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# The relationship of preoperative and intraoperative factors on the incidence of pain following ambulatory surgery

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Despite the growth of ambulatory surgery, little information is available concerning patients' recovery following discharge. The purpose of this study was to determine the incidence and severity of postoperative pain and pain-related outcomes such as sleep and activity disturbance following a wide variety of ambulatory surgical procedures. Second, this study attempted to identify a correlation between preoperative and intraoperative variables and the level of postoperative pain experienced after discharge. One hundred and eighty-nine adult patients undergoing a variety of outpatient surgical procedures were studied. Data collected included preoperative pain and anxiety ratings, preoperative medication use, type and location of surgery, type of anaesthetic, postoperative pain ratings and the occurrence of pain-related outcomes during the 24 h following surgery. Seventy-four per cent of patients experienced moderate or severe pain following discharge, 32% reported sleep disturbance and 34% reported activity disturbance secondary to pain. Preoperative anxiety level, level of pain expectation, use of psychoactive medications and pain level at the time of discharge were significantly correlated with the greatest level of pain following discharge. These results suggest that pain following ambulatory surgery is a significant problem and that patients who are at greatest risk of this complication may be identified preoperatively in order to target pain-specific therapies toward this group and improve recovery.

Key words: Ambulatory surgery, postoperative pain, anxiety, pain expectation

## Introduction

Ambulatory surgery continues to grow rapidly in the US in response to pressure to control costs. Currently, approximately 60% of elective surgical procedures in the US are performed on an outpatient basis. While the incidence of pain among inpatients has been characterized in several studies<sup>1,2</sup>, the incidence of pain following outpatient surgery, especially pain experienced following discharge, is relatively unknown.

Postoperative pain in ambulatory surgery is an important issue for many reasons. The negative physiological and psychological effects<sup>3-6</sup> of postoperative pain are well recognized. Because of the adverse consequences of postoperative pain, the US Department of Health and Human Services recently published guidelines for the management of postoperative pain<sup>7</sup>. In addition, uncontrolled pain is one of the

leading causes of unplanned admission following ambulatory surgery<sup>8</sup> which may significantly increase the cost of healthcare.

The purpose of this study was to determine the incidence and severity of postoperative pain and pain-related outcomes such as sleep and activity disturbance following a variety of ambulatory surgical procedures. Second, we attempted to identify preoperative and intraoperative variables that correlated with an increased incidence and severity of pain following discharge after outpatient surgery.

## Methods

The study was approved by the Committee on the Protection of the Rights of Human Subjects of the University of North Carolina, Chapel Hill. Informed consent was obtained and complete data was obtained from 189 adult patients presenting for outpatient surgery. Preoperatively, patients completed a survey assessing their anxiety, pain expectation, use of analgesics and psychoactive medications (anxiolytics,

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antidepressants and antipsychotics), prior history of outpatient surgery and history of treatment in a pain clinic. Anxiety was assessed using a four-point verbal response scale with 0 = not anxious, 1 = a little anxious, 2 = moderately anxious and 3 = very anxious. Postoperative pain expectation was assessed using a four-point verbal response scale with 0 = no pain, 1 = a little pain, 2 = moderate pain and 3 = severe pain. Demographic data for each patient was collected.

Intraoperative data collected included the surgical procedure, the surgical service, type of anaesthetic (general, regional, monitored anaesthetic care) and intraoperative use of analgesics and local anaesthetic infiltration. Postoperative pain assessments were made using a four-point verbal response scale with 0 = no pain, 1 = mild pain, 2 = moderate pain requiring analgesics and 3 = severe pain unrelieved by analgesics. Pain assessments were made by postanesthesia care unit (PACU) nurses on patient arrival at the PACU and at discharge from the PACU. Patients were contacted the day following surgery by a PACU nurse and asked to rate their pain at the present time as well as their worst pain following discharge using the four-point verbal response scale. In addition, patients were asked if their pain had interfered with their ability to sleep or perform normal activities, if they had called the hospital or a physician because of pain and if they would have preferred to remain in the hospital in order to receive pain medication.

Spearman correlations, Wilcoxon rank sum test, Kruskal-Wallis rank analysis of variance and Fisher's exact test were used, where appropriate, to determine correlation between preoperative and intraoperative variables and outcome. Student's *t* tests and  $\chi^2$  analysis were used to determine differences between groups with and without moderate and severe pain and between groups experiencing pain-related outcomes. *P* values <0.01 were considered statistically significant.

