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The effect of an enhanced recovery after surgery protocol on opioid consumption, pain and length of stay among patients undergoing prostatectomy and nephrectomy

Abstract

Objective: To examine the effect of the Baptist Health Lexington Urology ERAS Protocol (BHLEX-UEP) on opioid consumption, pain and length of stay among patients undergoing prostatectomy and nephrectomy.

Methods: A quasi-experiment (N=303) was conducted in a 434-bed Magnet® re-designated community hospital in the south-eastern United States of America (USA). Data on all adult patients who underwent prostatectomy or nephrectomy surgery were retrieved over a 19-month period. Group differences related to morphine equivalents consumed, mean pain score on the day of surgery, and length of stay were examined between patients who experienced the traditional recovery protocol (n=133) and those experiencing the BHLEX-UEP (n=170).

Results: Significant differences for the three variables of interest were found between the groups.

Conclusions: Results of this study indicate that the use of the BHLEX-UEP for patients undergoing prostatectomy or nephrectomy could lead to a decrease in opioid consumption and patients' pain and a shorter length of stay in hospital.

Keywords: enhanced recovery after surgery, urology, opioid, pain

Introduction

Enhanced recovery after surgery (ERAS) is a comprehensive approach to surgery that places the patient at the centre of a multidisciplinary team. Using a multimodal approach to pain management, one of the goals of ERAS is to diminish post-operative pain and opioid consumption.¹ An ERAS protocol is designed to create optimal patient care from the physician's office through to post-operative discharge to home.¹ ERAS protocols used among patients undergoing many types of surgery have led to positive post-operative

outcomes.² These outcomes include decreased opioid consumption during hospitalisation, effective pain management and decreased length of stay.^{2,3} There is evidence to suggest that ERAS protocols can effectively manage pain while diminishing opioid intake in patients by using a multimodal, scheduled approach to pain management.² The Baptist Health Lexington Urology ERAS Protocol (BHLEX-UEP) was initiated pre-operatively with patient education to explain how non-opioid analgesics are highly effective in managing pain. The goal of this education was to provide informed

patients with the expectation that they would experience effective non-opioid pain management with the ERAS approach.

Chronic opioid misuse frequently begins post-operatively as a result of opioids prescribed related to surgery.^{4,5} ERAS protocols can minimise opioid exposure while effectively managing pain.⁶ For example, findings from a recent study of patients undergoing head and neck surgery that compared patients who experienced the ERAS protocol to patients having the same surgery in a traditional recovery pathway showed that both pain scores and post-operative opioid consumption were lower in the ERAS group.³

Similar positive outcomes related to opioid consumption, pain management and length of stay have been found in surgical fields such as gastroenterology and orthopedics. To date, however, there is little research regarding ERAS protocols with patients undergoing prostatectomy and nephrectomy. The BHLEX-UEP developed for this study was based on ERAS protocols used in radical cystectomy surgery or the removal of the entire bladder.^{7,8} The purpose of this study was to examine the effect of the BHLEX-UEP on opioid consumption, pain and length of stay, among patients undergoing prostatectomy and nephrectomy.

Materials and methods

Sample

This quasi-experimental study (N=303) was conducted at a 434-bed Magnet® re-designated community hospital in the south-eastern United States of America (USA). Data on all adult patients who underwent prostatectomy or nephrectomy surgery were retrieved over a 19-month period.

An a priori power analysis revealed a minimum sample size of 118 (59 per group) with an alpha of 0.05 and power of 0.85 was required to reach significance. Participants were divided into two groups based on recovery protocol followed, either traditional recovery or BHLEX-UEP. Research team members reviewed patient charts using initiation of the BHLEX-UEP as the division of study groups. Working backward from the initial day of BHLEX-UEP implementation, traditional recovery group patients were selected in a sequential manner until a sample, allowing for missing data, was achieved (n=133). Similarly, working forward from BHLEX-UEP implementation, patients were identified sequentially for the BHLEX-UEP group (n=170).

