Postoperative pain management

- predictors, barriers and outcome

KERSTIN WICKSTRÖM ENE
Institute of Health and Care Sciences
University of Gothenburg

THE SAHLGRENSKA ACADEMY
AT UNIVERSITY OF GOTHENBURG

To my mother Ingrid

ABSTRACT

Despite the availability of clinical practice guidelines, effective analgesics and new technologies for drug administration, the management of postoperative pain continues to remain problematic and unsatisfactory. Nurses play an important role in the pain management. They assess and document pain, decide whether to administer analgesics, and they monitor the effect of medication which is prescribed and administered in a variety of ways. Continuous epidural analgesia (EDA) is a safe and effective method that is frequently used after radical prostatectomy (RP), although recent studies also have found intrathecal analgesia (ITA) with opioids and local anaesthetics to compare favourably with an EDA technique. Postoperative pain can be influenced by different factors e.g. perceived control, anxiety and depression and previous pain experience, aside from the pain treatment method. This thesis consists of five studies; the first and the second studies evaluate EDA and ITA as methods for pain treatment after RP; the third study describes pain, psychological distress and health-related quality of life (HRQOL) at baseline and three month after RP; the fourth study focuses on the ward nurses role in pain management and in the fifth study the relationship between known postoperative pain predictors and postoperative pain experience was evaluated.

Pain management after RP was not optimal with two thirds of the patients experiencing moderate/severe pain. Reluctance to use pain assessment tools and lack of documentation seemed to be hindrances for the development of a high quality postoperative pain management. Approximately one third of the patients´ and nurses´ pain reports were incongruent with nurses generally overestimating mild pain and underestimating severe pain. Documented pain scores rather than patients´ pain reports determined whether or not patients were to receive opioids. Almost one third of the EDA patients experienced severe pain during one or more of three postoperative days. ITA, given before surgery, seemed to be a commendable method for pain relief. Patients who scored high on the preoperative anxiety and depression scales reported higher postoperative pain scores as well. Patients with the highest pain scores in hospital also experienced the most pain during the three months after discharge from hospital. Anxiety and depression at three months correlated negatively with all components of HRQOL. Physical functioning had decreased, and mental health had increased at three months when compared to baseline. Age predicted a VAS >30mm, with younger patients at higher risk for postoperative pain. Preoperative symptoms of depression predicted a VAS >70mm. The only factor that predicted the next coming VAS score was the previous VAS score.

Patients have the right to be recognized as experts on their own pain experience and to have their pain report reflected accurately in the type of pain relief that they receive. They also have the right to expect that relief of their pain is considered to be a reasonable goal of the treatment.

Keywords: Postoperative pain management, nursing, radical prostatectomy, epidural analgesia, intrathecal analgesia, anxiety and depression, health-related quality of life, pain predictors.

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ORIGINAL PAPERS

This thesis is based on the following papers, referenced in the text by Roman numerals I-V

I Wickström K., Nordberg G. & Gaston Johansson F. (2005). Predictors and barriers to adequate treatment of postoperative pain after radical prostatectomy. *Acute pain* 7, 167-176.

II Wickström K., Nordberg G. & Gaston Johansson F. (2007). Intrathecal analgesia for postoperative pain relief after radical prostatectomy. *Acute Pain, 9*, 65-70.

III Wickström Ene K., Nordberg G., Gaston Johansson F & Sjöström B. (2006). Pain, psychological distress and health-related quality of life at baseline and 3 months after radical prostatectomy. *BMC Nursing* 5:8.

IV Wickström Ene K., Nordberg G., Bergh I, Gaston Johansson F & Sjöström B. (2008). Postoperative pain management - the influence of surgical ward nurses. *Journal of Clinical Nursing. Accepted for publication.*

V Wickström Ene K., Nordberg G., Sjöström B & Bergh I. (2008). Possible predictors of postoperative pain intensity. *Submitted for publication.*

CONTENTS

ABBREVIATIONS

APS	Acute pain services
APS	American Pain Society
ASA	American Association of Anaesthesiologists
EDA	Epidural analgesia
HAD	Hospital Anxiety and Depression
HRQOL	Health-Related Quality Of Life
IASP	International Association for the Study of Pain
ITA	Intrathecal analgesia
LoS	Length of hospital stay
MHLC	Multidimensional Health Locus of Control
NSAID	Non-Steroid-Anti-Inflammatory-Drug
PACU	Postoperative Anaesthesia Care Unit
PC	Prostate cancer
PCA	Patient Controlled Analgesia
PONV	Postoperative nausea and vomiting
PRN	Pro Re Nata (as needed/requested)
QOL	Quality of Life
RP	Radical prostatectomy
SOA	Systemic opioid analgesia
SF-36	Short Form-36
VAS	Visual Analogue Scale

INTRODUCTION

Inadequate pain relief in the postoperative phase is a well-known problem world-wide. A lot of surveys over a long time show that many patients still suffer from moderate to severe postoperative pain (Marks & Sachar, 1973; Donovan, 1983; Wilder-Smith & Schuler, 1992; Carr & Goudas, 1999; Svensson, et al., 2000; Dolin et al., 2002), despite an increased focus on pain and the development of new standards for pain management (Apfelbaum et al., 2003). Aside from the suffering caused by insufficient pain relief, this is an issue with potential adverse physiological and psychological consequences for patients in addition to financial draw backs for caregivers (Bardiau et al., 2003; Bedard et al., 2006). Poorly managed pain may interfere with postoperative complications, cause patient suffering and prolong recovery (Bardiau et al., 2003; Bedard et al., 2006). Patients may anticipate future medical interventions with greater anxiety if pain has not been managed effectively in the past (Twycross, 2002). There are a number of risk factors for chronic pain after surgery and one of the most striking predictor is indeed the severity of acute postoperative pain (Perkins & Kehlet, 2000; Macrae, 2001; Kehlet et al., 2006).

Nurses are in a unique position to supervise and assist patients in pain and in the treatment thereof, considering the extensive time nurses spend with the patients when compared with other health-team members (Nash et al., 1999). Nursing pain management involves a number of activities; assessing pain and deciding whether to administer analgesics, selecting one of different analgesics and choosing the route of administration. Nurses are also responsible for monitoring the effect of medication which is prescribed and administered in a variety of ways, including PRN (pro re nata, as needed/requested), EDA and ITA (Manias, 2003). However, nurses seem to develop individual models of pain assessment and analgesic administration resulting in obvious variability in pain outcome (Willson, 2000). Moreover, despite theoretical knowledge about core issues in postoperative pain management this is not always implemented in the clinical setting (Dihle et al., 2006a).

There is a belief that the amount of pain perceived is merely directly proportional to the extent of injury (Melzack et al., 2001). The severity of postoperative pain is however influenced by multiple factors aside from the extent of trauma (Pan et al., 2006). Despite of identical surgical procedures, there is postoperatively a large variation in the pain experience and analgesic requirement (Özalp et al., 2003). Preoperative expectations of pain have been found to correlate with the postoperative pain experience (Thomas et al., 1998; Svensson et al., 2001; Mamie et al., 2004). Psychological factors such as anxiety and depression have been considered as important predictors of postoperative

pain (Caumo et al., 2002; Özalp et al,. 2003) and perceived control over pain has been identified as a major psychological factor that is associated with reduced pain reports and increased pain tolerance (Pellino & Ward, 1998; Shiloh et al., 2003). Patients with good analgesia are more co-operative, recover more rapidly and leave hospital sooner (Kehlet, 1994). Therefore, identification of patients at high risk of severe postoperative pain and giving those patients special attention would be desirable from both the patients´ and the caregivers´ perspective.

The pain treatment method is also of importance for the pain experience. In the present studies, most of the patients (85%) are diagnosed with prostate cancer (PC) and operated with radical prostatectomy (RP). After RP, several techniques for postoperative pain management are available. Continuous epidural analgesia (EDA) is a safe and effective method that is frequently used (Ballantyne et al., 2003; Block et al., 2003), although recent studies (Brown et al., 2004; Sved et al,. 2005) have found that intrathecal analgesia (ITA) with opioids and local anaesthetics also compares favourably with an EDA technique. The use of advanced analgesia techniques increase the need for monitoring though, and all staff involved in the care of such patients should be trained and educated in the procedure (Karlsten et al., 2005).

Pain is a personal experience not only for patients but also for health professionals and it is influenced by the context in which it occurs (Manias et al., 2005). Pain management also requires an interdisciplinary effort and cooperation (Gordon & Dahl, 2004). Patients have the right to a care that is based upon sound, proven and up to date knowledge and practice, delivered by competent practitioners who recognize a minimum standard, necessary to meet the patients´ needs (Hunter, 2000).

BACKGROUND

Definitions of pain

There have been several attempts to define pain. McCafferey (1972, p. 14) states that “pain is whatever the experiencing person says it is, existing whenever he/she says it does”. The International Association for the Study of Pain (IASP) defines pain as “an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage”(IASP, 1994, p.217). Acute pain is described as being “the normal, predicted physiological response to an adverse chemical, thermal or mechanical stimulus associated with surgery, trauma and acute illness” (Carr & Goudas, 1999). In order for pain to be classified as chronic post-surgical, the following criteria should be full-filled: 1) the pain has developed after a surgical procedure, 2) the duration of pain is of at least two months, 3) other causes for the pain should have been excluded and 4) the possibility that the pain is a pre-existing problem must be explored and excluded (Merskey & Bogduk, 1994).

Physiology of acute pain

Pain is not a single entity. Its variability reflects rather the dynamic physiology of the nociceptive input from periphery to the cerebral areas that interpret the nociceptive information. Pain is in general seen as either nociceptive, inflammatory or neuropathic, giving pain a patho-physiology correlate (Kehlet et al., 2006). Nociceptive pain is the pain that results from activation of high thresholds peripheral sensory neurons (nociceptors) by intense mechanical, chemical or thermal noxious stimuli. Signals from these nociceptors travel primarily along small myelinated A-delta and unmyelated C sensory afferent fibres to the dorsal horn of the spinal cord where they make synaptic contact with second order neurons. The signals travel post-synaptic mainly along the spinothalamic tract of the spinal cord to the thalamus and sensory cortex (Gottschalk & Smith, 2001). This spino-cerebral signalling continues also partly to the hypothalamus and the limbic system, the loci being important in determining the individuals´ emotional reactions to pain (Woolf, 1994). The nociceptive input and rostral transmission signalling is under the influence of both local and bulbo-spinal neural activity. These can bee either inhibiting or facilitating. There are a numerous pharmacologically identified transmittors that can act as modulators in this circuitry of nociceptive input.

Inflammatory pain is the heightened pain that occurs in response to tissue injury and inflammation. It results from the release of sensitizing inflammatory mediators that lead to a reduction in the threshold of nociceptors that innervates the inflamed tissue (peripheral sensitisation). The peripheral sensitization is

augmented by important biological processes that result in central sensitization of the spinal cord and rostral sites. As a consequence of an increase in the excitability of neurons in the central nervous system, inflammatory processes are also associated with exaggerated responses to normal sensory inputs. These phenomena, named allodynia or hyperalgesia, although evoked within a matter of minutes, can outlast the precipitating tissue injury for several hours or days. Spinal cord nociceptive neurons may become sensitized by repeated brief stimulation, which leads to prolonged spontaneous discharge i.e. the phenomenon of windup (Worwag & Chodak, 1998). This mechanism may hypothetically increase the level and duration of pain after surgery (Gottschalk & Smith, 2001) and legitimize thorough pain surveillance and analgesic medication.

Neuropathic pain is the pain that arises after injury to peripheral nerves or to sensory transmitting systems in the spinal cord and brain. As with inflammatory pain, allodynia and hyperalgesia typically reflects neuropathic pain.

In the immediate postoperative period, with direct activation of nociceptors, inflammation and in some cases injury to nerves, the clinical picture is dominated by spontaneous resting and breakthrough pain referred to the site of surgery; primary hyperalgesia, but also to the surrounding tissues; secondary hyperalgesia (Kehlet et al., 2006).