## Results

Of the 189 patients subject to data analysis, 127 (66.8%) were female and 63 (33.2%) were male. The mean age of the patients was 38.05 yr (range 18–82 yr). Distribution of preoperative anxiety and pain expectation ratings are presented in Table 1. Fifty-two patients (27.4%) were taking analgesics and 22 patients (11.6%) were taking psychoactive medications on a routine basis prior to surgery. Anaesthetic techniques utilized were general anaesthesia – 108 patients (57.2%), regional anaesthesia – 42 patients (22.2%) and monitored anaesthetic care – 39 patients (20.6%). Surgical services included orthopaedic surgery – 60 cases (31.7%), gynaecological surgery – 43 cases (22.8%), plastic surgery – 35 cases (18.5%), otorhinolaryngological surgery – 20 cases (10.6%), general surgery – 19 cases (10.1%), ophthalmological surgery – 10 cases (5.3%) and other – 2 cases (1.1%).

On arrival at the PACU most patients experienced either no (48.4%) or mild (20.7%) pain. On discharge

**Table 1.** Preoperative anxiety and pain expectations

	Total number (%) of patients			
	Score			
	0	1	2	3
Preop anxiety	27(14.3%)	64(33.9%)	58(30.7%)	40(21.2%)
Preop pain expectations	6 (3.2%)	69(36.5%)	97(51.3%)	17 (9.0%)

**Table 2.** Pain following discharge

	Total number (%) of patients			
	Score			
	0	1	2	3
Pain now	54(28.7%)	67(35.6%)	57(30.3%)	10 (5.3%)
Worst pain	11 (5.8%)	38(20.1%)	105(55.6%)	35(18.5%)

(Pain now = pain score at the time of the follow-up phone call. Worst pain = worst pain experienced following discharge).

from the PACU, the majority of patients had excellent pain control. However, nine patients (4.9%) were discharged with a pain score of 3 indicating severe pain. One patient was admitted for pain control. The majority of patients experienced moderate or severe pain following discharge. Pain scores following discharge are presented in Table 2. The frequency of pain-related outcomes was as follows: sleep disturbance secondary to pain – 61 patients (32.5%); activity disturbance secondary to pain – 64 patients (33.9%); called physician because of pain – 15 patients (7.9%) and would have preferred to stay overnight in the hospital in order to receive pain medication – 10 patients (5.3%).

The level of pain experienced by patients in the PACU was significantly correlated with the type of anaesthetic technique ( $P < 0.0008$ ). Patients receiving monitored anaesthetic care experienced the least pain and patients receiving general anaesthesia experienced the most pain in the recovery room. There was no correlation between anaesthetic technique and pain reported following discharge. The level of the worst pain experienced following discharge was significantly correlated with preoperative anxiety scores ( $P < 0.01$ ), preoperative pain expectation ( $P < 0.01$ ) and marginally correlated with preoperative use of psychoactive medication.

With regard to pain-related outcomes, there was a significant correlation with the desire to remain in the hospital overnight and preoperative psychoactive medication use ( $P < 0.001$ ) and preoperative analgesic use ( $P < 0.006$ ). Postoperative sleep disturbance secondary to pain was significantly correlated with both preoperative anxiety level ( $P < 0.001$ ) and preoperative analgesic use ( $P < 0.001$ ). Although 45.5% of patients taking psychoactive medications experienced postoperative sleep disturbance vs 30.4% of patients who were not, this difference was not statistically significant ( $P = 0.2$ ). Postoperative activity disturbance was significantly correlated with the location of surgery ( $P < 0.0001$ ) with patients having surgical procedures involving the chest or abdomen reporting activity disturbances more fre-

quently than those patients undergoing surgical procedures involving the head or extremities.

## Discussion

One of the most important findings of this study was the surprisingly high incidence of moderate and severe pain following ambulatory surgery, along with the high incidence of pain-related outcomes such as sleep and activity disturbance. We found that 74% of patients undergoing a wide variety of outpatient surgical procedures experienced moderate to severe pain at some time during the 24 h following discharge from the outpatient surgery facility. In addition, 32% of patients experienced difficulty sleeping because of pain and 34% of patients reported that pain interfered with their normal activity. Our findings are similar to those of Firth who conducted a postal survey of patients following ambulatory surgery and reported that 53% of patients experienced moderate to excruciating pain and 22% of patients had difficulty sleeping following outpatient surgery<sup>9</sup>.

