic treatment groups by a computer procedure. The first group was postoperatively treated with etoricoxib 120 mg x 1 for 4 days and then 90 mg x 1 for 3 days. The second group received sustained release tramadol 100 mg x 2 for 7 days. A hospital pharmacist prepared the study medication in identical-appearing capsules. The first group received placebo at the afternoon dosage to blind the content to patient and staff. All patients were provided paracetamol as first line rescue medication, and oral oxycodone 5 mg in an escalating manner as second line rescue, if needed.

The same perioperative protocol was used for all patients. After 8 mg of betamethasone iv, general anaesthesia with alfentanil, propofol and sevoflurane was used.

The patients filled in a daily diary the 7 first days after surgery. They answered questions (appendix 4) about worst pain and pain relief using a VAS-scale, satisfaction and experience of side effects. The patients were also required to answer an EQ-5d questionnaire and a quality of life VAS scale (0-100) preoperatively and at 16 weeks.

After 12-16 days, all patients were seen by a research nurse to remove stitches and to evaluate wound healing. After 12 weeks, a CT-scan was performed to diagnose signs of impaired bone healing. At 16 weeks after surgery, a physician assessed healing and functionality together with the patient in association with an EQ-5d questionnaire assessment.

Questionnaires, EQ-5d and 8-item health profile:

Euro Quality 5 dimensions (EQ5d) is a standardized instrument for measurement of health status and outcome (25). It is frequently used in clinical questionnaires because it is easy to use as a self-report instrument. This descriptive system of health-related quality of life status, consists of the five dimensions; pain/discomfort, mobility, self-care, usual activities and mood/depression. The responses have 3 levels; no problem, some problems, extreme problems.

In study II-IV, we used a questionnaire based on these basic 5 EQ-5d domains but included also questions about sleep, impaired sexual activity and need for analgesics. There were two alternatives, only yes and no (appendix 1, 3).

In study V, the normal EQ-5d questionnaire with 5 dimensions and in addition the QoL VAS scale, was used (e.g. the first morning after operation, appendix 4).

Statistics:

All analyses were performed using the Statistical Package for the Social Sciences (SPSS) version 15.0.

Continuous data was analysed by t-tests for two-group comparisons and by ANOVA for multiple group comparisons, when a normal distribution of data could reasonably be assumed. In cases where this assumption was not considered valid, a Fischers test was used. The mass-significance problem was addressed by using Bonferroni corrections of significance levels where appropriate.

Categorical data were compared using Chi-square tests for independent groups and Mc Nemars test for dependent (repeated measures) data.

Logistic regression was used in study II, for evaluation of differences over time between the genders.

Continuous data is presented as means and standard deviations, categorical data as frequencies.

For all statistical analyses, a significance level of $p < 0.05$ was used.

STUDY SUBJECTS

Study I:

The following 92 hospitals were asked

Alingsås	Landskrona	Uddevalla
Arvika	Lidköping	Umeå – 3 units
Borås	Lindesberg	Uppsala – 3 units
Bäckefors	Linköping	Varberg
Eksjö	Ljungby	Visby
Enköping	Luleå	Värnamo
Eskilstuna	Lund	Västervik
Falkenberg	Lycksele	Västerås
Falköping	Malmö	Växjö
Falun	Mora	Ystad
Finspång	Nacka	Ängelholm
Gällivare	Norrtälje	Örebro - 4 units
Göteborg - 6 units	Nyköping	Örnsköldsvik
Halmstad	Oskarshamn	Östersund
Helsingborg	Piteå	
Hudiksvall	Sandviken	
Hässleholm	Skellefteå	
Jönköping	Skene	
Kalix	Skövde	
Kalmar	Sollefteå	
Karlshamn	Stockholm – 11 units	
Karlskoga	Strömstad	
Karlskrona	Sundsvall	
Karlstad	Södertälje	
Katrineholm	Torsby	
Kristianstad	Trelleborg	
Kungsbacka	Trollhättan	
Kungälv	Täby	

Studies II-IV

Table 2a: The study subjects in study II, III and IV:

	IHR	AS	CBA	Total
Number allocated	120	132	138	390
Number included	107	122	126	355
Age (mean years)	63	42	27	41
Smokers and/or snuffers	29	42	41	112
Gender M/F %	82/18	52/48	0/100	43/57
Hospital	Arvika	Mölndal	Falköping	
ASA 1	58	91	114	263
ASA 2	42	21	4	67
ASA 3	5	4	-	9
ASA 4	-	6	-	6
ASA miss	2	-	8	10

Study V

Table 2b: The study subjects in study V

	Etoricoxib	Tramadol	Total
Number asked	50	50	100
Number included	49	49	98
Age (mean years)	47±11	51±10	49
Smokers	7	7	14
Gender M/F %	0/100	0/100	0/100
ASA 1	41	40	81
ASA 2	8	9	17

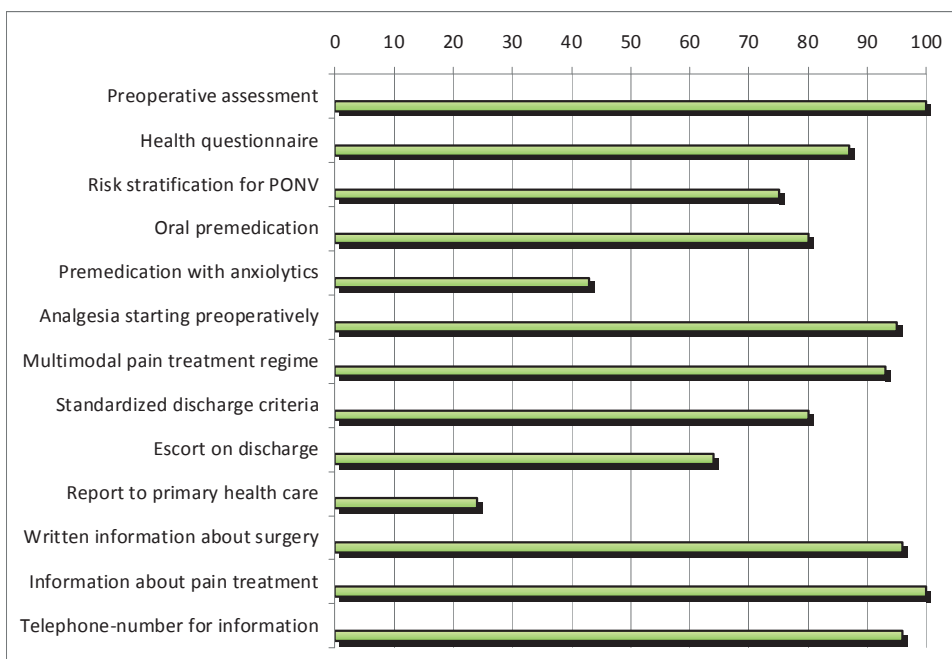
REVIEW of RESULTS

Study I

Of the 92 Swedish hospitals, 81 answered resulting in a response rate of 88%. Two of the hospitals were only for children. The 11 non-responders were evenly distributed across Sweden and of different sizes. In 2005 more than 50% of all Swedish surgical procedures were performed as DS. No absolute upper limit of weight or age was found; 32% of the units reported an upper limit for BMI at 35, 12% of the units used an upper limit of 75 years if general anaesthesia was considered necessary.

DS routines in Sweden were found to be almost similar between centres and with a high degree of standardisation. We also found the routines similar to common international practice. In figure 1, routines used by different units are shown in percent of all responding units.

Figure 1: Frequencies of performed routines at all Swedish day surgery units, %



All hospitals reported pain to be the main problem after DS. Most units started pain treatment already with premedication. Paracetamol was used by 95%, NSAID by 73% and coxibs only by a few units. At a mean VAS score of >3.6, rescue medicine was given, parenterally ketobemidone was the most common add-on analgesic used. As take-home medication, paracetamol was usually supplied as a base, weak opioids

were provided for 1-3 days if moderate pain while oxycodone was provided for severe pain by 42% of units.

Study II-IV

In these studies, 390 patients agreed to participate; 120 inguinal hernia repairs (IHR), 132 arthroscopic procedures (AS) and 138 cosmetic breast augmentations (CBA) was screened.

35 out of these 390 eligible patients were excluded due to:

- Language difficulties
- Surgery was changed to a more extensive procedure leading to in-hospital stay
- Patient changed their mind before discharge and did not want to participate
- Signed consent was missing

Patients' preoperative health profile (table 3) was used as base line data for the 3 different surgery groups. Headache, sick-listed or waiting time was not included in the recovery health profile.

Table 3: Preoperative health profile in *numbers* and *%* (from EQ-5D-questions; **pain, mobility, depression, self care, usual activities** and 6 additional items).