Nociception is not synonymous with pain. This process may be necessary for pain to occur, but nociception is not sufficient to account for pain as a clinical presentation. Nociception is a physiological phenomenon, whereas pain is a perceptual one and involves higher central- nervous mechanisms. A nociceptive barrage may be perceived and reported as pain by one patient, but not necessarily by another. Such variability in individuals´ perception of pain is common (Turk & Okifuji, 1999). The neuromatrix theory of pain (Melzack, 1999) proposes that pain is not only a sensory event but rather a multidimensional phenomenon that could be influenced by past experience, cultural learning, and a host of cognitive and psychological variables. The brain possesses a neural network, “the body-self neuromatrix”, which integrates multiple inputs to produce the output pattern that evokes pain.

Prostate cancer

In Sweden, prostate cancer (PC) is the most common form of cancer in men, with an incidence in 2006 of 9263 new cases (Socialstyrelsen, 2008). During the past 20 years the incidence of PC has increased. This has been related to the introduction of new tools for diagnosing PC at an early stage. The majority of these patients are asymptomatic and more young patients are diagnosed today,

compared to twenty years ago (Khatami, 2007). In 60-70% percent of the patients the cancer is diagnosed while still localized to the prostate (Fransson, 2000). When diagnosed with localized PC patients may elect not to be treated (watchful waiting). However, when patients consent to treatment, there are different therapeutic options; 1) active surveillance; closely monitoring by repeated blood tests and biopsies, 2) radiation therapy; external beam radiotherapy or brachy-therapy (implanting radioactive seeds in the prostate gland) and 3) RP; surgical removal of the prostate gland (Khatami, 2007).

Surgical procedure

Radical retropubic prostatectomy is the most common technique for removing the prostate gland and it is a procedure performed with increasing frequency (Kirschner-Hermanns & Jakse, 2002). An incision in the lower abdomen, from the pubic bone to the navel, is used to reach the prostate gland. The prostate gland is detached from the bladder; the overlying veins, seminal vesicles and vas deferens are also removed. The urethra is reconnected to the bladder and a catheter is inserted into the penis through the urethra into the bladder and is left in place until the reconnection heals. Drains will be put into the abdomen and will be left in place for a couple of days to excess fluids, such as blood and urine (Cancer centre, 2008). Compared to watchful waiting, RP reduces disease-specific mortality, overall mortality, and the risks of metastasis and local progression (Bill-Axelson et al., 2005). Postoperative pain after RP can be moderate to severe but is often of rather short duration (Gupta et al., 2006). After the operation, patients can experience physical and existential fatigue, pain, micturition problems and changes in their sexual life (Jakobsson, 2000).

Perceived control and psychological distress

Perceived control, e.g. the perception of, or belief in, the availability of a response that can reduce or limit pain, has been associated with less pain reports and an increased pain tolerance (Shiloh et al., 2003). It has previously been shown that patients who are more internal, e.g. believing that they can influence and are responsible for their own health (Wallston & Wallston, 1978) have lower pain scores and use less postoperative morphine (Reynaert et al., 1995).

Anxiety can be described as “vague, uneasy and unpleasant feelings of potential harm or distress. These feelings are accompanied by an arousal that are due to real or perceived threats to one’s physical or mental well-being” (Gobel, 1993, p.580). Depression includes a broad spectrum of moods and behaviours. It is described as “a feeling of gloom, emptiness, numbness or despair”. Depression exists on a continuum of emotional responses ranging from minor mood changes to major depression (Much & Barsevick, 1993, p.594). Psychological distress is

in this thesis defined as the level of self-reported symptoms of anxiety and depression. Most psychological distress appears to be related to the diagnosis of cancer per se (Cliff & MacDonagh, 2000). There are only a few studies that have considered psycho-pathology in men with prostate cancer (Bisson et al., 2002).

Health Related Quality of Life (HRQOL)

Health can be described as "a state of complete physical, mental and social well-being and not merely as the absence of disease or infirmity" (WHO, 1948). Quality of life is defined as "an individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns. It is a broad ranging concept, affected in a complex way by the persons´ physical health, psychological state, level of independence, social relationships, and their relationships to salient features of their environment" (WHO, 1998, p.551). It is becoming essential that outcomes from cancer treatment include measures of QOL, in addition to survival and objective response to treatment (Velikova et al., 1999).

Health-related quality of life (HRQOL) is one dimension of the wider QOL. HRQOL concerns the aspects of life affected by health (Bowling, 2005). HRQOL encompasses "those attributes valued by patients, including: their resultant comfort or sense of well-being; the extent to which they are able to maintain reasonable physical, emotional, and intellectual function; and the degree to which they retain their ability to participate in valued activities within the family, in the workplace, and in the community" (Naughton & Shumaker 2003, p.73). HRQOL is more specific and more appropriate to clinical research and practice than QOL, as it points only to those aspects of life which are affected by health care interventions (Velikova et al., 1999). Patients with early-stage PC will be living for long periods with their cancer and the effects of the treatment, and therefore measuring pre-and post-treatment HRQOL is of increasing importance (Greene et al., 2005).

Nurses´ role in pain management

It is a humanitarian and ethical issue for nurses to provide pain relief (Hunter, 2000). In the humanistic view, the nurses are interested in the patients´ subjective experiences and the nurses´ goal is to provide physical and emotional comfort. In this view the nurses have an ethical obligation to manage the patients´ pain (Van Niekerk & Martin, 2002). Pain management has long supported the principle of beneficence, recognizing the obligation to provide care that benefits the patient and promotes good (Ferrell, 2005). In the "Deliberative Nursing Process Theory" (Orlando, 1990, p.31), the author

describes four practices which are basic to nursing; 1) observation, 2) reporting, 3) recording, and 4) actions carried out with or for the patient. These practices should be examined in terms of the benefits gained by the patient when they are carried out. Furthermore, the Swedish National Board of Health (SOSFS 1993:17) emphasizes that a model of the caring-process can be used for assessing, planning and carrying out as well as evaluating and documenting the caring interventions. A nursing situation is comprised of three basic elements: 1) the behaviour of the patient, 2) the reaction of the nurse and 3) the nursing actions which are designed for the patients´ benefits. The interaction of these elements with each other is the nursing process (Orlando, 1990, p.36).

Observations have been defined as any information pertained to a patient which the nurse acquires when she is on duty (Orlando, 1990). Assessment of pain is a crucial observation for obtaining efficient postoperative pain relief and it is an essential activity that must occur prior to therapy and throughout treatment (McGuire, 1992). The nurse is professionally prepared and responsible for helping patients to communicate their needs and to see them being met. The nurses´ observations are the starting point from which she makes and implements her plans for the patients´ care (Orlando, 1990). Nurses as well as physicians are obliged to document care, including assessments of care needs, planned and implemented care interventions and outcomes of care, in patients´ records (SFS 1985:562; SOSFS 1993:17). The documentation serves several purposes; to ensure continuity in the patients´ care, to be a tool for health professionals, for quality assurance, for supervision and control as a legal instrument and for research (SOSFS 1993:20). The documentation should reflect the process of care for the patient and facilitate a follow-up of the care process (SOSFS 2005:12). Pain assessment, interventions, follow-up and evaluation should routinely be documented in the patients´ record. Nursing notes are an essential part of patient care. These notes provide a comprehensive document of a patient’s stay in hospital, but are also an explicit record of the nurses´ professional competence (Manias, 2003).

The natural consequence of an observation is a decision to act in relation to what is observed (Orlando, 1990). Analgesic administration has long been identified as one essential nursing responsibility (Pasero et al., 2007). Patients have the right to be recognized as experts on their own pain experience and to have their report reflected accurately in the type of pain relief that they receive. They also have the right to expect that relief of their pain is considered to be a reasonable goal of treatment (Hunter, 2000).

RATIONALE FOR THE STUDY

It is not clearly established whether postoperative EDA is better than other pain management methods or if the adverse profiles differ (Block et al., 2003). Postoperative EDA is an expensive therapy, although valuable for selected patients, but the benefits of the therapy must be weighed against the risks and failures (Ballantyne et al., 2003; Gupta et al., 2006). Most patients operated with RP are classified by the American Association of Anaesthesiologists (ASA) to class I or II, with few co-morbidities and this is why the indication for this kind of advanced pain treatment may not be absolute.

In contrast to EDA, the management of postoperative pain by administering a single dose of intrathecal opioids has failed to gain widespread popularity (Gwirtz et al., 1999). Advantages with ITA could be the technical ease of administration, the simplicity of postoperative management and a potential reduction in costs, compared to EDA (Gwirtz et al., 1999; Eandi, et al., 2002). The rationale for study I and II is to evaluate the pain treatment method after RP according to pain relief, side effects, barriers to treatment and length of stay.

Acute postoperative pain is followed by persistent pain for 10-50% of the individuals after common operations (Kehlet et al., 2006). Although long-lasting pain is not generally encountered after RP, pain problems three months after surgery have been reported (Sall et al., 1997) and few studies have described this phenomenon after RP. Long-lasting pain may have an effect on patients' recovery and HRQOL after discharge from hospital. A second rationale is to describe pain and HRQOL three months after surgery.

Nurses play an important role in pain management. They assess pain and decide whether to administer medication (Manias, 2003). Pain assessment includes the fact that pain is identified, recognized as legitimate, quantified, documented and used to evaluate interventions. Documentation of assessments is the key to adequate management of pain (McGuire, 1992). Systemic opioid analgesics (SOA) are mostly prescribed as a variable dose and given by nurses on a PRN basis. Thus, the nurses make the decisions concerning medication for pain relief (Sloman et al., 2005). Nurses are expected to, within the prescribed dosage range, use their professional judgement concerning the amount of analgesic administered to patients to avoid under-medication (Hunter, 2000). A third rationale is to describe nurses´ approaches to pain management.

Postoperative pain after RP can be influenced by different factors aside from the pain treatment method i.e. expectations of pain (Thomas et al., 1998; Svensson et al., 2001; Mamie et al., 2004), psychological factors such as anxiety and/or depression (Caumo, et al., 2002; Özalp, et al., 2003), perceived control (Pellino

& Ward 1998; Shiloh et al., 2003; Gedney & Logan, 2007) and age (Thomas et al., 1998; Caumo et al., 2002). A fourth rationale is to investigate the relationship between preoperative factors that have been shown to predict pain and the pain experience itself. It would be desirable to identify the patients at high risk of postoperative pain and to give them special attention.

AIMS

The overall aim of the thesis was to gain a comprehensive knowledge of patients´ pain experiences, factors influencing pain and barriers to optimal pain management.

Specific aims:

Paper I To describe the postoperative pain experience during three days with EDA treatment after RP. A second purpose was to identify barriers to adequate treatment of pain with continuous EDA.

Paper II To evaluate ITA in terms of pain experience, side effects and need for rescue analgesics during three postoperative days after RP.

Paper III To investigate patients' experiences of pain, psychological distress and HRQOL, and the interrelationship between these factors, at baseline and three months after RP.

Paper IV To compare pain levels reported by patients with those documented by nurses and to find out to what extent the amount of opioids administered correlated with these pain levels. Secondly, to study if pain management and nurses´ approaches to pain management, had improved during a two year period, during which an educational program on postoperative pain and the treatment thereof was implemented.

Paper V To evaluate the relationship between preoperative factors that have been shown to predict postoperative pain and the self- reports of pain intensity in a population of men undergoing RP, and also to investigate whether a previous pain score could predict the subsequent pain score.

METHODS

Design

The thesis comprises five studies (table 1).

Table 1. Design of the thesis

Paper	Design	Participants	Data collection	Data analysis
I	Prospective, descriptive study	90 patients undergoing RP with postoperative continuous EDA	Demographic form MHLC HAD VAS Medical data	Descriptive One-way ANOVA Pearson product moment correlation
II	Prospective, descriptive, pilot study	50 patients undergoing RP with pre-surgical ITA	Demographic form VAS Medical data	Descriptive Pearson product moment correlation
III	Prospective, longitudinal descriptive study	140 RP patients at baseline and 3 month after surgery	Demographic form HAD SF-36 VAS Medical data	Descriptive One-way ANOVA Paired sample t-test Pearson product moment correlation
IV	Prospective descriptive, cross-sectional, two-part study	Part I-77 patients undergoing major urologic surgery and 19 nurses Part II-141 RP patients and 22 nurses	Demographic form VAS Medical data Nurse documentation Nurse pain questionnaire	Descriptive Fisher's exact test Independent sample t-test Spearman's rank order correlation Logistic regression analysis
V	Prospective explorative study	155 RP patients	Demographic form MHLC HAD VAS Medical data	Descriptive Pitman's test Logistic regression analysis

Sample and settings

Sample

Altogether, 100 (paper IV, part I) consecutive patients undergoing major urologic surgery and 181 consecutive patients on the waiting-list for RP were recruited to be part of these studies (table 2). In paper IV (part I) 77 (77%) and in papers I-V, 155 (86%) patients consented to participate.