The incidence of pain following outpatient surgery that we reported is also in close agreement with the incidence of moderate and severe pain reported both in medical inpatients<sup>1</sup> and surgical inpatients<sup>2</sup>. Cohen reported that 75% of patients reported being in moderate or marked distress following inpatient abdominal surgery<sup>2</sup>. The recognition of the high incidence of pain following inpatient surgery helped spur the development of more optimal techniques for postoperative analgesia, such as patient-controlled analgesia and the use of neuroaxial narcotics. This report of an almost identical incidence of moderate and severe pain following ambulatory surgery should heighten clinicians' awareness of this problem and encourage the development of more effective analgesia treatments for outpatients. As the number and complexity of procedures being performed on an outpatient basis continues to expand, it is likely that the incidence of pain following ambulatory surgery will grow as well unless effective strategies for the prevention and treatment of postoperative pain are developed and utilized.

Despite the fact that 18.5% of patients experienced severe pain following discharge, only 7.9% of patients called their physicians concerning pain. In addition, only 5.3% of patients stated that they would have preferred to remain in the hospital overnight in order to receive pain medication. These findings suggest that patients may be reluctant to contact their physician and prefer to recover at home despite experiencing significant pain. In a study of outpatients undergoing laparoscopy, Jamison reported that 97% of patients preferred to recover at home vs staying overnight in the hospital<sup>10</sup>.

The other important finding of our study was that clinicians may be able to identify patients preoperatively who are more likely to experience significant postoperative pain and pain-related outcomes. We expected that certain surgical procedures would be associated with a

greater incidence of moderate to severe postoperative pain. Although patients undergoing plastic surgical procedures had the highest incidence of moderate to severe pain following discharge (80%) and patients undergoing ophthalmological surgery had the lowest incidence of moderate to severe pain following discharge (50%) there was no statistically significant correlation between the type of procedure and pain experienced following discharge. It is likely that this study did not have a sufficient number of patients to demonstrate this correlation. However, we were able to identify several preoperative factors that correlated with the severity of postoperative pain following discharge. Patients who expressed high levels of anxiety or pain expectations preoperatively had higher pain scores following discharge. There was a significant correlation between preoperative anxiety and pain expectation ( $P < 0.0004$ ). While it is possible that patients undergoing certain surgical procedures would have greater anxiety and pain expectations, there was no significant correlation between preoperative anxiety or pain expectation and type of surgical procedure. Lastly, patients taking psychoactive medications preoperatively experienced more pain postoperatively.

This relationship between preoperative anxiety, pain expectations and postoperative pain has been demonstrated in numerous studies. Parris demonstrated a positive correlation between preoperative anxiety ratings and postoperative pain ratings in women undergoing outpatient laparoscopy<sup>11</sup>. In a study of women undergoing minor gynaecological surgery, Wallace reported that preoperative pain expectation was positively correlated with reported pain immediately following surgery<sup>12</sup>. In addition, Liu reported that recent life stress affected recovery following surgery in terms of the degree of perceived pain and the presence of postoperative morbidity<sup>13</sup>.

Given the high incidence of pain following surgery, what can be done to ensure a more comfortable recovery? First, clinicians should be able to identify patients who have high levels of preoperative anxiety or significant pain expectations and target those patients for psychological support and education. Several studies have demonstrated that preoperative education can reduce patient anxiety<sup>14</sup> and diminish the intensity of pain following surgery<sup>12,15</sup>. Vallerand demonstrated that a group of patients undergoing third molar extraction who were given preoperative information regarding potential postoperative sequelae reported significantly less pain and greater satisfaction with pain control compared to a group of patients who were only given information regarding wound care<sup>15</sup>.

The strongest correlation with the level of pain reported following discharge was the intensity of pain at the time of discharge. Twenty-three per cent of patients rated their pain as moderate or severe at the time of discharge. Given the level of pain these patients were experiencing at the time of discharge, it is not surprising that these patients experienced more pain following discharge. Based on these results we believe that it is

imperative that patients who are in pain when otherwise ready for discharge should receive additional pain management in order to ensure that their pain is well controlled prior to discharge. The use of balanced analgesia with local anaesthetics, nonsteroidal anti-inflammatory drugs and opiates as well as psychological support and education may be useful in achieving this goal. Lastly, as analgesia following discharge typically is provided by the operating surgeon, perhaps education of our surgical colleagues regarding effective postoperative analgesia would improve patient comfort.

In summary, this study found a significant incidence of moderate and severe pain and pain-related outcomes following a wide variety of ambulatory surgical procedures. Patients' preoperative anxiety, pain expectations and pain intensity at discharge were positively correlated with the level of pain reported following discharge home. Given the high incidence of postoperative pain following ambulatory surgery, the negative psychological and physiological effects of pain and the growth in the types and numbers of outpatient surgical procedures, further efforts need to be made to develop effective strategies for the prevention and treatment of postoperative pain in the ambulatory surgery patient.

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