	IHR <i>n=107</i>	AS <i>n=122</i>	CBA, <i>n=126</i>	% of all
1. Pain trouble	52 *	80 *	6	40%
2. Mobility problems	33 *	68 *	9	31%
3. Depressed mood	11	21	6	11%
4. Difficulties to manage self-care	2	2	2	2%
5. Socially inactive outside home	19	18	10	13%
6. Sleeping disturbance	20	30	5	15%
Headache	14	20	14	15%
7. Disability to sex	21	8	9	11%
8. Need of analgesics >3 times/week	15	29	4	14%
Sick-listed > 1 week before surgery	14	31	7	15%
A waiting time > 3 month before surgery	75	70	25	48%

* $p < 0,05$ between groups.

Pain at PACU was rated by the visual analogue scale (VAS) for the 3 groups, at rest and at ambulation (figure 2) showing that 36% of patients had a VAS scored > 3 at ambulation (table 4). At rest the mean VAS score was for IHR 1.7, for AS 1.7 and for CBA 3.6. Both at discharge and the first day, the CBA group had more patients in pain compared to IHR and AS groups.

Preoperative nicotine use and analgesic consumptions did not change the pain frequency at PACU, while patients with preoperative pain were significantly associated with more pain (table 5b). The group of patients using nicotine had fewer individuals both at hospital and the first day at home, rating pain, however. These findings were not consequently significant.

Table 4: Patients in pain at different time points (%) from all included

Time points	IHR + AS + CBA n= 355	Nicotine-user	Non-nicotine-user
PACU	36 % VAS > 3 at ambulation		
At discharge		27 %	44 %
Day 1	56 %	49 %	58 %
1 week	40 %		
2 weeks	28 %		
4 weeks	20 %		

Nicotine use by smoking and or snuffing was found to reduce the probability for nausea in both genders at recovery. Elderly patients and gender men had the least risk for nausea (table 5b, 6 and figure 2a created from figures in table 6). This result indicates that nicotine use could be important information in preoperative risk assessment, and affect preoperative nausea prophylaxis.

Figure 2: Mean VAS, pain score at rest and in movement at recovery

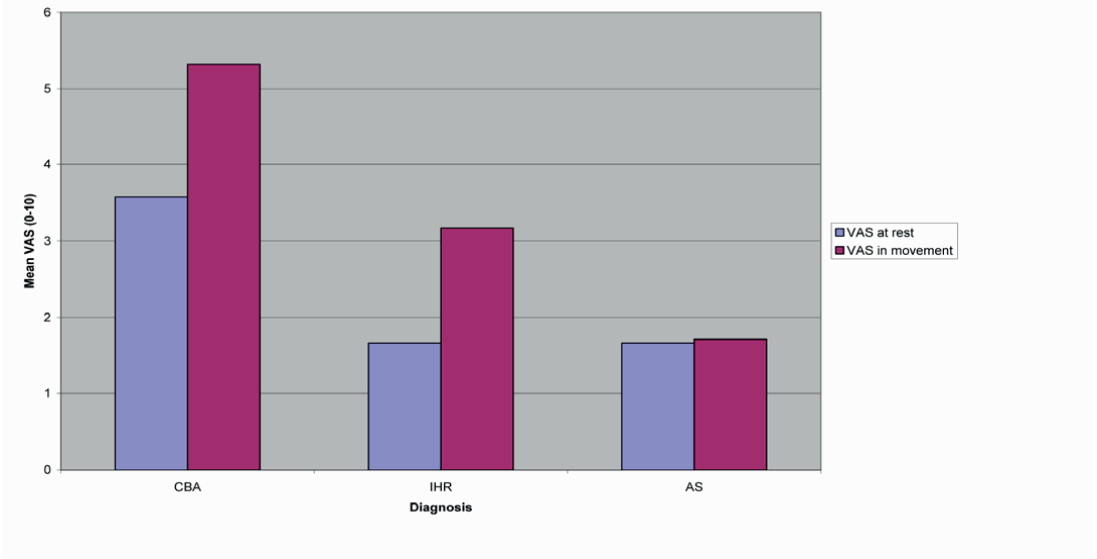


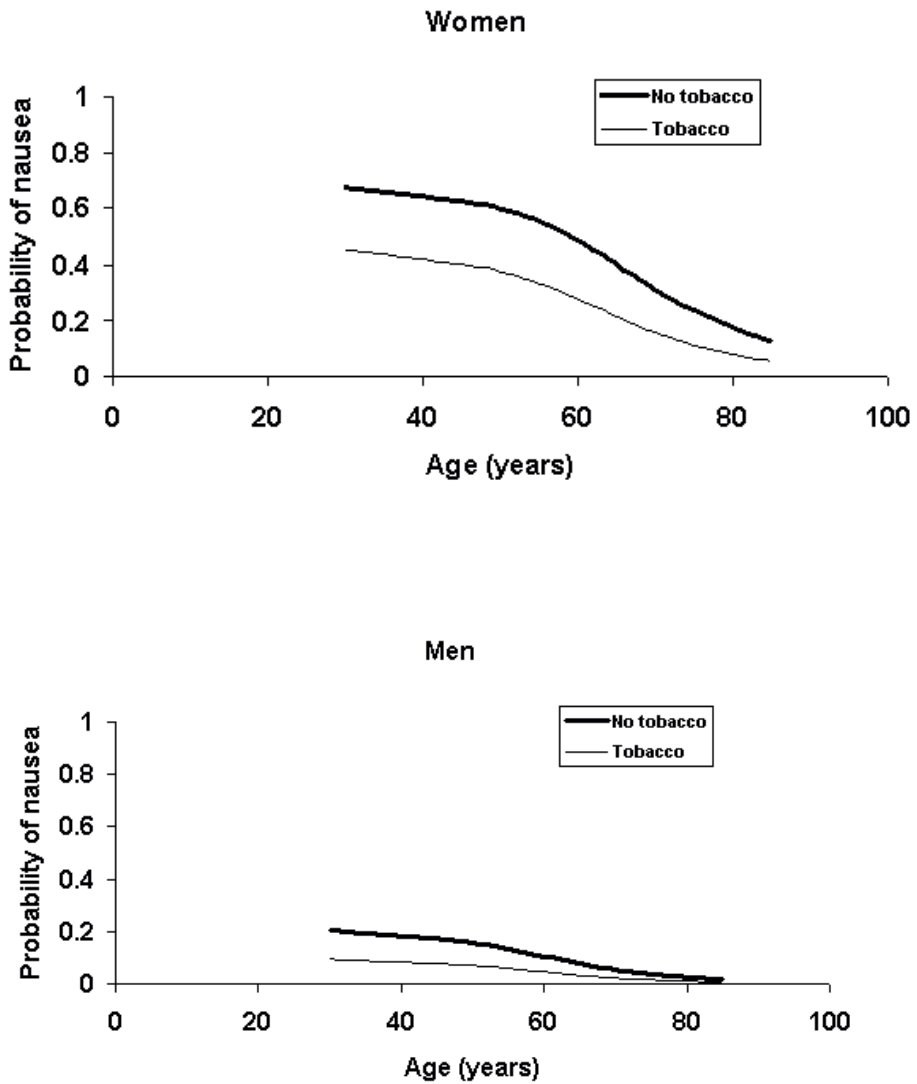
Table 5b: Conclusion at recovery

	Pain at recovery	Nausea at recovery
Preop. Nicotine use	→	↓*
Preop. Pain	↑***	↑***
Preop. Analgesic use	→	↑*

Table 6: Risk for nausea in the recovery room (PACU)

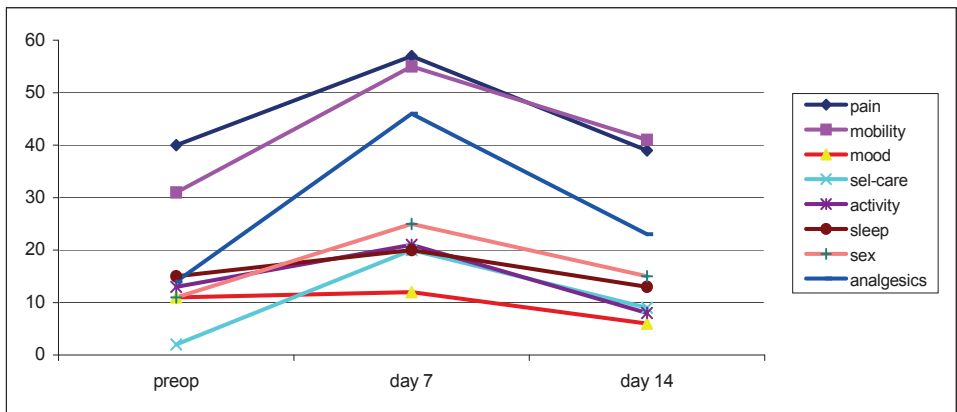
Variable	p-value	OR(95% CI)
Age	0.0256*	0.97(0.95-1.00)
Sex(0=men,1=women)	0.0000***	7.61(2.88-20.09)
Smoking or snuffing	0.0079**	0.42(0.22-0.79)

Figure 2a: Probability of nausea at recovery for men/women and age (spline function, logistic regression)



When we followed the development and restitution of symptoms in our 8-item health quality parameters, we found, when considering the whole group, that most of the patients were almost restituted 14 days after surgery (figure 3).