The number of nurses who were asked to participate was 28 in both parts of paper IV and consent was given by 19 (68%) (Part I) and 22 (79%) (Part II), nurses respectively. Five patients did not want to participate because of difficulties with the Swedish language. The rest of the patients and nurses did not give any reason for declining to participate.

Table 2. Study sample

Paper	Time period	Invited to paticipate	Accepted to participate	Final sample
I	Jan 2003-Nov2003	115	99	**90**
II	Nov 2003-March 2004	66	56	**50**
III	Jan 2003-June 2004	181	155[a)]	**140**[b)]
IV-Part I	Patients: Feb 2000-Feb 2001 Nurses: Autumn 2000	100 28	77 19	**77** **19**
Part II	Patients: Jan 2003-March 2004 Nurses: Springtime 2004	162 28	141 22	**141**[c)] **22**
V	Jan 2003-March 2004	181	155	**155**

a) Includes the 15 patients with systemic opioid analgesia (SOA)
b) 15 patients who did not answer the three months questionnaires were excluded
c) Only patients from the University hospital were included

Settings

In papers I, III and V, patients on the waiting-list for RP were recruited from two hospitals; a University hospital with two urology surgical wards (n=141) and a community hospital with one urology ward (n=14). In papers II and IV

(part II) patients on the waiting-list for RP and in paper IV (part I) patients undergoing major urologic surgery were recruited from the University hospital. According to the general plan held at this time for this type of surgery, the patients were supposed to stay in hospital for three days postoperatively.

Instruments

Demographic form

The demographic form (papers I-V) contained questions about age, marital status, education, time on waiting list, employment, previous surgical experience, previous pain experience and postoperative pain expectations (table 3).

Visual Analogue Scale (VAS)

There are different types of self-report scales for rating pain, e.g. verbal rating scale (VRS) consisting of a series of verbal pain descriptors ordered from least to most intensity and numerical rating scales (NRS) consisting of a series of numbers rating from 0 to 10 or 0 to 100 with endpoints intended to represent the extremes of the possible pain experience (Katz & Melzack, 1999). The visual analogue scale (VAS, 0-100mm) that was used to assess the patients´ pain intensity in these studies, is one of the most commonly used rating scales of pain intensity in pain research. The VAS is often presented as a 100mm long line where the patients rate their pain by making a mark between the extremes of “no pain at all” (0) and “worst pain imaginable” (100) (Jensen et al., 2003).

The validity of self-reports is an often discussed matter. Self-report scales such as the VAS, are designed to measure pain experience. Self-reports of pain experience are influenced by psychological and environmental factors, not just nociception. A valid pain assessment scale should be influenced by environmental factors and that should be seen as evidence for the validity of self-report scales for assessing pain experience. The pattern of pain experience following surgery indicates that self-reports of pain intensity behave as if they accurately reflect pain experience. Study findings indicate that the clinical use of self-report scales offers valid reflections of pain experience for most patients most of the time (Jensen, 1997).

The analysis of the VAS scores is a frequently discussed matter. In studies using the VAS, a score of more than 30/100 mm is often used as a limit to indicate inadequate analgesia and a VAS score of more than 70/100 mm is a common breakpoint for defining severe pain (Dolin et al., 2002). A mean pain score of

VAS >30mm has been found to have a significant effect on general activity and mood and VAS ≤ 30mm thus should be maintained to optimize the patients´ functional status (Dihle et al., 2006b). The achieved VAS measurements may preferably be allocated into three broad categories; i.e. mild pain (≤30mm), moderate pain (31-70mm) and severe pain (>70mm) (Bodian et al., 2001). The rationale for this is the non-linear relationship between pain and VAS. The use of groups rather than the full spectrum of measured values would therefore provide a greater clinical relevance for comparisons.

In papers I and III, pain scores were divided into three broad categories based on pain intensity, as suggested by Bodian et al. (2001).

- Pain group I was defined as patients whose "worst pain" was scored as VAS ≤ 30mm (mild pain) during all three postoperative days.
- Pain groups II was defined as patients whose "worst pain" was scored as VAS 31-70mm (moderate pain) for one or more of three subsequent postoperative days.
- Pain group III was defined as patients whose "worst pain" was scored as VAS >70mm (severe pain) for one or more of three subsequent postoperative days.

After three months, the "worst pain" scores were divided into the same categories, based on the "worst pain" level at home.

Since the recommended pain level on the wards was to be below VAS 30-40mm, when a VAS score reported by both nurses and patients to be less than 40mm or when the discrepancy was less than 10mm, the nurses´ pain reports were considered equivalent to those of the patients´ (Iafrati, 1986) (paper IV).

Multidimensional Health Locus of Control (MHLC)

MHLC measures expectancies about control, and was developed for prediction of health related behaviour (Wallston & Wallston, 1978). The scale is an 18-item questionnaire measuring the subjects´ beliefs concerning three dimensions of control of health outcomes; i.e. "internal" (IHLC), "powerful others" (PHLC) and "chance" (CHLC). All of the dimensions are independent of one another and there is no total MHLC score. People who believe they can influence and take responsibility for their own health are labelled as "internals". Those who score high on the "powerful others" subscale are likely to rely on others (e.g. doctors and nurses) to control their health. Finally, those who score high on the "chance" subscale are not likely to rely on their own actions or the action of others because they believe that their health rather is a matter of chance. There are six statements for each dimension. Each statement is rated on a scale from 1-6 with 1 indicating "strongly disagree" and 6 indicating "strongly agree",

making the range of scores 6-36 for each dimension. The scale is reliable with a Cronbach alpha in the 0.60-0.75 range (Wallston, 2005).

Hospital Anxiety and Depression Scale (HAD)

The HAD scale (Zigmond & Snaith, 1983) has been found to be a reliable (Cronbach´s alpha > 0.80) instrument for assessing the symptom severity of anxiety disorders and depression in somatic, psychiatric and primary care patients as well as in a general population (Bjelland et al., 2002). HAD is a questionnaire that performs well in screening for the separate dimensions of anxiety and depression in patients from non-psychiatric hospital clinics (Lisspers et al., 1997; Bjelland et al., 2002).The instrument is a 14-item, self-administered rating scale that produces two sub-scales, one measuring anxiety (HAD-A) and the other measuring depression (HAD-D). Each item has four response categories, reflecting a continuum of increasing level of emotional distress. Thus, HAD $\leq$7 indicates no anxiety (HAD-A) or depression (HAD-D), HAD 8 – 10 indicates possible anxiety or depression, and HAD $\geq$11 indicates probable anxiety or depression. The aim of the HAD scale is to reflect the present state of mood and the scale reflects how the patient has felt during the last week. The scale scores are not affected by the presence of physiological illness (Zigmond & Snaith, 1983). The HAD discriminates well between samples with high, medium and low prevalence of anxiety or depressive disorders. For scientific purposes, the scale is able to differentiate groups with different prevalence or intensities of anxiety and depression (Herrmann, 1997).

Short Form 36 (SF-36)

The SF-36 measures perceived health status by assessing eight health components: “physical functioning” (PF): limitations in physical activity, including self-care activities; “role-physical” (RP): work and activity limitations due to physical problems; “bodily pain” (BP): limitations due to pain; “general health” (GH): overall self-rated health; “vitality” (VT): energy versus fatigue; “social functioning” (SF): limitations in social activities due to emotional problems; “role emotional” (RE): work and activity limitations due to emotional problems: “mental health” (MH); emotional symptoms (e.g. nervous, depressed). Standardized scores range from 0 (poor functioning) to 100 (good functioning). In addition one single item concerns reported health transition over the past year. The reliability for the Swedish version of SF-36 is more than 0.70 in a general population (Sullivan et al., 1995).

Nurse pain questionnaire

In order to determine the nurses´ approaches to pain management, a nurse questionnaire developed for a previous study (Warrén Stomberg et al., 2003) was used. From this questionnaire, eight questions representing the "Guidelines for postoperative pain management" recommended by The Swedish Society of Medicine (MKR, 2001) were used (table 6). The guidelines are similar to recommendations given by the American Pain Society (APS) (Gordon et al., 2005).

Pain treatment

All patients in the studies received paracetamol (1g x 3-4) starting preoperatively and continuing postoperatively until the patients left the hospital. Additional doses of ketobemidone (equianalgesic morphine type of opioid analgesia) were administered systemically PRN. Oral rescue analgesics (tramadol and NSAID´s) were not given by routine but at the discretion of the surgeon on the ward. The recommendation by the hospital was to keep the pain level below VAS 30-40 mm.

Epidural analgesia (EDA)

In patients treated with EDA, the epidural catheter was inserted preoperatively. Surgery was performed under general anaesthesia (propofol/ thiopental, fentanyl, a non-depolarizing muscle relaxant, oxygen/nitrous oxide and isoflurane). In the majority of the patients (n=79, 88%) the EDA was not activated until about 30 minutes before the end of surgery with the administration of a bolus dose of ropivacaine and sufentanil, which was continued in the postoperative anaesthesia care unit (PACU). In the surgical ward a plain ropivacaine infusion for pain relief was used in these patients. For 11 (12%) of the patients i.e. the patients in the community hospital, an epidural solution of bupivacaine 1 mg/ml, fentanyl 2 µg/ml and adrenaline 2 µg/ml was started perioperatively and the analgesic solution was used throughout the whole treatment period. When returning from the PACU to the ward, each patient had a prescription of epidural drugs, drug concentrations and infusion rates to be used and also a checklist for basic and specific controls (e.g. hemodynamics, sensibility, motor function, and VAS) needed to be documented every four hours, by the attending ward nurse. When the pain relief was insufficient, additional doses of ketobemidone were given systemically PRN. The surgeon on the ward had the main responsibility for the pain management. If there were any problems, the anaesthetic department was consulted.

Intrathecal analgesia (ITA)

Patients with ITA received lumbar intrathecal morphine 0.1-0.2 mg and hyperbaric bupivacaine 10 mg preoperatively shortly before anaesthesia was instituted. The morphine dosage was selected at the discretion of the attending anaesthesiologist. Subsequently, surgery was performed under general anaesthesia (propofol/ thiopental, fentanyl, a non-depolarizing muscle relaxant, oxygen/nitrous oxide and isoflurane) with controlled ventilation in intubated patients. Postoperatively the patients were supposed to stay in the PACU for a minimum of six hours after the administration of the intrathecal drug. When returning to the ward the patient had a checklist for the basic and specific controls which were to be performed for 12 hours after the administration of ITA, consistent with national recommendations (SFAI, 2005).
Every hour:

- haemodynamics
- VAS
- sedation score (0-3),
- respiratory rate
- motor function

Every four hours:

- nausea and vomiting (PONV)
- pruritus

Supplemental opioids were to be avoided on the ward during the first 24 hours after the intrathecal administration and if pain relief was insufficient, oral analgesics were to be given.

Systemic opioid analgesia (SOA)

Patients, unsuitable for either EDA or ITA, received ketobemidone administered systemically on a PRN basis (2.5-5 mg i.v. in the PACU and 2.5-5 mg s.c. on the ward) until pain relief was achieved. Patients given only SOA for pain relief did not have any special protocol for pain assessment.

Procedure

In paper IV (part I) patients were informed about the study, both verbally and in writing, on the ward the day before surgery. Patients willing to participate signed a consent form. The nurses on the wards were informed about the study and they were given the nurse questionnaire to answer (Paper IV, part I and II).

Three weeks before surgery, patients in paper I-V received a letter with written information about the study. Patients willing to participate signed and returned a

consent form and answered the demographic form, MHLC and SF-36. The day before surgery, the patients answered HAD and they were informed about the VAS. Patients were asked, by the author, about pain at four hours after surgery and “worst pain” experienced during the last 24 hours at intervals of 24, 48 and 72 hours. The patients were asked to put a mark on a 100mm line, representing “worst pain” experienced. Three months after the operation the patients were sent the SF-36 and the HAD questionnaires and a form asking about pain at home and the patients were requested to return the questionnaires in a prepaid envelope.