Figure 3: Percent patients reporting impairment in health related quality of life, related to their surgical procedure, specific for each item (n=355)



Analysing every group for the same items, we found improvements compared to the preoperative profile for the IHR group, both improvements and worsening for the AS group and most worsening for the CBA group during the first 2 postoperative weeks (table 7).

Table 7: Changes and proportion of patients in each group studied, in the 8-item health profile questions at 2 weeks as compared to base line (preoperatively). All figures in %

	IHR	AS	CBA	Entire cohort
1.Pain	49-30 Im *	66-45 Im **	5-42 W***	40-39 Im
2.Mobility	29-21 Im	56-64 W **	6-37 W***	31-41 W
3.Mood	10-2 Im	17-10 Im	5-6 W	11-6 Im
4.Self-care	2-0 Im	2-18 W	2-8 W	2-9 W
5.Activity	18-5 Im	15-14 Im	8-4 Im	13-8 Im
6.Sleep	19-2 Im	25-17 Im	4-19 W	15-13 Im
7.Sex	20-14 Im	7-20 W	7-11 W	11-15 W
8.Need for analgesics	14-9 Im	24-28 W	3-32 W	14-23 W
	8 improved	4 impr/4wors	1 impr/7wors	4 impr/4wors

Improved

Worsening

* p<0,05, ** p< 0,001, *** p< 0,0001

Pain was the main disability for all patients during the whole follow-up period of 24 weeks (6 months), mobility disabilities being the second worse (figure 4 and 5).

Figure 4: Percentages of included patients reporting pain

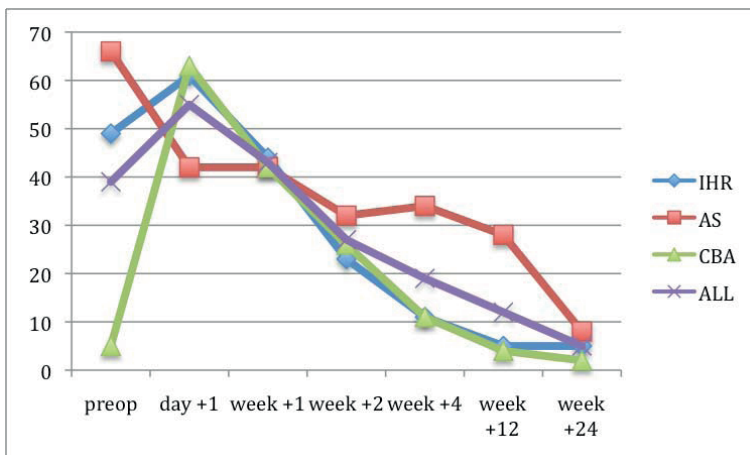
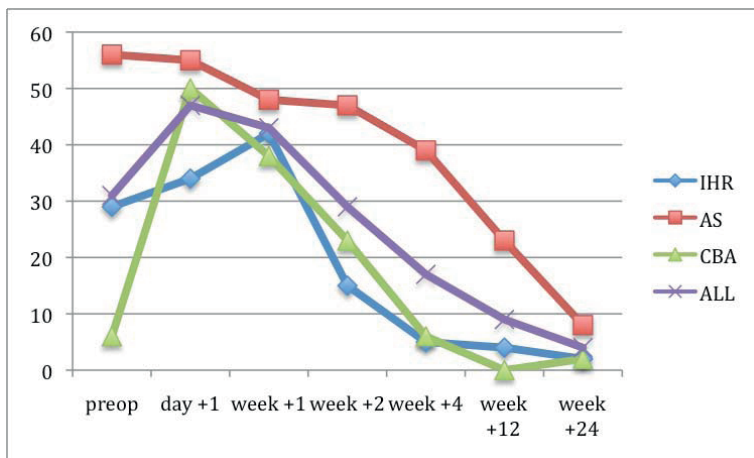


Figure 5: Percentages of included patients reporting mobility problems



When we analysed the self-assessed questionnaires we found that the recovery profile differed between the procedures studied.

When following individual patient data, it was found that preoperative pain was associated with a significant higher risk for pain also at PACU and after one postoperative week (study III).

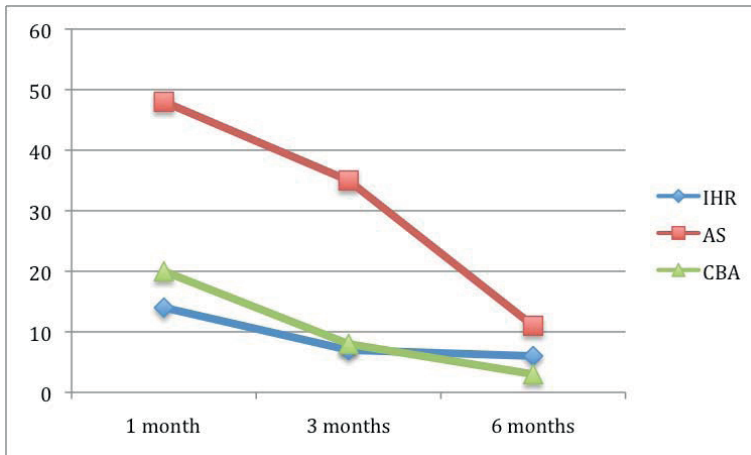
We also found that patients with remaining pain after 30 days had a different preoperative health profile, especially evident for patients in the AS group (table 8). Follow-up at 30 days reveal that 19% (67/355) of the patients reported surgery related pain. When analysing this group, only preoperative pain among AS patients showed a significant association with pain after 30 days. Preoperative depression, analgesic use, immobility or female gender, were not found to be associated to surgery related pain at the 30-day follow-up.

Table 8: Number of patients with pain at 30 days and their preoperative profile

	IHR	AS	CBA	Total
Pain at 30 d	12	41	14	67
Preoperative pain sign	9	33	2	44
	p=0.2058	p=0.0075**	p=0.1709	
Preoperative depression sign	5	10	1	16
	p=0.2042	p=0.8051	p=0.6088	
Preop. analgesic use	4	15	1	20
Preop. immobilization	8	21	1	30
Female gender	3	23	14	40

All surgery related symptoms, pain, immobility, depressed mood, disturbances in self-care, activity, sleep or sexual function and analgesic use were added together and the sum was called "discomfort of any kind".

Figure 6: Proportions of patients reporting surgery related discomfort of any kind at 1, 3 and 6 months, % of all participants included



The end-point; when patients were fully recovered differed among the procedures. IHR and CBA patients followed the same path of restitution although the starting points were not identical. The AS patient group showed a slower restitution of symptoms, when answering, "do you feel any surgery related discomfort of any kind"? (figure 6).

Study V

In this HVS intervention study comparing the selective coxib etoricoxib and tramadol after hallux valgus surgery, pain relief during the first postoperative week was found to be better in the etoricoxib group than in the tramadol group. Scored maximal pain was higher in the tramadol group during the first postoperative week (figure 2 in study V). In table 9, pain ratings as mean VAS score are presented for the entire group.

Table 9: Pain at different time points for all HVS patients n=98 (mean VAS at PACU, after 1 day and 1 week, % of patients in pain after 16 weeks)

	Mean VAS / pain %
PACU	2.1
Day 1	3.2
1 week	2.0
16 weeks	19 % of patients

We found that patient satisfaction was better, 47/49 in the etoricoxib group, compared to 39/49 in the tramadol group. There were few adverse events. Side effects were reported from 8 patients in the etoricoxib group and from 35 patients in the tramadol group (table 3 in study V). Satisfaction rate with pain management was 88% of patients. No impaired healing or cardiac adverse events were noted in patients' assessed outcome at 16-week follow-up (table 4 and 5 in paper V).

Patients scored their quality of life prior to surgery and after 16 weeks. An increased score was found in both groups but not significant between groups or between time points (table 10). Also pain relief scored in % with a maximum of 100% effectiveness is shown in table 11. Pain relief was high in both groups with an increased mean pain relief score day 1-7 in the etoricoxib group. Maximal VAS pain score during the period, showed a peak on day 2 and 3, with a mean score significant lower for the etoricoxib group compared to the tramadol group.

Table 10: QoL VAS score in %.

Quality of life VAS score from EQ-5D (1-100)			
	etoricoxib	tramadol	p
Preoperatively	88	92	ns
After 16 weeks	94	95	ns

Table 11: Pain relief from study medication VAS score (0 -100 % effective)

	etoricoxib (n=49)	tramadol (n=49)	P
Pain relief Day 1	90 ± 13	86 ± 13	ns
Pain relief Day 2	85 ± 17	78 ± 18	p = 0.0454
Pain relief Day 3	89 ± 16	80 ± 20	p = 0.0143
Pain relief day 4	93 ± 12	87 ± 17	ns
Pain relief Day 5	94 ± 11	87 ± 19	p = 0.0472
Pain relief Day 6	94 ± 11	90 ± 17	ns
Pain relief Day 7	93 ± 14	89 ± 19	ns
Mean Pain relief score			
Day 1-7 Mean max VAS ≥ 3 at anytime during the 7-day medication period (No. of Pat.)	92.0 ± 11.8	85.4 ± 14.9	p = 0.0402
	7	15	ns
Mean max VAS pain score Day 1-7	1.8 ± 1.2	2.5 ± 1.6	p = 0.018

ns: non-significant difference between study groups

Summary

Study I showed that Swedish DS is increasing and routines are similar between hospitals but that follow-up routines differ. The duration of follow-up varies between hospitals, but is consistently short.