Statistical analysis

SPSS (version 12.0-14.0) was used to analyze the data. Continuous variables are presented as means and standard deviations, and categorical data are presented as number and percentage. For correlations between variables the Pearson product moment correlation (paper I-III) and Spearman´s rank order correlation (paper IV) were used. Differences in VAS-values between pain group means were analyzed using one-way analysis of variance (ANOVA) with Sheffe´s post-hoc test (Paper I and III) since it has been demonstrated that this method is adequate for VAS values (Dexter & Chestnut, 1995). A paired sample t-test was used to measure differences before and after surgery (paper III). Fisher’s exact test was used for categorical variables. By use of a non-parametric test (Pitman´s test) (Good, 2000) the correlation between ”worst pain” and different possible predictors was tested (Paper V). By use of a logistic regression analysis we tested the probability of receiving opioids and the probability that VAS at one occasion would exceed 30mm or 70mm (Paper IV and V). All tests were two-tailed and a p-value <0.05 was accepted as statistically significant.

Ethical considerations

Ethical considerations in the study followed the World Medical Association Helsinki Declaration (2000) regulations regarding research involving human research subjects. The study was approved by The Ethics Committee of The University of Gothenburg, Sweden (study code Ö 123-02). Patients undergoing major urologic surgery were informed orally and in writing on the ward the day before surgery and patients on the waiting-list for RP were sent a letter with written information about the study. Along with the information there was a consent form to sign, stating whether or not the patient wanted to participate in the study. The patients were also informed about their rights to withdraw from the study at any time without giving any reason and that the withdrawal would not affect their treatment. All data were treated confidentially.

RESULTS

Sample

Demographics for the 155 RP patients are presented in table 3. Of the nine drop outs in paper I, three patients had back problems and were considered unsuitable for epidural catheter insertion, one patient declined to have an epidural catheter, in four patients the catheter insertion failed and one patient received SOA for no mentioned reasons. In paper II there was a drop out of six patients; four patients with back problems unsuitable for ITA and two patients who were given EDA. The mean age for the 77 patients in paper IV, part I was 61 years and there were 58 male and 19 female patients. The mean age of the 19 nurses (paper IV, part I), all female, was 33 years. They had an average clinical experience of 7.3 years. Six (32%) of the nurses had, in addition, an advanced surgical nurse education. In part II, one of the 22 nurses was male. The mean age of the nurses was 39 years, their clinical experience was in average 10.4 years and 4 (18%) nurses had an advanced surgical nurse education. Considering both part I and II, one out of four nurses had an advanced pain education and in addition, all nurses in part II had received specific pain management education in the hospital.

Table 3. Patient demographics and background characteristics (n=155)

Age	63 ±5
Civil status	
Single	17 (11)
married/cohabit	138 (89)
Education	
elementary school	51 (33)
junior high school	34 (22)
senior high school	33 (21)
university	33 (21)
unspecified	4 (3)
Employment	
full time	62 (40)
part time	10 (6)
retired	79 (51)
sick leave	4 (3)
Time on waiting list	
< 1 month	18 (11)
1-2 months	45 (29)
2-3 months	29 (19)
> 3 months	63 (41)
Pain expectations	
no pain	1 (1)
mild	21 (13)
moderate	91 (59)
severe	30 (19)
missing	12 (8)

Continuous data are presented as the means and SD and categorical data as n and %

Pain experiences (paper I-III)

When the study started, unless contraindicated, all RP patients were receiving EDA for postoperative pain relief. Pain experienced by the EDA patients (n=90) at four hours postoperatively and during three subsequent postoperative days is presented in Figure 1.

After evaluating the effects of EDA and providing a three months education of staff on pain and pain management, the method for postoperative analgesia was shifted to ITA. Pain experienced after four hours and during days one, two and three, by the initial 50 patients with ITA, is presented in Figure 2.

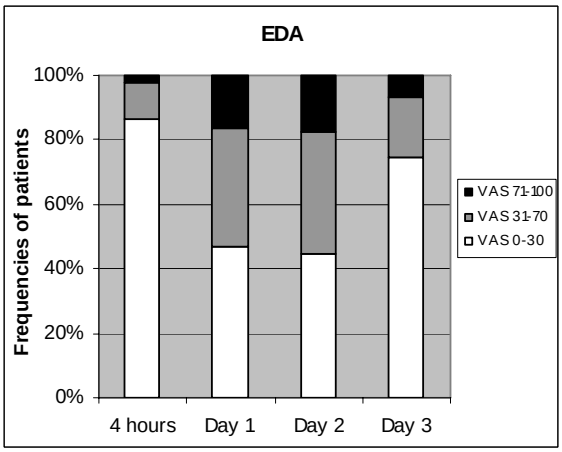


Figure 1. Pain levels during 3 postop. days with EDA (n=90)

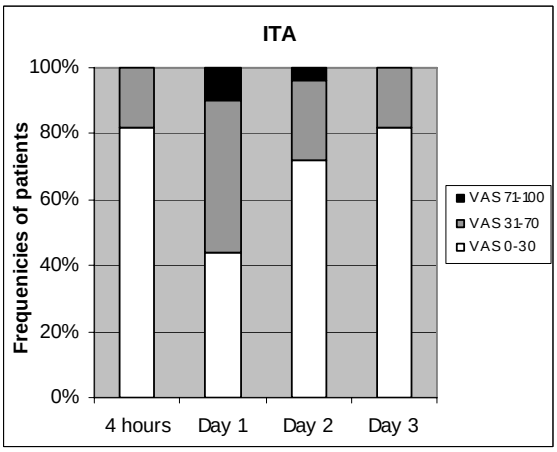


Figure 2. Pain levels during 3 postop. days with ITA (n=50)

About two thirds of the EDA- (69%) and ITA- (66 %) patients reported moderate or severe pain for one, two or three days (Figures 3 and 4). Fewer ITA patients reported severe pain and the pain was of shorter duration.

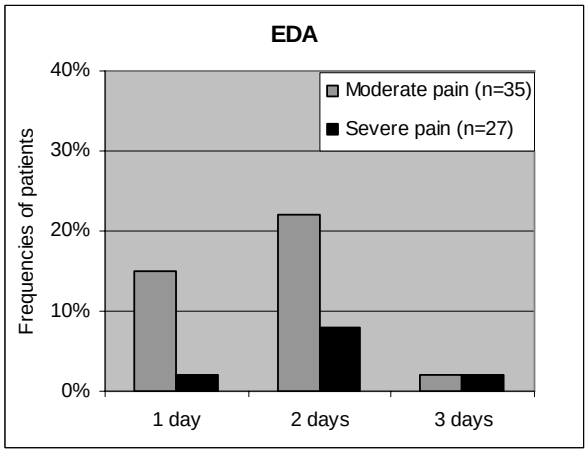


Figure 3. Duration of pain intensity during 3 postop. days with EDA (n=90)

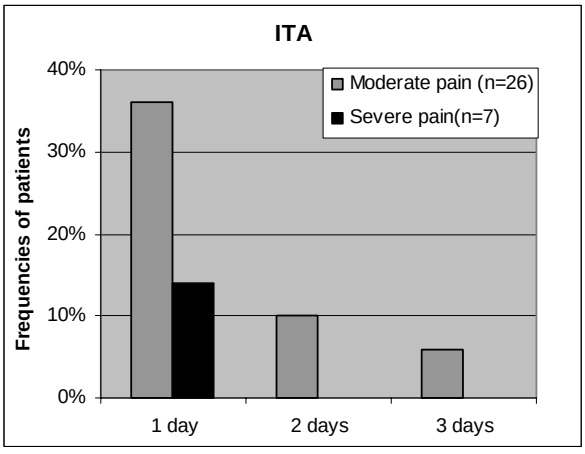


Figure 4. Duration of pain intensity during 3 postop. days with ITA (n=50)

Of the 15 patients with SOA only for pain relief, five reported mild, eight moderate and two patients severe pain during the three postoperative days.

Fifteen patients (10%) did not answer the three months questionnaires. In hospital these patients were equally distributed among the three pain categories; five with mild, five with moderate, and five with severe postoperative pain. Out of the 140 patients who filled in and returned the three months questionnaire, forty patients (29%) reported moderate (n=35) or severe (n=5) pain after discharge from hospital. There was a correlation between high postoperative pain scores in hospital and high pain scores during the three months after discharge from hospital ($p<0.01$, $r=0.43$). However, when asked about pain as it was at present, three months after surgery, only three patients reported a pain score above VAS 30mm. “Worst pain” scores in hospital and at home regarding the different pain treatment methods are presented in table 4.

Table 4. Differences among pain treatment methods regarding “worst pain” scores postoperatively in hospital and at home

Pain level VAS	**Mild <30mm**	**Moderate 31-70mm**	**Severe >70mm**	**Total number of patients**
Pain in hospital				
EDA	28(31)	35 (39)	27 (30)	90
ITA	17 (34)	26 (52)	7 (14)	50
SOA	5 (33)	8 (53)	2 (13)	15
Total	50 (32)	69 (46)	36 (23)	155
Pain at home				
EDA	53 (68)	20 (26)	5 (6)	78
ITA	36 (75)	12 (25)	0	48
SOA	11 (79)	3 (21)	0	14
Total	100 (71)	35 (25)	5 (4)	140

Data are presented as n (%). The table shows that more patients treated with EDA experienced severe pain compared to patients with ITA and SOA, both in hospital (30% vs 14% and 13% respectively) and at home, during three months after their discharge from hospital (6% vs 0%)

Pain treatment strategies (paper I-III)

The opioid consumption during three postoperative days is presented in table 5. Fifty-five (61%) of the EDA patients and 43 (86%) of the ITA patients received rescue opioids at some occasion, though the doses of opioids were small. There was a correlation between pain and opioid consumption on all three days ($p<0.01$). We found no correlation between age and the opioid consumption. NSAID´s were not given routinely. Days one, two and three 31 (20%), 48 (31%) and 53 (34%) patients respectively were given NSAID´s orally. These patients reported less pain day two ($p<0.05$) and used less opioids on days two and three ($p<0.05$) compared to the patients who did not receive NSAID´s.

Table 5. Opioid consumption during three postoperative days

	Opioids (mg)	**Number of patients receiving opioids**
Day 1		
EDA	1.7 ± 3.3	23 (26)
ITA	4.7 ± 5.6	41 (82)
SOA	15.1 ± 11***	14 (93)
Day 2		
EDA	4.9 ± 6.6	44 (49)
ITA	2.0 ± 4.3	13 (26)
SOA	10.8 ± 10***	11 (73)
Day 3		
EDA	3.4 ± 5.3	34 (38)
ITA	2.5 ± 3.8	23 (46)
SOA	2.7 ± 4.6	5 (33)
Total		
EDA	10 ± 12	55 (61)
ITA	9.2 ± 11	43 (86)
SOA	28.6 ± 22***	14 (93)

Continuous data are presented as the means ± SD and categorical data as n (%). The mean opioid consumption is based on all patients. *** = $p<0.001$

Barriers associated with the analgesic techniques (paper I and II)

Fifty-one patients (57%) experienced some kind of complication (technical or medical), from their epidural analgesic regime. In 22 of the patients; i.e. 17 patients with catheter related problems and five with a pain score $\geq$60mm, some correctional activities were instituted i.e. the catheter was reinserted (n=3), the catheter tip was adjusted (n=4), bolus and/or infusion rate was adjusted (n=15). Yet, pain scores of more than 30mm were present in 15 of these patients day two and in five patients still on day three. Eight patients had their catheter removed within the first 24 hours, because of low blood pressure (n=5), sensory deficit (n=1), motor deficit (n=1) and problem with the catheter insertion (n=1). There were no serious complications that could be related to the EDA treatment.

Of the ITA patients, one reported pruritus, but no medication was needed. Two patients were hypotensive on the ward and required colloid infusions. No other serious complication related to the ITA treatment; e.g. post-spinal headache, respiratory depression, or sedation was found.

Postoperative nausea and vomiting (PONV) (paper I-II)

Seventy patients (45%) suffered from PONV and 36 (23%) requested anti-emetics on some occasion during the three days. The frequency of PONV decreased slightly over time with 53 (34%), 30 (19%) and 18 (12%) patients reporting PONV days 1-3 respectively. PONV was more common in the group of patients with severe pain (61% vs 43% for moderate pain and 36% for mild pain). There was no difference in the incidence of PONV between the three pain treatment methods.

Length of stay (LoS)

Then mean PACU time was 14 ± 7 h (range 3-46 h). Patients with severe pain (VAS >70) had the longest PACU time (18 ± 7h, $p<0.01$). The EDA patients stayed longer in the PACU compared to the SOA and ITA patients (15 ± 8h vs 14 ± 6h and 11 ± 6h).

The mean length of hospital stay was 4.1 ± 1 day (range 2-8 days). There was a correlation between the LoS and “worst pain” days two ($p<0.01$, $r=0.48$) and three ($p<0.01$, $r=0.46$). The ITA patients had the shortest LoS with a mean of 3.4 ± 1 days ($p<0.05$) compared to 4.4 ± 0.9 and 4.9 ± 1.1 for the EDA and SOA patients respectively.

Pain assessment and documentation (paper IV)

The day after surgery, in part I of study IV, every patient had their pain assessed and documented between 1 and 16 times (mean 7.3±3.3 times). In part II, there were missing pain documentations for 13 (9%) patients and the frequency of documented pain assessments had decreased to between 0 and 10 times (mean 3.2±2.2 times) ($p<0.001$). For patients with advanced pain treatment, there was a special protocol for pain assessment documentation; i.e. for the EDA patients (for the whole time of treatment) and ITA patients (for the first 12 hours). Day one, less pain scores were documented for the SAO patient than for the EDA and ITA patients ($p<0.05$). Days two ($p<0.001$) and three ($p<0.001$), the EDA patients´ pain scores were documented more frequently than those of the ITA and SAO patients´.

In part I, there were missing patients´ pain reports for 4 patients and in part II for 14 patients. The nurses´ ability to assess pain similar to the patients´ reports; VAS within 10mm, had increased after two years, i.e. from 48% of the nurses in part I to 65% in part II ($p<0.001$). Compared to part II, more patients in part I reported higher pain scores than those documented by the nurses (30% vs 20%). Overall, the nurses overestimated pain rated as mild by patients (nurse mean VAS 59 vs pat mean VAS 23, part I and nurse mean VAS 52 vs pat mean VAS 21, part II) and underestimated pain rated as severe by patients (nurse mean VAS 45 vs pat mean VAS 79, part I and nurse mean VAS 35 vs pat mean VAS 65, part II). In part I there was a difference in pain scores between men and women, i.e. 33 (±33) versus 53 (±33), ($p<0.05$) when reported by patients.

There was a correlation between the patients´ reports on “worst pain” and the nurses´ documented “worst pain” assessments in both parts of the study (part I, r=0.51, p<0.01, part II, r=0.83, p<0.01) (Figure 3).

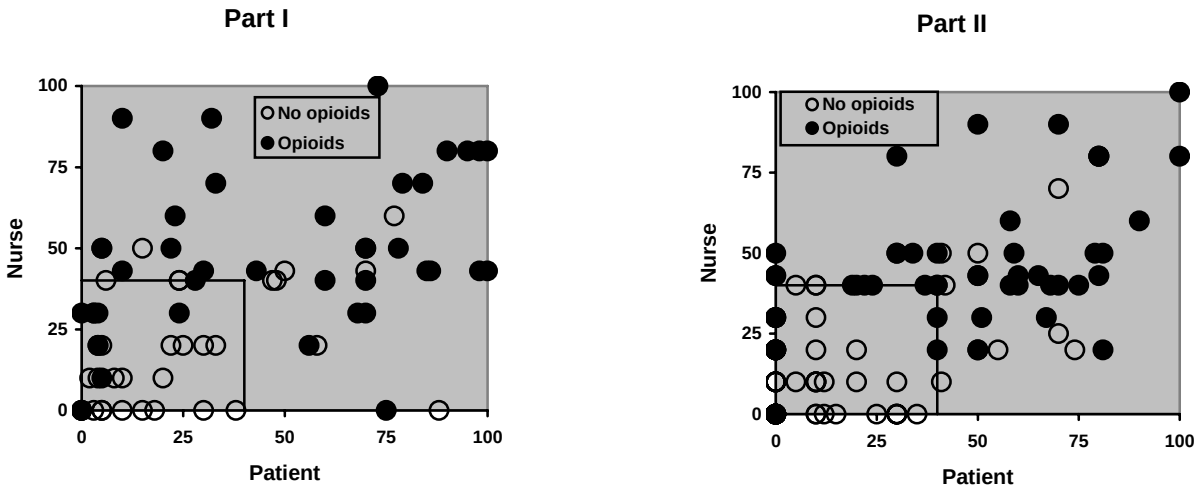


Figure 3.Patients´ reported and nurses´ documented VAS scores and opioids given the day after surgery. The recommended pain level on the ward was VAS 30-40mm and all patients with a VAS score higher than this were supposed to be treated with opioids. In part I, 12 patients (16%) and in part II 14 patients (10%) were not given any opioids despite a reported or documented pain score of VAS ≥40mm (non filled circles in the middle and the right part of the figure). Some circles are hidden behind others.

Probability of receiving opioids (paper IV)

By using a logistic regression analysis, we tested the probability of receiving opioids depending on the pain scores (Figure 4). The results were calculated on data from all of the patients´ pain reports and all documented pain scores in part I and II. When the VAS values of the patients and the nurses were included simultaneously in a logistic regression model it turned out that only the nurse’s VAS was of significant importance when predicting use of opioids (p=0.0008).

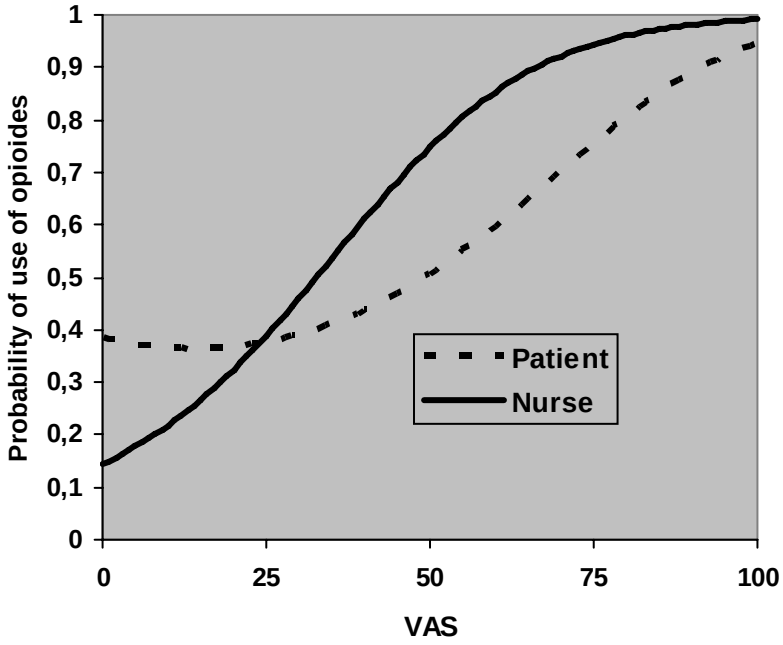


Figure.4. Probability of receiving opioids depending on the patients´ pain reports and the nurses´ documented pain scores. The probability of receiving opioids, when the pain score was > VAS 25mm, was significantly larger if the pain score was documented in the patients´ records ($p<0.001$)

When for example, a patient reported "worst pain" to be VAS 50mm, the probability of receiving opioids was 50%, but if the nurse had documented a pain score of VAS 50mm, the probability of receiving opioids was 75%.

Nurses approaches towards pain management (paper IV)

The nurses´ approaches to pain management had not changed much after two years and after the implementation of an education programme (Paper IV) (table 6). The number of nurses who evaluated the effect of a given analgesic treatment had decreased from part I to part II (100% vs 73%), ($p<0.05$). Almost none of the nurses in part II though experienced difficulties in carrying out repeated pain measurements compared to part I ($p<0.05$). In part II, the nurses reported that they gave prophylactic analgesics more often than in part I ($p<0.01$).

Table 6. Nurse pain questionnaire

	Part I (n = 19)	**Part II** (n = 22)
Do you inform patients about pain assessment before surgery?		
Always/mostly	14 (74)	20 (91)
Seldom/never	5 (26)	2 (9)
Do you inform patients about pain treatment before surgery?		
Always/mostly	17 (89)	21 (96)
Seldom/never	2 (11)	1 (4)
Do you use VAS scoring for pain assessment?		
Always/mostly	10 (52)	13 (60)
Seldom/never	9 (48)	9 (40)
Do you have difficulties in carrying out repeated pain assessments?		
Always/mostly	6 (32)	1 (5)*
Seldom/never	13 (68)	21 (95)
Do you assess pain during both rest and activity?		
Always/mostly	11 (58)	13 (59)
Seldom/never	8 (42)	9 (41)
Do you document pain assessment?		
Always/mostly	16 (84)	18 (82)
Seldom/never	3 (16)	4 (18)
Do you give analgesics before i.g. physical activity?		
Always/mostly	9 (50)	21 (95)**
Seldom/never	9 (50)	1 (5)
Do you evaluate the analgesic treatment effect?		
Always/mostly	19 (100)	16 (73)*
Seldom/never	0	6 (27)

*=$p<0.05$, **=$p<0.01$. The table shows the nurses´ answers on performances in their clinical work.

Perceived control, anxiety and depression

There were no differences in the MHCL between the three pain level groups and no correlation was found among the different dimensions of MHLC and the postoperative pain scores.

In paper III, the HAD scale was answered both before and at three months after surgery by 123 patients (88%). Prior to surgery, 28 men (23%) reported possible or probable anxiety (HAD-A $\geq$8), but this number decreased to 10 patients (8%) at three months after surgery ($p<0.01$). Patients with previous experience of postoperative pain scored higher on the preoperative HAD anxiety scale ($p<0.01$, $r=0.32$). There was a correlation between preoperative anxiety and "worst pain," both in hospital ($p<0.05$, $r=0.23$) and at home ($p<0.01$, $r=0.26$) as well as anxiety at three months ($p<0.01$, $r=0.53$).

The number of patients reporting depression decreased from 13 (11%) preoperatively to 11 (9%) at three months. Preoperative depression correlated with "worst pain" in hospital ($p<0.01$, $r=0.23$) and "worst pain" at home ($p<0.01$, $r=0.31$). The patients with the highest pain scores after discharge from the hospital were also those who reported the most depression at three months ($p<0.01$, $r=0.30$), and the patients with preoperative depression were those who reported the most depression at three months ($p<0.01$, $r=0.58$).

Health Related Quality of Life (paper III)

Differences in health experiences before and three months after RP are presented in table 7. High pain levels, reported by patients, during the three postoperative days correlated with BP (<0.01) at three months. Preoperative depression negatively affected all components of SF-36 except bodily pain (BP) preoperatively, while preoperative anxiety affected all but physical functioning (PF), role physical (RP) and bodily pain (BP) negatively. At three months, anxiety and depression correlated negatively with all components of SF-36 ($p<0.01$).

Table 7. Differences in health experiences before and three months after RP (n=140).

Health areas	Before surgery	3 months after surgery	p-value	Control group
PF	91.3 ± 12.7	85.9 ± 15.6	<0.0001	83.3 ± 19.
RP	85.5 ± 31.7	65.2 ± 42.3	<0.0001	78.9 ± 35.3
BP	88.8 ± 20.6	89.2 ± 19.8	Ns	71.0 ± 26.5
GH	75.8 ± 19.4	75.3 ± 20.4	Ns	70.5 ± 19.8
VT	75.2 ± 20.8	74.5 ± 22.4	Ns	70.5 ± 21.3
SF	86.8 ± 20.2	85.8 ± 21.3	Ns	88.9 ± 17.9
RE	83.3 ± 32.7	82.3 ± 33.3	Ns	88.5 ± 27.5
MH	76.3 ± 20.3	83.1 ± 17.9	<0.0001	82.9 ± 15.2

The health areas are: physical functioning (PF), role physical (RP), bodily pain (BP), general health (GH), vitality (VT), social functioning (SF), role-emotional (RE) and mental health (MH). The control group consists of 2658 healthy men, age 60-64 years (Eriksson and Nordlund 2002).