Study II investigating the first week after 3 common procedures, showed that the preoperative health profile is important in predicting early recovery, particularly nausea and pain. This study also focused on the reason for nicotine users to exhibit a lower incidence of nausea.

Study III, addressing the patients' self-assessed follow-up of symptoms during 4 weeks after surgery, showed differences in the recovery process between different surgical procedures. The results of this study also underlined that all patients were not fully recovered 4 weeks after DS.

Study IV, a 6-month follow-up of the postoperative health profile, showed different procedure specific restitution and that the required follow-up time differed between surgical procedures.

Study V, a 16-week pain intervention study, showed that etoricoxib was more effective in controlling pain and with fewer side effects than tramadol after hallux valgus surgery.

DISCUSSION

The focus of this thesis is to give a picture of day surgery (DS) routines, to follow longitudinal changes in recovery for typical but different DS procedures and to describe and discuss some of the most important postoperative problems.

Some aspects not included in the studies are discussed, in order to point out important fields in improving understanding of Swedish DS.

Hypothesis and aim

The general considerations forming the basis of this thesis are to investigate the normal course of restitution to normal life after DS, the ability to predict deviations from this normal course from preoperatively available data and aspects of the management of such deviations from the normal course. This is done by mapping; routines, pain management, quality control and recovery for specific procedures. The overall aim is a better understanding of the DS concept.

Background and present status of DS (study I)

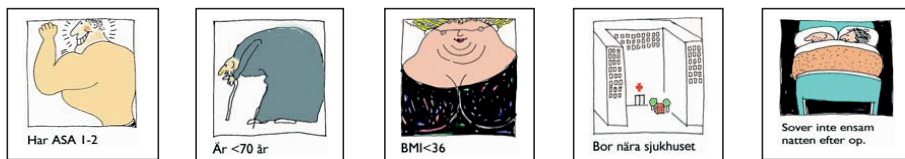
The number of DS procedures is increasing all over the world, as is the number of patients treated in the DS process (20, 26). This trend is expected to continue (12). A majority of operations in Sweden are performed as DS. Most DS procedures are not aimed at treating life-threatening conditions, but performed in order to improve quality of life.

Some potential benefits of DS are;

- Fewer infections
- Early ambulation
- Fewer thromboses
- Less anxiety, especially for children and elderly (27-28).

Selection criteria

Both patient related conditions as well as procedure related factors must be considered in the process of selecting patients suitable for DS (29). Factors like surgical risk and postoperative adverse symptoms influencing safety and quality should be known (30-31). These factors must be evaluated prior to the booking of surgery (32). Analysis of the current status in Sweden shows that many hospitals have strict inclusion criteria. The Swedish Association of Anaesthesia and Intensive care (SFAI) have recently published guidelines regarding patient selection, routines and discharge (www.sfai.se).



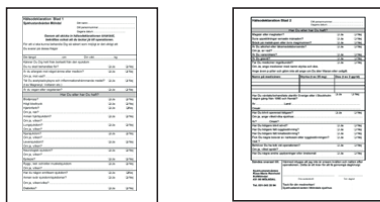
By permission from the artist Leif Nelvin

The SFAI guidelines of DS patient selection address:

- ASA-class I or II (class III only after careful consideration)
- Age of patients < 70 years
- Suitable operation, minimally invasive
- Distance between surgical facility and home of the patient < 30 minutes to hospital
- Accompanying person should be available
- Medical history and concomitant medications should be known
- Patient's preferences and previous experiences should be regarded
- Risk factors and need for prolonged postoperative observation should be known

Preoperative planning

A self-assessed health declaration filled in by the patients prior to surgery and before planning of anaesthesia is useful (33). Such a self-administrated medical history questionnaire was used by 87% of the Swedish units. This health declaration together with information from the patients' medical record is the basis for decisions on further preoperative tests or preoperative consultations. The authors Chung et al showed that there was no increase in peri-operative adverse events after DS as a result of no standardised preoperative testing like blood tests and chest X-ray (34).



Routines

Before introducing new procedures in DS programs, methods and routines must be addressed. A number of national guidelines that may serve as a basis for this have been published from different countries, e.g. from Australia (www.aams.org.au) and from United Kingdom (www.nedelaysscotland.scot.nhs.uk) for example. In study I we

found conformity between the Swedish DS centres regarding methods and routines used.

The DS unit

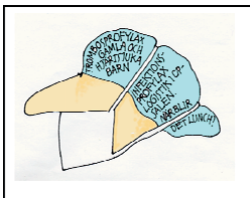
The question of which is the best type of unit, an autonomous unit outside an ordinary hospital or a hospital based DS unit, is not easily answered. In order to perform more extensive surgery in elderly and sick patients it is advantageous to have the unit near the hospital facilities. On the other hand, it might be more effective not to share the operation unit with in-hospital and emergency patients. In a situation with heavy demand on available surgical resources, it is possible that DS are not given high priority. In a freestanding or free-functioning hospital unit, DS patients will not compete with other patients making it an ideal unit with respect to efficacy (35). In Sweden 61% of the hospitals had units dedicated to DS in 2005.

Information, safety aspects

Since DS to a large extent involves “self-care”, it requires good pre- and postoperative information to patients and also to their relatives. As the patient is accepted for surgery, adequate information, oral and written, is required regarding what will happen during the day of surgery and what symptoms to be expected. This information must also include what to do and whom to call if problems arise after the surgical procedure (10). All Swedish DS units give information about pain treatment and 96% give written information about the surgical procedure.

Surgery and anaesthesia

The surgical technique used in DS must be as “minimally-invasive” as possible combined with a short lasting anaesthesia and effective treatment of pain and PONV. It may be helpful to use earlier research results on procedure specific postoperative pain treatment in e.g. PROSPECT (Providing evidence-based and procedure-specific recommendations and clinical decision support for the management of postoperative pain, www.postoppain.org). In order to select anaesthesia method, the most important factor to consider is the surgical procedure planned and the patient’s condition. The most common choice is general inhalation anaesthesia, although total intravenous anaesthesia (TIVA) has gained popularity with the introduction of modern, short acting intravenous agents. Whether to use TIVA or inhalation agents for maintenance of anaesthesia is a matter of personal preference, as time to discharge is not affected by selection between these two methods (36). The use of spinal anaesthesia in DS has been a question of duration of anaesthesia that together with voiding problems have limited its use in DS. With modern, short lasting spinals the postoperative time to discharge is not un-conveniently prolonged and voiding problems are rare, therefore the use of spinal anaesthesia in DS is gaining popularity (37). There was no question regarding frequency of spinals or type of anaesthesia in the Swedish questionnaire.



Discharge criteria

Discharge criteria are used in deciding when the patient is ready to leave the PACU to a step down unit and when to leave the hospital. To use the DS fast track method, it is necessary to optimise the selection of anaesthetic method, optimal pain treatment and minimally invasive surgery techniques that reduce the stress response in order to facilitate early recovery (38). Proper use of short acting anaesthetics may make it possible to bypass the PACU and thus reduce the time at hospital (17). Eligible for discharge means that the patient is able to walk, void, eat and drink and is without major pain or nausea. The wound dressing must be checked and information about allowed activity must be given prior to discharge. Return to normal cognitive functions is of main importance among discharge criteria. For a safe discharge for all patients including children and the elderly, a clearly pre-defined process is needed as described by Awad and Chung (18). Also the need for patient escort has been emphasised (39). In study I, we found that 64% of units in Sweden required the patient to be escorted by a relative or friend in order to be eligible for DS. A majority of the units supplied the patients with a telephone-number if there were postoperative questions, but only 40% of the units performed regular phone-calls for follow-up the first day after surgery. The same amount of units did follow-up except for selected cases, and only 24% of units report to the primary health care about surgery performed.

Readmission

The rate of un-planned admission or readmission is low after DS (9, 40). That is also confirmed in Swedish DS (study I). Mezei et al reported a readmission rate of 1,1% in Canada, mainly for surgical reasons only a few for anaesthesiological side effects (9). Twersky et al described a readmission rate of 1,3% during the first 30 days in an US study, bleeding being the most common reason for hospital returns (40). In Swedish DS, unplanned readmissions were most often due to severe pain. Orthopaedic DS were found to be at highest risk for readmissions, mainly due to pain.