Preoperative pain predictors (paper V)

The correlation between some predictors associated with postoperative pain and the self reports of “worst pain” during the three postoperative days was evaluated (Pitman’s test) (table 8). A pain level higher than VAS 30mm during three postoperative days was predicted by age ($p<0.05$) with younger patients at higher risk for experiencing pain and a pain level higher than VAS 70mm was predicted by preoperative depression ($p<0.05$).

One hundred and five (68%) patients had previously undergone surgical procedures and 36 (44%) of these patients had experienced moderate/severe pain. Moderate/severe pain after RP was expected by 121 (78%) patients and was actually experienced by 105 (68%) patients. Patients with previous experience of postoperative pain expected higher pain scores ($p<0.01$), though this was not actually experienced.

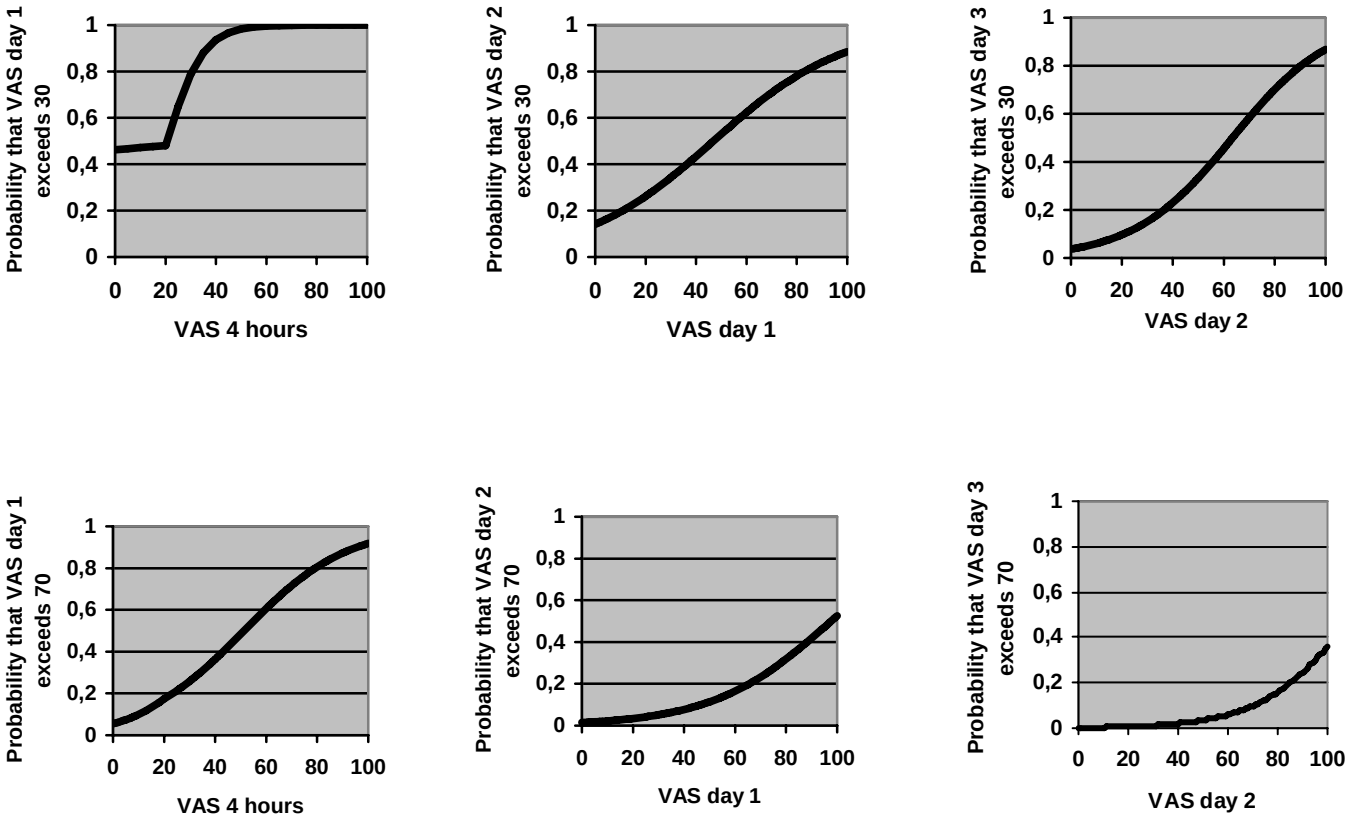
Table 8. Univariate analysis of the association between potential pain predictors and postoperative pain (n=155)

Variable	Two-sided p-value
Psa	>0.30
ASA	>0.30
Weight	>0.30
Age	0.016*
Marital status	0.30
Employment	0.13
Education	0.20
Time on waiting-list	>0.30
Previous surgery	>0.30
Previous postop. pain experience	>0.30
Pain expectation	0.29
Surgery time	>0.30
Intra-operative bleeding	0.19
HAD anxiety	0.073
HAD depression	0.020*
MHLC internal	>0.30
MHLC chance	>0.30
MHLC powerful others	0.14

*=$p<0.05$. The table shows that there is a correlation ($p=0.016$) between age and "worst pain", with younger patients reporting higher pain scores than older. There is also a correlation between preoperative depression and postoperative pain ($p=0.02$).

We also tested how well the previous VAS value could predict the next one. The correlation coefficients (r) between VAS 4 hours and VAS day 1 were 0.52 ($p<0.001$), between VAS day 1 and day 2, 0.47 ($p<0.001$) and between VAS day 2 and day 3, 0.55 ($p<0.001$). Seventy percent of the patients with a pain score >30mm at four hours continued to be in pain. By use of logistic regression analysis the probability that VAS at one occasion would exceed 30mm or 70mm was studied, depending on previous VAS values, age, depression and pain treatment method (figures 5 and 6). The probability that VAS day one would exceed 30mm ($p<0.05$) and 70mm ($p<0.05$) was predicted only by VAS after

four hours. The probability that VAS day two would exceed 30mm was predicted by VAS day one ($p<0.0001$) and EDA ($p<0.001$) (figure 6) and that VAS would exceed 70mm was predicted by VAS day one ($p<0.001$) and EDA ($p<0.05$). The probability that VAS day three would exceed 30mm ($p<0.0001$) and 70mm ($p<0.01$) was predicted by VAS day two only.



Figur 5. The figures show the probability that VAS exceeds 30mm and 70mm days one, two and three depending on previous VAS values. If e.g. the VAS value is 40mm after four hours, the probability that VAS exceeds 30mm day one is 95% and the probability that VAS exceeds 70mm is 40%.

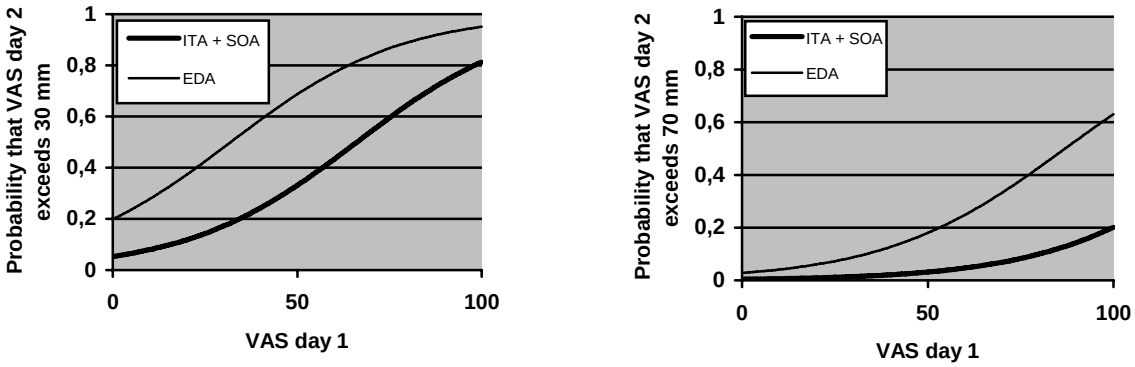


Figure 6. The figures show that patients with EDA were at higher risk for experiencing pain levels >30mm or >70mm day two after surgery compared to patients with ITA and SOA.

DISCUSSION

Discussion of the findings

In the present study it was found that the postoperative pain management was not optimal, regardless of the pain treatment method, and that the nurses played an important role in the pain management, also when the patients received an advanced treatment of pain.

Appropriate assessment of pain allows the caregivers to be fully and properly aware of the patients´ pain status. Additionally, the patient becomes involved and an active participant in his/her own care, and as a result the patient becomes more comfortable and able to function more properly (McGuire, 1992). By using a pain assessment tool, as a common pain language for patients and caregivers, they most likely would communicate better. In fact, nurses are reporting that instruments measuring pain are useful and helpful for their understanding of their patients´ pain suffering (Young et al., 2006). In addition, these authors found that pain assessment tools also helped the patients to better express their pain and their need for pain relief. Thus, forty percent of the nurses in the present study answered that they did not use the VAS instrument when assessing pain, nor did they assess pain during activity. Nurses may have sufficient theoretical knowledge about pain management but this does not necessarily mean that they implement this knowledge in their practice (Twycross, 2002). Nurses often seem to rely on their personal judgement of the patients´ pain conditions. (Schafheutle et al., 2001; Dihle et al., 2006). Assessing pain by using signs of pain rather than a pain assessment tool has actually been found to be a hindrance to good pain management (Sjöström et al., 1997; Schafheutle et al., 2001; Manias et al., 2005; Dihle et al., 2006a). One reason for the rather high pain scores (papers I and II) could be that nurses and physicians in the present study are wrongly confident that advanced pain management techniques like EDA and ITA provide adequate pain relief for all patients (Sandie & Heindel, 1999) and therefore the patients´ pain will frequently not be assessed (Schafheutle et al., 2001; Van Niekerk & Martin, 2002).

The nurses´ ability to assess pain in accordance with the patients´ reports had increased during the two years the study took place and in which a pain management education program was implemented. Although a high correlation between patients´ and nurses´ pain reports previously has been reported (Rundshagen et al., 1999; Idvall et al., 2005), others have found that there frequently is a discrepancy between patients´ reported pain and experience of relief when treated, and how nurses rate patients´ pain and relief (Sjöström et al., 1997; Mc Cafferey et al., 2000; Solomon, 2001). In the present study the nurses´

and patients´ pain reports were incongruent in every third patient. It should be noted that patients´ VAS scores and nurses´ VAS scores do not have equivalent roles as often is the case when two observers with the same profession are considered. The patient experiences and suffers pain and the nurse determines the treatment. Furthermore, consistent with previous studies (Adamsen & Tewes, 2000; Klopfenstein et al., 2000), the nurses in the present study underestimated severe pain and overestimated mild pain. In addition, findings from several studies suggest that health professionals believe that patients exaggerate their pain (Rundshagen et al., 1999; Mc Cafferey et al., 2000). Discrepancies between patients´ reports and caregivers´ perception of the patients´ pain, as well as the infrequent monitoring and recording of pain severity, may actually leave clinicians unaware as to whether a particular treatment is effective or not (Carr et al., 2005).

The frequency of documented pain assessments had decreased over time (paper IV, part I vs part II) and pain score documentation was even nonexistent in almost 10% of the part II records. Twenty percent of the nurses reported that they seldom or never documented pain scores after assessment. This is consistent with previous studies demonstrating that nurses´ documentation of assessment and treatment outcomes are infrequent and inconsistent (Mac Lellan, 1997; Dalton et al., 2001; Manias, 2003; Gunningberg & Idvall, 2007). Nurses are obliged to assess and document care, needs implemented, care interventions and outcomes of care (SFS 1985:562; SOSFS 1993:17). Documented pain scores have been shown to enhance communication between health care professionals concerning the management of pain in individual patients (de Rond et al., 2001). Nurses caring for patients who experience acute pain need to be diligent in all aspects of pain management, and that also includes documentation of their activities (Manias, 2003).