Quality and safety consideration

Only a few studies have compared in-hospital surgery with DS regarding safety and quality of care. These previous studies described that both safety and cost effectiveness are characteristics of DS care. (41-43). Similarly, there are few studies comparing the suitability of different surgery techniques for DS. Johansson et al compared outcome after laparoscopic and open cholecystectomy. In a double blind (to patients and to staff) study these authors described no differences in safety or outcome. The hospital stay was shorter after laparoscopic surgery compared to open surgery (44). When evaluating available literature, DS is considered safe. Warner et al found major morbidity after DS to be low, in the material reported by this group, only 1 out of 1366 operations (45). Complications after DS are reported to be less than 1 % and mainly due to haematomas and infections (46). In our studies, all surgery and anaesthesia were uneventful. No morbidity or mortality occurred for the 453 (355 + 98) patients included.

Postoperative restitution

The preoperative health status of the patient is an important starting point when following the peri-operative process and the restitution of health. The long term, longitudinal changes of symptoms from the surgery and anaesthesia have not previously been well evaluated. Identification of factors affecting quality of life and patient experience are needed in the implementation of good standards (47).

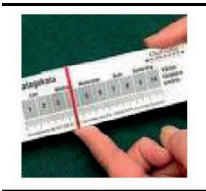
Study II-III-IV-V

Management of postoperative pain

Our investigation of the present DS situation in Sweden shows that postoperative symptoms are frequent after DS (study I). PONV and pain are the main symptoms during the early recovery phase (study II) while mobility problems, pain and other symptoms are present in DS patients during a longer period (studies II-V).

Acute pain, quantity and scales

Pain is the most common problem after DS. Several authors have shown that patients still have moderate to severe pain 24 hours after DS. In a study by Mc Grath and co-workers, as many as 30% of the patients had severe pain 24 hours post surgery (48-49). We found the average pain level at PACU for all patient groups, using the VAS (visual analogue score) and or NRS (numerical rating scale) to be <4. It is of importance to register pain severity during the stay in PACU in order to develop optimal pain relief program. We registered pain scores for all patients at the PACU, while we in the questionnaires at home for patients included in studies II-IV, only asked for surgery related pain with a yes or no answer. The VAS or NRS scales were well functioning in our applications. These scales are validated only for postsurgical pain but are frequently used also in other clinical situations (50).



Multimodal pain treatment

The concept of multimodal pain treatment (MMPT) has been an important approach to pain treatment in order to achieve effective clinical routines (51-52). MMPT means the treatment of pain with 3 or more analgesics with different modes of action and has long been the main method of postoperative pain control after DS. A number of authors have described the importance of pain treatment and pointed out methods (53-54). A majority of the patients in studies II-V received paracetamol, selective or non-selective NSAID's, opioids and local infiltration anaesthesia as a MMPT concept.

Pain and gender differences

Recent studies indicate that women are more sensitive to pain and need more analgesics than men (55). We found that the CBA group consisting of only young and healthy women scored the highest level of pain in the PACU when compared to the

IHR and AS groups consisting mostly of men. At PACU, 25% of the women and 10% of the men had a pain score VAS ≥ 4 , and the first day at home, 35% of the women and 10% of the men reported pain. In the HVS patient group, also with only women included, a majority had a daily maximum VAS score >3 the first and second postoperative day, the second day score being higher than the first day. Men and women in our studies received the same pain treatment, even though there were gender differences and also some differences between the procedures such as the use of corticosteroids and NSAID. Many authors have suggested different programs for different groups of patients to achieve the best result (52, 56).

Acute postoperative pain

Acute postoperative pain (APP) corresponds to the first 48 hours post-surgery. The patients in our studies were usually not in severe pain during this phase, however the CBA group had a higher pain score compared to the other groups. The mechanisms for severe pain are not fully known and improved understandings of the underlying postoperative mechanisms are required (57). The use of pre-incision bupivacain infiltration compared to infiltration at the end of surgery, does not seem to make any difference for the postoperative phase, but peripheral block and more use of local incision anaesthesia at the end of surgery will improve APP outcome (58-59).

Individual response

The patients' individual response to different drugs is due to the patients' phenotype and genotype. Polymorphia and mutations affect toxicity and efficacy. Some patients are poor metabolisers while other are ultra rapid metabolisers (60). An appropriate dose for one patient can be a toxic or non-relieving dose for another. Andrew Moore and Henry Mc Quay from the Oxford pain research group have suggested that modern pain studies must include responder analysis (61).

Prediction of pain

Proper prediction of pain is an important issue in order to identify patients at risk for severe postoperative pain. We found those AS patients, who in the preoperative profile reported that they suffered from pain, reporting pain also at the 30-day follow-up (study III). Both preoperative pain and analgesic use were factors influencing the frequency of pain at PACU. Pain, opioid use and pain fear are important factors in the preoperative profile to select patients with severe risk for postoperative pain (62). It is also necessary, to inform patients of the importance of early rescue medication in case of break through pain at home (63).

Non-steroid anti-inflammatory drugs

NSAID's are the most effective analgesics for nociceptive pain with a low NNT. All patients cannot be treated with coxibs due to increased risk for allergic reactions, bleeding problems, kidney function disturbances or heart diseases. In study V, we showed that etoricoxib was superior to tramadol the first week in HVS after surgery. The alleged risk of reduced bone healing has influenced the frequency of both orally and intra-articular use of coxibs (64). The reluctance of using NSAID in orthopaedic surgery is wide spread (study I). When investigating Swedish routines for knee arthroscopy, a lower usage of NSAID was found at community or local hospitals compared to teaching centres (65). In study V, we were unable to demonstrate any postoperative differences between the etoricoxib and tramadol group regarding reduced bone healing. If the clinical routine is to exclude NSAID's, corticosteroids could be an alternative. Corticosteroids were routinely used to all patients in study V while this was not the case in studies II-IV. If CBA and IHR patients had had a more frequent use of NSAID or corticosteroids, pain level probably would have been improved since anti-inflammatory treatment is the most effective way to treat post surgical pain (48, 51).



Opioids

All patients in our studies were treated with opioids. Opioids are used in almost all surgery e.g. as slow release preparations preoperatively premedication and in combination with general anaesthesia and postoperatively for pain control. Local administration of intra-articular morphine is frequently used and is described to be effective in orthopaedic surgery (66). Opioids may give adverse reactions e.g. nausea, dizziness and constipation. To minimize discomfort for patients, a non-opioid postoperative analgesia by using a balanced multimodal treatment with local anaesthesia, paracetamol, NSAID and corticosteroids, is suggested (67). High doses of opioids given parenterally have been suggested to potentially increase the risk for angiogenesis and therefore the risk for recurrence of breast malignancy. An effective regional anaesthesia may reduce the need of opioids and consequently the risk of recurrence (68).



All opioid-agonists have potential side effects and it is desirable reduce its use in DS. As the side effects of opioids, may be a limiting factor in ability to discharge patients after DS, a MMPT approach to pain control, decreasing the need for opioids, is recommended.

Anti-epileptic drugs

Anti-epileptic drugs have been suggested to be effective as postoperative analgesics. Dauri et al showed in a recent review article that gabapentin and pregabalin reduced pain and opioid consumption after surgery but did not prevent PONV (69). The use of anti-epileptic drugs in DS is not standard and they were not used in our studies.

Local anaesthetics

Local anaesthetics are a very important complement to analgesics. The use of local infiltration and or long-acting peripheral nerve blockade reduces time at the PACU and facilitate discharge due to less nausea, pain and cognitive dysfunction (70). All patients in our studies received local infiltration of bupivacain into the wound or ropivacain into the joint space.

Treatment of long-lasting pain

Our data indicate that the patients have pain problems for a longer period than previously expected. We have shown that 40% of patients have pain after 1 week, 28% after 2 weeks and still after 4 weeks altogether 20% suffer from pain in IHR, AS and CBA groups (study III). In the HVS group, at 16 weeks, 20% of patients were still not pain-free (study V).

Continuous delivery of local anaesthesia

Continuous delivery of local anaesthetics were not used for our patients, but has been suggested as an option for long lasting pain relief to reduce development of chronic pain.

Analgesic treatment outcome

Liu et al showed in a systematic review of analgesic techniques, that improved postoperative analgesia improved outcome for the patients. By better pain relief during the recovery phase to patients in the AS group (study IV) a decrease in pain duration may have occurred. However, a modest reduction in pain score do not always indicate improved pain relief. Liu et al suggest development of validated patient-reported instruments (71).



Persistent postsurgical pain

The concept of persistent postsurgical pain (PPSP) or chronic post-surgical pain (CPSP), was proposed by Macrae and Davies 1999 (72). These authors define PPSP as;

- pain developing after surgery procedure
- with a duration of at least 2 months
- other causes than surgery have been excluded
- no pre-existing continuous pain problem

In Study IV, where the patients were followed for 6 months after surgery, we found that 6% of IHR, 28% of AS and 4% of CBA patients still reported surgery related pain at 3 months. This meets the above-mentioned criteria for PPSP. We were also able to demonstrate that the number of patients experiencing surgery related pain after 6 months decreased to 8% in the AS group and 2% in the CBA group but remained unchanged in the IHR group (6%). This finding clearly shows that the resolution of postoperative pain follows a different time path in the three groups studied. Our observation that the number of patients experiencing post surgical pain continues to decrease at least up to 6 months after certain surgical procedures (i.e. AS and CBA), but not after others (IHR), leads to the conclusion that the definition of PPSP may be too general.

Risk factors

In order to predict the risk of protracted postoperative pain in the individual patient, it is of importance to investigate pre-, per- and postoperative risk factors for the development of PPSP. Preoperative risk factors that may play a role in transition from acute to long-lasting persistent pain have been suggested to be related to psychosocial factors such as; depression, vulnerability, stress and preoperative pain and or severe acute postoperative pain (73). In study III-IV, we found that younger patients, women and patients describing preoperative pain experienced a longer period of postoperative pain. Aasvang and co-workers describe the intra-operative risks to be anaesthesia related such as well as surgical e.g. nerve injuries (74). Further acute postoperative pain has been described as postoperative risk factor for PPSP. Most patients in the present studies had good pain relief at PACU (study II), but many patients reported extensive pain already the first day at home. Our studies show that in-hospital pain is well treated compared to pain at home but also that pain at home could be a late risk factor for PPSP (study II-IV).

Prevention of long-lasting pain

Prevention of postoperative pain should focus on the whole peri-operative period by inhibiting noxious input and also by using less invasive surgery. The incidence of PPSP is described to be 2-10% after surgery (75). Patients undergoing IHR are at increased risk for prolonged postoperative pain with occurrences in 5-8% of patients

(76). CBA is also known to cause PPSP (77) although PPSP is more common after mastectomy (78). The role of acute postoperative pain as the main determinant for PPSP is under debate. Recent publications are conflicting. In a study of pain following total hip arthroplasty, Clarke et al. were unable to predict PPSP from acute postoperative pain (79), while Hickey and co-workers found the level of pain on the fifth day after breast surgery to be associated with development PPSP (78). In our studies, the AS group had the lowest rate of acute postoperative pain but was the group with highest rate of residual pain 3 and 6 months after surgery. The IHR group did not decrease the frequency of pain between 3 and 6 months (6%) so PPSP could have developed. It seems likely that PPSP is more procedure specific than related to acute postoperative pain.

Pain problems and duration varies for different groups of procedures. Patients in the IHR and CBA groups describe pain during the first 2 postoperative weeks while pain following AS surgery often lasts for more than 12 weeks. Many patients have disease induced preoperative pain. The recovery process is therefore dependent both on decreasing surgery related pain and disease related preoperative pain. Pain after IHR and AS is improved after 1 week compared to preoperatively while 11% of CBA patients who are without preoperative pain, still suffer from surgical pain 4 weeks after surgery.

Postoperative nausea and vomiting

Postoperative nausea and vomiting (PONV) is a common problem after all kinds of anaesthesia and surgery (80) and may after DS be the limiting factor preventing the patient from returning home after the procedure. The exact cause of PONV is presently not known, although several hypotheses exist. Oddby-Muhrbeck et al have investigated the role of blood-borne factors associated to PONV. These authors found no correlation to levels of gastrin, cholecystin, dopamine or serotonin, but some relations to epinephrine, vasopressin and blood-glucose levels (81). Further, platelet-associated factors were found to be related to the occurrence of PONV after breast cancer surgery (81). Some authors have even suggested that weather and the moon phase could be involved in PONV, although no clinical evidence was found (82).



Nicotine use

In Study II, we have shown that regular nicotine use by smoking or snuffing significantly reduces the incidence of postoperative nausea. It has previously been demonstrated by several authors that smoking, apart from its many negative effects, also reduces the incidence of PONV (83). Whether this effect of smoking is related to the nicotine content of smoke or to other of its many components is presently not known, but has been discussed by several authors (83-84). Regular use of nicotine by smoking and probably also by snuffing is detrimental because of all negative health effects. Smokers have a substantially increased risk of peri- and postoperative complication e.g. airway problems (85). In health care, we always try to reduce the nicotine use and advice the patients to stop smoking at least 6 weeks before surgery (86). The findings in study II, that smoking but also snuffing, decreased the incidence of postoperative nausea emphasised the role of nicotine as the possible cause of the observed reduction of PONV. Although other contents in tobacco cannot be ruled out altogether as responsible for the decrease in PONV, it seems most likely that chronic nicotine use is responsible for the antiemetic effect.

Prophylactic treatments

A number of prophylactic and therapeutic approaches to the PONV problem has been described, although no best choice or combination of prophylactic treatment for PONV is established (87). Apfel and Sinclair have focused on risk score mathematics to select patients for prevention therapy (83-84). The most common treatment for PONV is oral meklozin or metoklopramid, and parenteral ondansetron (a 5-HT blocker), droperidol or betamethasone. These drugs may be used alone or in combination. A common drug regimen is triple-treatment like droperidol, betamethasone and ondansetron in combination (88). In study II we treated patients after PONV risk scoring, and used only meklozin or a 5HT3-blocker as single treatment. In study V all patients received 8 mg betamethasone parenterally at the start of anaesthesia.

Corticosteroids

Macario et al studied the practice patterns for treatment of PONV and found 5-HT-antagonists to be the most common choice but corticosteroids were also frequently used in DS (89). The question, whether the use of a single dose of a corticosteroid might pose a risk for the patients has been addressed by Raeder and co-workers who could not demonstrate any adverse effects after a single dose of 16 mg dexamethasone (90). These authors also showed a benefit apart from reduction of nausea, namely a prolonged analgesic effect from one to three days after breast surgery, when using dexamethasone combined with rofecoxib.

Recovery follow-up

In order to determine whether an individual patient is suitable for DS, it is necessary to predict the postoperative course. Even though the majority of patients usually can safely return home after a certain surgical procedure, factors concerning the



individual patient may make this difficult or even impossible. Furthermore, the postoperative course might be different also among patients that can return home after surgery. Previous investigators have focused on time to discharge from hospital and time to return to work. It is obvious that a tool that permits a more detailed prediction of the postoperative course from preoperative data would be valuable (91).

Study III-IV investigated the symptoms the patients will experience after DS using a patient self-assessed health profile at different time points up to 6 months postoperatively. Procedure specific changes with different time courses for recovery were found (study III-IV).

Preoperative profile

There are many possible benefits from stratifying the patients' preoperative profile in order to predict the recovery process, as discussed by Chung et al (92). These authors found that postoperative symptoms were influenced by demographic factors such as age, sex and ASA status and by the type of surgery. We were able to confirm that these findings regarding demographic factors e.g. gender, age, nicotine use, preoperative pain, depressed mood and analgesic use, could be used in order to identify patients who might benefit from prophylaxis against PONV and at risk for extensive pain (54, 83).

Definitions of recovery

In a longitudinal perspective, we investigated three typical DS procedures for up to 6 months and we found differences in the recovery process between these procedures until end-points were reached. All analysis was based on the preoperative health profile.

In study III and IV we used these end-point definitions:

Improved: better than before surgery in the 4 parameters; pain, mobility, mood and sleep disturbances.

Recovered: the sum of the means of the 4 variables; pain, mobility, mood and sleep is ≤ 0.5 .

Fully recovered: no deviations from normal in the 8-item health profile; pain, immobilization, depressed mood, self-care problems, inactivity, sleep disturbances, difficulties in having sex, analgesic use

The first recovery end-point, improved, meaning better than before surgery was reached already after one week for IHR and AS but not for CBA even at 4 weeks follow-up.

The second recovery end-point, recovered was reached for IHR at 2 weeks, for CBA at 4 weeks but for AS not reached after 4 weeks.

The third end-point, fully recovered, was not reached for any group.

From one month to 6 months, we have found differences between the groups regarding the "fully recovered" end-point. The IHR group was fully recovered by 85-94% during this period, AS group by 55-89% and CBA group by 80-97% respectively. Our results show that the recovery process is different between these groups. Evaluation of recovery and outcome would benefit from procedure specific follow-up times and protocols. The importance of following the patients' recovery after DS has been emphasised by many authors like Hedgepeth and Herrera who have focused on recovery and quality of life as an end-point and used different instruments for follow-up (93). Multimodal recovery program (94) as well as multimodal pain treatment are ways to optimize the patients' postoperative status.

Follow-up methods

Although the first disease register, a Lepra register, started already 200 years ago in Norway, and many other registers are presently in use, none is yet specifically addressing DS.

Several methods are used for evaluation of postoperative recovery after DS. Most of these methods suffer from lack of validation and test of reliability, as it is difficult to develop questionnaires to measure longitudinal recovery with validity and reliability. Seibert et al have presented a validated questionnaires for measuring postoperative satisfaction (95). Allvin et al have developed a questionnaire in 5 dimensions and 19 items (96). Scales for measurement of recovery and activity of daily living are for example: QoR40 (97), FRI (98), RAS QOL (99), PRP (96), EQ-5d (25). We used a questionnaire based on the basic 5 EQ-5d domains: pain, mobility, depression, self-care and normal activities. In addition we included questions about sleep, impaired sexual activity and need for analgesics, thereby extending it to an 8-item health profile questionnaire. The reason for using this 8-dimension questionnaire was to expand the patients' profile in order to be better suit our research questions. All questionnaires were paper based, not web-based (100).