Obviously, the lack of agreement between patients´ and nurses´ pain scores most likely will be reflected in a lack of agreement also when it comes to actual pain treatment. From a probability calculation we found that pain scores documented by nurses, rather than pain scores reported by patients, largely dictated whether or not the patients would receive pain treatment. Although nurses in principle rate a patients´ description of pain as a key piece of information for determining the analgesic dose and frequency of administration, they do not always prioritize this data when actually making decisions (Hunter, 2000). Nurses may be more influenced by patient behaviour *per se* than self-reports of pain, especially in decisions concerning opioid titration (Mc Cafferey et al., 2000). A fundamental reason for under-medication of analgesics seems to be a misconception concerning who the expert is on a patients´ pain (Hunter, 2000). Moreover, one fourth of the nurses (paper IV, part II) reported that they did not evaluate the effect of treatment. Failure to reassess the patients after the administration of an

analgesic may lead to a less than optimal pain management with higher levels of pain and discomfort for the patients (Bucknall et al., 2007). According to national guidelines (MKR, 2001) pain should be assessed before and after every pain-relieving intervention. By observing nurses it has been reported that their evaluation of pain treatment in general is both unsystematic and inadequate (Schafheutle et al., 2001; Dihle et al., 2006a; Bucknall et al., 2007) and furthermore they do not ask pain-related questions frequently following the administration of analgesics (Schafheutle et al., 2001). The patient must be trusted to be the principal expert on the quality of pain experience and is therefore the only person who truly can say when the pain is relieved (Hunter, 2000).

Lack of time because of staff shortages and an increased workload is argued to be the most common barrier to effective pain management (Schafheutle et al., 2001; Manias et al., 2005). This is hardly the main reason in the present study, where all but one nurse answered that they had no difficulty in carrying out repeated pain assessments. Rather, the shortcomings in the present study could, aside from the lack of attention to both the patients reports and the importance of frequent monitoring, be related to neglected attention to the actual documented pain scores. This would indicate ignorance among health professionals concerning its importance and may signal an impression of a lack of meaningfulness to actually document pain scores (Schafheutle et al., 2001). Patients with more sophisticated pain treatment such as EDA/ITA had their pain scores documented more frequently and this is consistent with previous reports (Gunningberg & Idvall, 2007). Despite that, the EDA patient with the most frequent documented pain scores had the highest pain scores, also indicating that insufficient attention was paid to the documentation, resulting in a poor pain treatment outcome.

In part II, almost all nurses reported that they informed the patients preoperatively and this was an improvement compared to part I. Preoperative information has been found to have positive effects on pain intensity and patient satisfaction (Sjöling et al., 2003; Warrén Stomberg et al., 2003). Uninformed patients may be unclear about their pain expectations and about their own role in pain management and may therefore not always report to nurses when they are in pain (McDonald et al., 2000). Patients need to be well informed and rather educated as to what to expect in the way of pain relief and the role of the nurse and by doing so the patient-nurse relationship may be facilitated (Hunter, 2000; Van Niekerk & Martin, 2002).

In patients undergoing RP, EDA is a common way of treating postoperative pain. In paper I it was found that with an EDA treatment, more than half of the patients experienced non-acceptable pain relief and approximately 30% of the

patients experienced severe pain. Consistent with this it has previously been reported that in patients with postoperative EDA, one third of the patients suffered from significant pain (McLeod et al., 2001). In RP patients with low thoracic EDA, pain at rest and during coughing has been found to be lower than in patients with i.v. PCA with opioids, but the improvement in pain relief did not translate into a reduction in postoperative complications nor shorter duration of hospital stay (Gupta et al., 2006). According to these authors the benefits of EDA should be weighted against the possible higher costs, and the increased time needed for patient preparation.

One of the advocated benefits with postoperative EDA is the avoidance of systemic opioids (Ballantyne, 2004). In the present study however, the majority of patients required rescue opioids at one or more occasions despite the EDA. One reason for that could be that on the wards, for safety reasons, the patients received an epidural infusion with plain local anaesthetics only. A majority of studies show that using a mixture of local anaesthetics and opioids is associated with significantly better dynamic pain relief (Wheatley et al., 2001). A more adequate pain relief may be achieved by using also epidural opioids together with local anaesthetics on the wards and in addition by doing frequent dose adjustments when needed. This requires proper training of staff outside the formal anaesthetic unit, but it will still not exclude the continuous need of an adequate dialogue between the anaesthesiologists who insert the epidural catheter and the ward staff who cares for the patients postoperatively. This need is recognized by the organization of various pain service units, being nurse-based or organized in a more multidisciplinary fashion. In several studies (Rawal, 1999; Ballantyne et al., 2003; Warrén Stomberg, et al., 2003; Gunningberg & Idvall, 2007) such regimes have been found to improve the quality of postoperative pain management.

With ITA, pain relief was sufficient in the immediate postoperative period (4h) with no patient reporting severe pain and most of the patients (82%) reporting no pain or mild pain only. Although pain levels subsequently increased day one, no patient reported severe pain for more than one day and one third of the patients went through this surgical procedure with mild or no pain at all. Compared to EDA, fewer patients suffered from severe postoperative pain and the pain, moderate or severe, was of shorter duration.

In patients with ITA, one reason for the rather high pain scores during the first 24 hours could be that intrathecal morphine was given in doses of no more than 0.1-0.2mg. The national recommendation in Sweden says to give morphine in doses about 0.1-0.3mg (SFAI, 2005). The 50 patients studied were the first patients in our hospital to be given ITA for postoperative pain relief after RP and considering the risks for respiratory depression rather cautious dosing was

chosen. A larger intrathecal morphine dose would possibly render a better pain relief to an enhanced number of patients. On the other hand pruritus and PONV are reported to be common side effects to intrathecal opioids (Gan et al., 2003; Brown et al., 2004) and larger doses of intrathecal morphine may enhance both the severity and the incidence of PONV and pruritus (Gwirtz et al., 1999) in addition to the well recognized risk of having more frequent respiratory depression.

In respect of the possibly enhanced risk for respiratory depression when combining intrathecal and systemic opioids, systemic opioids were to be avoided on the ward for the first 24 hours. This restriction in the use of systemic rescue opioids could however possibly be reflected in the relatively insufficient pain relief on day one in comparison to subsequent postoperative days. The insufficiency on day one might be improved by modifying the conservative view, that giving systemic opioids to patients with intrathecal morphine must be avoided unless supervised in a high dependency area such as the ICU or PACU. With well educated and dedicated nursing staff combined with regular surveillance according to guidelines, it should be possible to safely manage patients with ITA on regular hospital wards as well, providing that systemic opioids are carefully titrated to an adequate analgesic effect.

When comparing EDA and ITA in the clinical setting, ITA compares favourably to EDA because of the shorter time in patient preparation, technical ease of administration, less need for support from the anaesthetic unit and no technical problems with catheters and infusion pumps. Other benefits of the ITA is the reduction of costs attributed to less expensive administration, drug cost, infusion pumps, delivery tubing and follow-up care, when compared to the EDA (Eandi et al., 2002).

Systemic opioids were supposed to be given on a PRN basis. There is evidence that nurses are conservative when making decisions about opioid dosing and frequency of administration (Mac Lellan, 1997). Consistent with our findings, it has previously been reported that patients with mild pain receive significantly lower doses of opioids and even if higher doses of opioids are given to those with severe pain, these doses are not titrated to optimal reduction of pain severity (Dihle et al., 2006). Nurses do not always titrate opioids appropriately and do not increase subsequent doses of opioids when the previous dose has been safe but ineffective (Mc Cafferey et al., 2000). Under-medication of pain is often the result of the nurses' failure to involve patients in pain decisions and also of a lack of trust regarding the patients' reports concerning the quality of their pain (Hunter, 2000).

The patients with the highest pain scores in hospital also experienced the most pain at home after discharge, though at three months after surgery pain seemed to be well controlled with only three patients reporting moderate pain. The development of chronic pain after surgery has been considered a consequence of poor peri-operative control of pain (Perkins & Kehlet, 2000; Macrae, 2001). However after RP the risk of developing chronic pain seems low, regardless of the analgesic regime used, considering that pain was not sufficiently controlled in all patients also at the time of discharge from hospital.

Postoperative pain interferes with the patients´ ability to function and is an important indicator of when a person may be discharged from hospital. In the present study the patients with ITA experienced less pain and required less rescue opioids compared to the EDA patients, and as a consequence, ITA patients stayed in average one day less when compared to the use of the EDA regimen. High pain scores as well as rescue opioid use correlated with LoS confirming that patients in pain, using opioids may not be able to leave the hospital. Considering the surveillance needed also after the removal of an epidural catheter, it seems less likely that the LoS after EDA can be reduced down to that necessary after ITA. The future strategies on patient recovery and mobilisation should focus on these issues. LoS contributes significantly to the total cost from a hospital perspective (Strassels et al., 2002).

Psychological wellbeing is of great significance for the experience of pain after surgery, and psychological preparation of patients undergoing surgery has been shown to shorten hospital stay and to reduce the need for postoperative analgesics (Carr & Goudas, 1999; Clark et al., 2002; Carr et al., 2005; Gedney & Logan, 2007). It has been proposed that the levels of preoperative psychological distress may be related to expectations of pain and this in turn could be influenced by previous experiences of painful surgical procedures (Carr et al., 2005; Gedney & Logan, 2007). Pre-operative state anxiety i.e. transitory feelings of fear and worry, has been shown to correlate with post-operative pain severity (Caumo et al., 2002; Carr et al., 2005; Katz et al., 2005). We consistently found that patients with previous experience of postoperative pain seemed to be more anxious preoperatively and preoperative anxiety and depression were associated with high postoperative pain levels both in hospital and after discharge from hospital. Previously, similar relationships have been shown between preoperative anxiety and pain at one (Katz et al., 2005) and three months after surgery (Haythornthwaite et al., 1998).

Others have shown depression to be a strong predictor of postoperative pain (Taenzer et al., 1986; Caumo et al., 2002; Clark et al., 2002). The mean preoperative anxiety and depression scores in this study were however lower than those found by others in RP patient before surgery (Gerbershagen et al.,

2007). Still, depression was found to be of importance for a pain level >VAS 70mm. We also found preoperative depression to affect pain and depression after discharge from hospital. Using baseline measurement of anxiety and depression in RP patients has been found to predict the frequency of anxiety and depression after six months (Korfage et al., 2006). The challenge for clinicians is to detect those patients with early distressing psychological symptoms and provide them with in-dept support (Bisson et al., 2002; Korfage et al., 2006). Hutcinsson et al., (2006) have developed a model for treatment of psychological distress in cancer patients, something which could also be suitable for patients having a RP operation. The authors suggest that all cancer patients should be screened for anxiety/depression and then directed to an appropriate level of psychological care. The problem when using a uni-dimensional pain scale such as the VAS is that the pain score reflects both sensory and emotional components of pain and in some patients anxiolytic medication or psychotherapeutic interventions might thus due better than some of the analgesic medication (Clark et al., 2002). From a clinical perspective, a greater understanding of causative relationships could make it easier to use pre-treatment interventions in order to receive an improved treatment outcome as well as reduce healthcare resources (Gedney & Logan, 2007).

Regarding MHLC, it has previously been shown that patients who are more internal, i.e. who believe that they can influence and are responsible for their own health (Wallston & Wallston, 1978), have lower pain scores and use less postoperative morphine (Reynaert et al., 1995). This was however not confirmed in the present study, where we found no significant correlation between any of the different dimensions of the MHLC instrument and the pain intensity. The low predictive power of the MHLC variables might result from a relatively low sensitivity of the general MHLC scales to various problems of post-surgery patients (Luszczynska & Schwarzer, 2005).

HRQOL in localized PC patients is usually not essentially reduced before surgery (Greene et al., 2005; Gerbershagen et al., 2007). In the present study, the results of the physical dimensions of the SF-36, as compared to baseline, had significantly decreased by three months after RP. However, consistent with previous results, the mental health scores were significantly higher postoperatively, (Namiki et al., 2004). After RP, patients may be likely to believe that all cancer has been removed in surgery, which possibly is reflected in a reduced psychological distress after the operation (Hervouet et al., 2005). Anxiety and depression at three months post-surgery affected all components of the HRQOL negatively. Others have found depression but not anxiety to be predictor of all dimensions of HRQOL (Eller et al., 2006) and that depression, even at low levels, can have profound effects on quality of life, including functional status (Much & Barsevick, 1993). Interventions to improve HRQOL

in men with prostate cancer will have to target the management of not only physical but also psychological symptoms (Eller et al., 2006).

We found age to be an inverse predictor of pain, i.e. VAS > 30mm, with younger patients being at higher risk of experiencing pain. Others have also found younger persons to report higher pain scores and to use more opioids than older ones (Macintyre & Jarvis, 1996; Gagliese & Katz, 2003). Young patients with a cancer diagnosis may experience greater distress than older patients because of the effect of serious illness on their life, possibly reflecting higher pain level reports (Özalp et al., 2003).

In a multivariate analysis model we found the only predictor of the severity of postoperative pain to be the previous VAS value such that pain at four hours predicted pain day one, pain day one predicted pain day two, and pain day two predicted pain day three. Seventy percent of the patients with a pain score > VAS 30mm at four hours after surgery continued to be in pain. Pre-emtive analgesia is a frequently discussed matter but studies comparing pre-incisional with post-incisional treatment have failed to provide convincing evidence for the value of pre-emptive analgesia (Kissin, 2000; Moiniche et al., 2002). Kissin (2000) discusses the definition of pre-emptive analgesia and defines it as "treatment that prevent establishment of central sensitization caused by incisional and inflammatory injuries; it starts before incision and covers both the period of surgery and the initial postoperative period". This means that an effective blockade of noxious stimuli during the initial postoperative period reduces subsequent postoperative pain (Kissin, 1996). Patients who wake up after surgery with insufficient pain relief should be treated immediately in order to avoid further pain. The results in paper V show anyway that it would be meaningful to identify at least a subgroup of RP patients at high risk for severe postoperative pain. This could be related to an insufficient treatment *per se*. It could however also imply that pain once manifested is not easily converted despite a generous analgesic treatment. This may be more evident in subgroups of patients, e.g. younger and depressive patients, who might benefit from a more aggressive therapy instituted in the very early postoperative period.

Methodological considerations

Almost all of the patients, or six out of seven, were men with the same diagnosis who underwent the same kind of surgery. It is therefore relevant to compare pain levels among the patients. It might be difficult however, to say whether the results could be extrapolated to other patients in other surgical units.

There were more drop-outs in paper IV part I, than in the other studies. This might be due to the fact that the patients were asked in hospital, the day before surgery, to participate in the study. In contrast, the patients in the other studies received a letter while at home, three weeks before surgery.

In many aspects the ITA regime seemed to compare favourable to the EDA technique. The EDA and ITA treatments were however observed in separate studies and therefore no definitive conclusions can be drawn and comparisons between the two techniques should be made with caution. A randomized, controlled, double-blind comparison between an EDA and ITA regime is however not easily performed considering the ethical concerns involved in e.g. a subarachnoidal puncture and saline administration for the patients with an active EDA regime, and an EDA catheter and saline infusion for the patients with an active ITA regime. A comparison of costs between the two techniques should nevertheless be valid, and with the ITA there was a reduction in costs attributed to less expensive administration, lower drug cost, no infusion pumps, easier delivery tubing and follow-up care and a reduction in hospital stay.

Patients were asked once a day about their “worst pain” experienced during the preceding 24 hours, though it was not possible to meet all patients for an interview more often than once a day. This method of pain assessment with an overall daily retrospective estimation may overlook periods with more or less pain (Bisgaard et al., 2001). However, others have reported about a significant correlation between moderate/severe pain when frequently reported and when measured once daily (Gordon et al., 2002). In the present study however, all patients were interviewed about their pain experiences in a consistent way and the result should therefore be valid.

In clinical trials, pain scores are often presented as mean VAS values. Bodian et al., (2001) reported on the use of VAS scores as outcome measures in clinical trials and found that the achieved VAS measurements could preferably be allocated into three broad categories ($\leq$30, 31-70, and >70). In this thesis, a 0-100mm VAS was used and pain was referred to as mild (VAS$\leq$30mm), moderate (VAS 31-70mm) and severe (VAS >70mmm) in accordance with what others have suggested (Bodian et al., 2001; Dolin et al., 2002). In papers I and III, patients were enrolled in three different groups depending on their pain

scores, as suggested by Bodian et al. (2001). In paper I the mean pain score for the entire group of patients (n=90) was VAS 40±29mm; however, when allocating the patients in three pain groups, we found that 30% of the patients experienced severe pain (VAS>70mm). With ITA (paper II), the pain groups were small and therefore the Bodian method was not relevant for statistical calculations of differences between the groups.

The criteria for determining whether or not the patients' pain levels were similar to those documented by the nurses were set by the authors (paper IV). A VAS score of less than 40mm, reported by the patients or documented by the nurses, was seen as mild pain (Jensen et al., 2005) and since the recommended pain level on the wards was VAS less than 30-40mm, this seemed reasonable. A discrepancy of less than 10mm between the patients' reports and the nurses' documentation was considered to be an equivalent assessment and that limit has previously been used by others when comparing patients' and nurses' pain ratings (Iafrati, 1986; Choinnière et al., 1990; Rundshagen et al., 1999).

In papers I-III parametric tests (mean and sd, ANOVA, t-test, and Pearson product moment correlation) were used for statistical analysis of VAS, MHLC, HAD and SF-36. There is no agreement on whether parametric or non-parametric techniques are the most appropriate for statistical analysis of the VAS, although information from literature on psychological testing supports the use of parametric techniques (Philip, 1990). Dexter & Chestnut (1995) argue that the t-test and ANOVA test, for differences between groups' means, are good choices for comparing VAS measurements among groups. Further, Myles et al. (1999) suggest that VAS scores can be treated as ratio data. When comparing correlation coefficients between Pearson's product correlation test and Spearman's rank order correlation test in this study, we found the results to be almost the same, and in papers IV and V, non-parametric tests were used.

From a statistical point of view, the number of nurses in paper IV was rather small. However, the nurses involved were those who cared for the patients in the study and should therefore adequately reflect actual pain management on the wards. It is hard to say if the results could be extrapolated to other nurses on other wards.

The nurse questionnaire (paper IV) was not a validated instrument, but the questions were nevertheless based on the guidelines recommended by The Swedish Society of Medicine (MKR, 2001) and have been used in a previous study (Warrén Stomberg et al., 2003).

In paper IV, when considering the historical comparison and the lack of control, it may be difficult to compare part I and part II of the study and to draw any

definitive conclusions from the effect of the training program. A number of variable things, unaccounted for, may have happened during the study and may have had an impact on the results; e.g. in part II, the PACU-time was shorter, the nurses were older and fewer nurses had a special education.

IMPLICATIONS AND FUTURE RESEARCH

Nurses should be professionally prepared and responsible for helping patients communicate their needs and to see to it that the needs are met. Nurses are obliged to deliver clinically effective care, based on the best possible evidence available, to make appropriate assessments and responsible decisions in accordance with the individual needs of the patients (SSF, 2005). However, achieving these goals by implementing change, putting evidence into practice, and/or improving the quality of patient care is a complex task (Brown & McCormack, 2005).

To improve pain management and putting research findings into practice, the Promoting Action on Research Implementation in Health Services (PARIHS) framework may be used (Kitson et al., 1998; Rycroft-Malone, 2004; Rycroft-Malone, et al., 2004; Rycroft-Malone et al., 2004). Successful implementation of research into practice is a function of the interplay between three core elements; the level and nature of the *evidence*, the *context* or environment into which the research is to be implemented, and the method or way in which the process is *facilitated*. These elements should have equal standing (Kitson et al., 1998). The underpinning principles of the framework are; to generate knowledge, to implement research into practice and to evaluate the effectiveness of programmes (Kitson et al., 1996). The most successful implementations occur when 1) the evidence is scientifically robust and matches professional consensus and patient needs; 2) the context is receptive to change with sympathetic cultures, strong leaderships, and appropriate monitoring and feedback systems; and 3) there is appropriate facilitation of change with input from skilled external or internal facilitators (Rycroft-Malone et al., 2002). To challenge current pain management practices and implement changes requires a focused, collaborative, interdisciplinary approach (Brown & McCormack, 2005).

According to Orlando (1990), the first step of the nurse-patient relationship is the observation of the patient which in the present study would mean assessment of pain with a pain assessment tool. Pain should ideally be assessed both before and after treatment and pain scores should be documented in the patients´ records. The second and third steps are reporting and recording. In the present study we found that the nurses´ documented pain scores were of more significance than the patients´ pain reports and determined whether or not the patient would receive opioids. This highlights the impact documented pain scores have on actual decision- making and analgesic administration. The fourth step is the nursing actions which are designed for the patients´ benefits. The nurses in the study were supposed to give supplemental parenteral opioids on a PRN basis but they were not allowed to administer bolus doses on their own or make dose-adjustments in the EDA catheters. Furthermore, they were not

allowed to administer supplemental parenteral opioids to the ITA patients on the ward, during the first 24 postoperative hours. There is no evidence that administration of analgesics through these techniques by a competent nurse poses a danger in any way to patients (Pasero et al., 2007). Nurses should play a significant role in the administration and monitoring of analgesics by catheter techniques in all patients and care settings. A nurse-based organization supervised by an anaesthesiologist has been suggested to improve the in-service training for surgical ward nurses focusing on improving the management of regional analgesia techniques (Rawal & Berggren 1994).

In the present study, there was a shift from EDA to ITA. ITA has since been successfully implemented in the clinical anaesthetic practice for not only RP patients but in a comparable way also for abdominal hysterectomy patients. According to the patients, they are very satisfied with this pain treatment method. In addition, the length of hospital stay has been shortened even further compared to when the study was performed.

Early discharge from hospital is becoming more common, largely due to economical considerations. Postoperative recovery is a process beginning directly after surgery and extending beyond discharge from hospital (Allvin et al., 2007). Postoperative pain has been found to interfere with the ability to function after surgery, being one prime factor influencing the time of discharge from hospital (Wu et al., 2005; Dihle et al., 2006b; Hansson et al., 2006). Future research should focus on patients´ ability to recover. Aside from postoperative pain management, there are several areas, influencing recovery which can be improved. Preoperative information, education and guidance may have beneficial effects. Encouragement to express patients´ own views and opinions and support for patient initiative, areas which require more attention, due to the fact that some patients would like to take a more active part in their postoperative care and decision-making (Leinonen et al., 2001). Future studies should also focus on patient experiences at home, after discharge from hospital. An instrument such as Quality of Recovery (QoR 40) (Myles et al., 2000) could help health professionals to identify patient needs directly after surgery and also after discharge from hospital.

CONCLUSIONS

- Forty percent of the nurses reported that they did not use VAS when assessing pain and they did not assess pain both at rest and during activity and 27% of the nurses did not evaluate the effects of given analgesics.
- Approximately one third of the patients´ and nurses´ pain reports were incongruent with nurses generally overestimating mild pain and underestimating severe pain.
- Pain scores were documented more often when the patient had a special protocol for VAS documentation.
- Documented pain scores rather than patients´ pain reports determined whether or not patients were to receive opioids.
- Age predicted a VAS score >30mm, with younger patients at higher risk of postoperative pain. Preoperative symptoms of depression predicted a VAS score >70mm.
- The only factor that predicted the next coming VAS score was the previous VAS score, except for day two, when also EDA was a predictor.
- About one third of the patients experienced mild pain (VAS<30mm) during the three postoperative days independent of pain treatment method.
- Almost one third of the EDA patients experienced severe pain during one or more of three postoperative days.
- Compared to EDA, fewer ITA patients suffered from severe postoperative pain and the pain, moderate or severe, was of shorter duration.
- ITA patients stayed in average one day less in hospital when compared to EDA patients
- The patients with the highest pain scores in hospital also experienced the most pain during the three months after discharge from hospital.
- RP patients did not seem to be at risk for chronic pain after surgery.
- Patients who scored high on the preoperative anxiety and depression scale reported higher postoperative pain scores as well.
- Physical functioning had decreased, and mental health had increased at three months when compared to baseline. Anxiety and depression at three months correlated negatively with all components of HRQOL

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