Quality of life

In our studies, the aims were to follow changes in health from a base line and longitudinally during the whole postoperative recovery period. Furthermore, we wanted to detect possible differences between procedures and to create a follow-up method suitable for DS. We preferred the EQ-5d protocol because it was widely spread, often used, and convenient for following longitudinally changes over time (25).

Eriksen et al have published a similar study of 35 patients. These authors followed patients during 6 months after hernia repair, registering pain, quality of life and recovery using the SF36 scale. In this study the SF-36 scores decreased in three domains at 30 days compared to preoperatively (101). In contrast we found patients in the IHR group to increase in the 4-variables of theEQ-5d scoring used by us at 30 days after surgery compared to preoperative values. A possible explanation of the

difference in postoperative QoL between these two studies may be found in the higher rates of pain described by Eriksen et al, which may have affected the postoperative course in this patient group and thus explaining the differences in quality of life one month after surgery. This discrepancy of results underlines the opinion by authors like Henrik Kehlet and Andrew Moore who have pointed out that a cornerstone for all further research in surgery outcome must be procedure related (102).

Duration of follow up

Another aim of study IV was to determine the optimal duration of follow-up and to describe recovery profiles for different procedures. We found different time courses of recovery for the three types of surgery we studied confirming the hypothesis that the recommendation of a fixed time for follow-up is not appropriate for DS. A follow-up time of one month seems to be enough for hernia repair and cosmetic breast surgery, while arthroscopic surgery needed at least 3 months to cover the recovery process (study IV). The recovery profile was also specific for each procedure studied. In other studies, shorter follow-up times may be adequate, sometimes for less than one month. In a study of recovery after ligation of haemorrhoids the patients were followed for one week only. In this study, a patient satisfaction of 59% was found, possibly indicating that a shorter follow-up period after this kind of surgery might be enough.(103). In our studies (study III-IV) we found a similar rate of satisfaction (63%) early in the recovery period increasing to 73-92% after 6 months showing that time for follow-up is important.

Information, recovery aspects

It is important that every patient is well informed both of the procedure per se and of the expected postoperative course. Bellani et al have showed the importance of adequate information stating that "lack of information could be one of the main complaints and the most common cause of patients dissatisfaction" (104). Even after minor surgery such as removal of teeth, recovery data from HRQOL (health related quality of life) help the surgeon to give suitable information (105). Many studies including ours, underscore the importance of giving correct information to the patient (106). To this end, solid and well-documented knowledge of expected duration and intensity of procedure specific postoperative problems is required. Since our study as well as other studies indicate that there are great variations between different procedures, it is important to adapt follow-up routines accordingly (study IV). Follow-up research must therefore include many different procedures and patient groups.



Post-discharge, need for help and contacts

The need for help, re-admittances and contact with health-care after surgery was followed in studies III-IV. Normally, DS requires an escort to follow the patient home (39). It is also strongly recommended that DS patients should have a relative or friend

as help during the early phase at home after DS. The relevance of this advice was confirmed in study III as 83% of patients reported that they needed help.

In studies III-IV, we found a readmission rate of <2% during the 6 postoperative months, mainly due to need for new surgery. In 2 CBA patients, seroma and encapsulation was detected and 2 IHR patients returned with recurrent hernia. Of 3 AS patients, 2 needed new surgeries and one patient had prolonged hospital stay after symptoms from spinal anaesthesia and urine bladder infection. These results confirm the previously readmission rates of 1,1-1,3% described by Mezei and Twersky mentioned above (9, 40).

Many contacts with health care providers were noted; 70 contacts with health-care during the first four weeks, mostly due to pain problems and wound care considerations such as bandage problems while a total of 108 contacts were noted during the total 6 months follow-up period in this group of 355 patients (study III-IV).

Satisfaction

Materazzi et al investigated the safety and satisfaction after thyroid surgery with a follow-up time of three years. These authors found a high level of satisfaction, (84,2%) and they also reported DS to be safe despite the short stay at hospital (107). This long follow-up time is unique. A recently performed questionnaire study showed the satisfaction level to be lower after 30 days compared to the day for DS. Clinical outcome, postoperative information and pain were the main factors affecting patient satisfaction (10).

The ASA and IAAS committees have published indicators for outcome. Mattilla et al described quality, outcome and satisfaction after DS as high in a study (20). The rapid growth of DS cases requires good monitoring of quality of care (95). The management of pain as being the main determinant of postoperative quality of life, should be the focus of improvement in DS (102).

Limitations

Study I: The questionnaire consisted of 30 general aspects of DS organisation, routines treatments and outcome, which had to be answered. The questionnaire had not been used before and was not tested for validity or reliability before start.

Study II-IV: The response rate varied with the lowest rates for AS patients the first postoperative day and for all three groups at the 6-month follow-up. The reason for the missing AS patients the first day is that these did not have any complaints and were subsequently not included in the database.

We do not know how much and the frequency of nicotine use or when the patient had there last cigarette or snuff before surgery, only that the patient is a usual user of nicotine.

There could be a bias because of the many females and young people. The arthroscopic group is inhomogeneous in ages but homogenous in gender with 48% females.

Satisfaction score 0-10 was used but the question was: "How satisfied are you with the surgery?" If they only answered at surgery related results and not included deviations or other symptoms, we do not know.

At 6-month follow-up, the patients with remaining pain, 6%, 8% and 2% for IHR, AS and CBA groups respectively, were not further analysed to detect the reason for supposed PPSP.

Study V: This study included only young, healthy women. The result will not tell anything about other demographics. All treatment was blinded for patients and for all investigators with placebo tablets and therefore this limit were surely cancelled.

Future perspectives

Nearly 2/3 of all surgery in Sweden is performed as DS where the patients themselves have to take responsibility for the recovery process. An increased knowledge about this process and its problems will enable us to improve outcome of DS in all aspects including safety and patient comfort. DS is a challenging and exciting field. This thesis focuses on, and investigates, the postoperative period outside the hospital that was not directly available for observation for the care providers and aims to increase our knowledge of problems and complications during this period.

To describe these important matters; routines, pain management, quality control and recovery for specific procedures, the thesis aims to better understand the present Swedish DS concept.

Fundamental for patients during DS is:

- Analgesia
- Alimentation
- Alertness
- Ambulation

The achievement of these 4 functions is the key to safe and good quality DS.

Coordination between DS centres increases quality of care, with increased effectiveness and gives the possibility to compare results. The following items are of importance:

- Procedure specific information
- Preoperative health profile
- Prophylaxis for PONV and pain for selected patients; Nicotine user / Pain before surgery / Analgesic use
- Increased use of corticosteroids
- Improvements in surgical techniques
- Working in team

- Knowledge of suitable treatment to provide rapid recovery
- Efforts to improve pain management, especially after discharge
- Unit performed pain programme, individual based
- Optimal use of strong opioids instead of weak opioids
- Procedure specific follow-up time and programs

Do we need Swedish guidelines for routines, national preoperative health declarations, and general follow-up methods? National guidelines is perhaps most important in achieving evidence based DS. Even if standardised programs are used, we must never forget that every patient is unique and that the treatment has to be individualised for each patient.

CONCLUSIONS and IMPLICATIONS

Patient selection for prophylactic treatment

Preoperative health profile parameters such as nicotine use by smoking or snuffing, existing pain before surgery and analgesic use have importance for selection of prophylaxis against nausea and pain.

Regular nicotine use decreased the risk for postoperative nausea and thus these patients did not need prophylaxis as frequently as non-nicotine users. When selecting patients that need prophylaxis for nausea, the original Apfel score including earlier nausea, motion sickness, age and gender could be more precise if extended with information of regular nicotine use by smoking or snuffing.

Patients with preoperative pain need an extended analgesic regime, for AS patients during more than 4 weeks. All patients with preoperative analgesic use need individually designed analgesic treatment that requires careful preoperative planning. Prophylactic pain therapy is useful for patients with risk factors like; female gender, young age, depressed mood, pain already before surgery and type of surgery.

Optimised pain treatment

We found NSAID to be the most effective therapy for postoperative pain after HVS. When comparing a selective coxib (etoricoxib) to tramadol, patients were more satisfied with etoricoxib and rated less pain.

Pain problems and pain duration varies for different procedures. Pain control seems to be appropriate while the patient is still at the hospital, while pain at home requires increased attention, as the patients reported pain during a longer period after discharge. Surgical site local anaesthesia together with a preoperative start of multimodal pain treatment is important. Improvement of pain therapy during the whole recovery period at home seems to be required.

Quality control and methods for follow-up

Many usable scales for health related follow-up are available. We used a modified, enlarged EQ-5d-scale. The patient's preoperative status was the starting point for the follow up process. By following the patients' symptoms longitudinally, we were able to explore the recovery process. We conclude that quality control of DS should be procedure specific.

Duration of follow-up

By analysing the time course of restitution of different symptoms, knowledge of the recovery process after different surgery procedures will be improved. In these studies, we found a variable follow-up time required, from 4 to at least 12 weeks, in order to cover the patients' restitution of symptoms following DS.

Patient information

Based on our results, the following could be examples of appropriate patient information:

For IHR patients: "Your preoperative symptoms of pain, mobilisation difficulties and sleep problems will be reduced within 4 weeks. Pain, immobilisation and sleep disturbances will be better than before surgery already after one week".

For AS patients: "Your preoperative problems with pain and mobility problems will last for months but will be better than before surgery already after one week".

For CBA patients: "You will have postoperative problems with pain and immobilization during the first 4 weeks. After one week depressed mood and sleeping disturbances are not uncommon".

For HVS patients: "Your pain will be moderate and maximal the second and third day after the surgery. Wound irritations disappear within 2 weeks. You may experience some side effects from the analgesics. After 16 weeks, almost no walking disturbances will remain and pain and quality of life will be improved, compared to before surgery".

Summary

The increasing number of surgery procedures that previously required hospitalisation, are nowadays possible to perform as DS due to standardised good routines and improved pain management. The availability of experienced DS anaesthetists and surgeons working in team is the key issue of further developments. The main part of the recovery process takes place after discharge, which requires detailed planning and proper postoperative information.

The one most important limitation in increasing DS is inadequacy to manage pain after DS during the postoperative period. This main recovery problem requires an optimised pain control program to prevent long lasting pain. Consequently adopting more of minimal invasive surgery methods are ways to in the future further develop DS.

Preoperative profile helps us to select patient in need for prophylaxis, to identify patients with expected pronounced pain after surgery and to give individually tailored pain treatment. When we have knowledge of the group of patients and the procedure specific recovery profiles, it will help us to give adequate information to patients and to focus on procedure specific development of methods.

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POPULÄRVETENSKAPLIG SAMMANFATTNING

Dagkirurgi i Sverige innebär att patienten genomgår en planerad operation över dagen och kommer hem samma dag för att sova i sin egen säng. I Socialstyrelsens termbank definieras dagkirurgi som ”dagsjukvård där den kirurgiska åtgärden normalt kräver att patienten får anestesi och en period av postoperativ övervakning”. Dagkirurgi har ökat kraftigt de senaste decennierna, bland annat av ekonomiska skäl. Mindre traumatisk operationsteknik i form av bl.a. titthålsteknik, säker kortverkande anestesi och god smärtlindring har varit förutsättningar för denna utveckling. Ingrepp som tidigare krävde flera dygns vårdtid på sjukhus görs nu lika säkert med hemgång samma dag, även om patienterna är barn, äldre eller har sjukdomar. Idag görs drygt 60 % av alla operationer i Sverige som dagkirurgi.

Fördelarna med dagkirurgi är inte bara ekonomiska utan även medicinska. Den snabba mobiliseringen i den vanliga hemmiljön minskar risken för komplikationer såsom infektioner, blodproppbildning och förvirring. Hur patienterna mår efter sina operationer, operationsresultat och komplikationer har studerats tidigare. I denna bok beskrivs; hur vanlig svensk dagkirurgi fungerar, symptom från 3 olika faser under återhämtningen, de första dygnet, första månaden och första halvåret samt en jämförelse mellan 2 olika smärtbehandlingar.

Det övergripande syftet med detta arbete har varit att följa patienternas återhämtning efter olika typiska dagkirurgiska ingrepp, speciellt med fokus på smärtlindring.

Resultat

I den första studien svarade 88 % av 92 svenska sjukhus på en omfattande enkät kring rutiner och uppföljning inom dagkirurgi under 2005. Smärta efter operation uppfattades som det vanligaste problemet. Rutinerna var likartade över landet, över 90 % av sjukhusen lät narkosläkaren göra bedömning och planering av anestesi före operation, 87 % lät patienterna fylla i hälsoenkät, 95 % startade smärtlindringen redan före operationen medan färre än 40 % ringde patienterna dagarna efter operationen.

I andra, tredje och fjärde studierna följde vi upp 355 patienter som opererats för lumskräck, ortopedisk titthålskirurgi (artroskopi) eller silikoninläggningar i bröst. Dessa ingrepp valdes utifrån att dessa är vanliga inom dagkirurgi och att det är helt olika patientgrupper som berörs. Bräckoperationer rör mest medelålders och ibland sjukliga män. Artroskopiska ortopedoperationer rör patienter i alla åldrar, ofta med långvariga ledbekymmer och jämt fördelat mellan könen. Bröstoperationer görs ej pga sjuklighet utan av kosmetiska skäl och berör endast unga friska kvinnor.

Inga allvarliga komplikationer noterades. Under hela perioden behövde 7 patienter återkomma till sjukhuset. Totalt behövde patienterna 70 kontakter med sjukvården under första månaden för frågor efter sina operationer, där den vanligaste orsaken var smärtproblem (44%).

I studie II, kontrollerades hur nikotinbruk i form av rökning eller snusning påverkade risken för illamående och smärta efter operation. Det visade sig att de patienter som var vanebrukare av nikotin uppvisade halverad risk för postoperativt illamående. Illamående

var annars vanligast bland unga kvinnor. Nikotinbruk påverkade inte graden av smärtan efter operation. De patienter som hade smärta redan före operationen uppvisade oftare smärta och illamående på uppvakningsavdelningen jämfört med patienter som ej hade smärtproblem före operationen. Patienter som använde smärtlindring före operationen var oftare illamående efter operation. Resultaten av denna studie innebär att man före operationen bör inkludera eventuellt bruk av nikotin bland faktorer som avgör om förbyggande behandling mot illamående ska ges.

I studie III, följde vi upp återhämtningen under de första 30 dagarna efter operation. De olika patientgrupperna återhämtade sig helt olika. Bräck- och artroskopi-patienterna var redan efter 1 vecka bättre jämfört med den hälsoprofil som de hade före operationen. Bröstpatienterna, som var friska innan operationen, hade flest symptom i form av smärta, rörelsesvärigheter, depression och sömnpåverkan efter 1 vecka. Symptomen kvarstod vid 2 veckor men var nästan borta efter 4 veckor. Förekomst av smärta redan före operationen ökade risken för smärta på uppvakningsavdelningen liksom vid en vecka. De artroskopi-patienter, som hade smärta kvar vid 4 veckor kom ur gruppen som hade smärtproblem redan före operationen vilket var ett signifikant samband.

I studie IV, kontrollerade vi hur patienternas hälsoprofil före operationen utvecklade sig under 6 månader efter operationen. Bräckpatienterna med påverkad hälsoprofil före operationen var nästan återställda redan efter 1 månad och helt återställda efter 3 månader. Artroskopipatienterna, som hade flest symptom före operationen hade kvar en påverkad hälsoprofil genom hela uppföljningen. Deras återhämtning var långsammast medan bröstpatienterna var nästan helt återställda efter 1 månad fastän 10 % hade kvarvarande smärtor. Detta visar att olika ingrepp behöver olika uppföljningstid. Vi använde en modifierad variant av Euro-quality 5 dimensions (EQ-5d), med 8 parametrar, som uppföljningsmetod.

I femte studien jämfördes olika metoder för smärtlindring under första veckan efter operation för felställd stortåled (hallux valgus). Denna jämförelse gjordes i en randomiserad, dubbel blind studie med 50 patienter i varje grupp. Det betyder att patienterna lottades till sin behandling, varken patient eller behandlare visste vilken medicin som gavs. Resultatet visade att etoricoxib (=Arcoxia) gav bättre smärtlindring än tramadol (=Tradolan Retard), medförde färre biverkningar och högre patienttillfredsställelse utan att läkningen påverkades negativt för någon av grupperna

Slutsatser

Smärta är det största problemet för patienterna och är den enskilt viktigaste utmaningen för framtiden. Dagkirurgi innebär ständig metodutveckling, framtagande av förfinade processer och krav på god kunskap om effektiv smärtlindring. Brist på otillräcklig långsiktig smärtlindring kan dessutom ha betydelse för utveckling av långvarigt smärtsyndrom. Dessa utmaningar gör att dagkirurgi är en spännande specialitet som kräver särskild kunskap inom området för att uppnå optimal återhämtning för patienterna.

Kommentarer med anledning av studieresultaten:

Hälsoprofil före operation hjälper oss att:

- selektera patienter i behov av förebyggande behandling mot illamående
- identifiera patienter med förväntad ökad smärta efter operation
- ge individanpassad smärtlindring till ”risk”-patienter

Procedurspecifik uppföljning efter dagkirurgi ger svar på:

- vilka symptom man kan förvänta sig
- tidsaspekt

...och hjälper oss att:

- ta fram adekvat information till patienterna
- ha rätt fokus vid metodutveckling