Data collection

The following data were collected from patient charts: age, sex, type of surgery (prostatectomy or nephrectomy), length of stay in hours, mean pain score in the first 24 hours after surgery and opioid consumption (measured in morphine equivalents). Opioid consumption was recorded at three stages: the day of surgery (first 24 hours after arrival to the recovery floor), post-operative day one (24–48 hours after arrival to the recovery floor) and post-operative day two (48–72 hours after arrival to the recovery floor). Morphine equivalents were calculated using an online opioid conversion calculator.⁹

Ethical review statement

The Institutional Review Board of the hospital approved the study (IRB# BHL-20-1611). As a retrospective chart review with de-identified data, the requirement for patient consent was waived.

Intervention

This intervention consisted of two phases: phase 1, the BHLEX-UEP (see Table 1), and phase 2, extensive education of nurses. The protocol was designed by a multidisciplinary team consisting of a pharmacist, nurse anaesthetist, surgeon, nursing director, two charge nurses and the hospital ERAS coordinator. A continuous focus on training nurses to understand and use the protocol occurred during daily huddles with the ERAS coordinator, shared governance meetings, staff meetings and mandatory education sessions led by the hospital ERAS coordinator. These education sessions were offered during annual nurse competency training. The protocol was presented to nurses in poster format with verbal instruction. In addition, an ERAS team member visited 14 staff meetings to deliver a 15-minute presentation regarding the benefits of enhanced recovery protocols, the BHLEX-UEP and order set, and the importance of clearly explaining to patients the terms used when their care is based on the BHLEX-UEP (e.g. 'around the clock' dosing of non-opioid analgesics). Anecdotal evidence from multiple interactions in meetings suggests that nurses were unaware of how a combination of scheduled non-opioid analgesics could effectively control pain.

Data analysis

Data analysis was conducted using SPSS v25. Demographics of the sample were analysed using frequencies and percentages. Independent t tests were calculated to detect differences in means between traditional recovery and BHLEX-UEP groups for the variables of interest: morphine equivalents consumed, length of stay (in hours) and pain score on the day of surgery.

Table 1: Baptist Health Lexington-Urology Enhanced Recovery After Surgery Protocol

Stage	Protocol	Details
Pre-operative	Patient and family education	ERAS brochure and educational tool at pre-admission testing or surgeon's office
	Prehabilitation	- nutritional counselling - smoking cessation education - alcohol abstinence
	Carbohydrate loading and elimination of NPO ('nil by mouth')	- clear liquid diet day before surgery 20 oz. oral electrolyte solution (sugar-free if diabetic)
	Multimodal analgesia	- Acetaminophen 1000 mg oral - Gabapentin 600 mg oral - Meloxicam 15 mg oral - Scopolamine patch 1.5 mg (contraindicated in patients with glaucoma or >65 years) - antibiotics
Intra-operative	Transversus abdominis plane block	also used with traditional recovery group
Post-operative	Nutrition	clear liquids two hours after surgery, advance as tolerated
	Analgesia	- Gabapentin 100 mg three times per day for 48 hours - Acetaminophen 650 mg orally every 6 hours for 48 hours - Opioids as needed
	Mobilisation	- Out of bed on arrival to floor (walk from stretcher to bed) - Out of bed evening of surgery (ambulate or up to chair) - Out of bed and walking five times per day (post-operative day 1 through to discharge)

Results

Participants (N=303) in this study had surgery before (n=133) or after (n=170) BHLEX-UEP was implemented at the health service organisation. Both males (n=247, 82%) and females (n=55, 18%) were included. Participants in this sample had nephrectomy (n=122, 40%) or prostatectomy (n=180, 60%) surgery. Of patients undergoing nephrectomy, both full and partial were included. Given that differences in the variables of interest were non-significant between full or partial nephrectomy groups (probability value range 0.054–0.822),

data from all nephrectomy patients were included. Significant differences between the traditional recovery and BHLEX-UEP were found for the three variables of interest. Total morphine milligram equivalents (MME) consumed by day and for the duration of the post-surgical hospital stay, mean pain scores on the day of surgery and length of hospital stay (measured in hours) were significantly lower in the BHLEX-UEP group when compared to the traditional recovery group (see tables 2, 3, 4).

Discussion

Clinical and statistical differences for each variable in this study were meaningful. In relation to opioid use, mean opioid consumption on the day of surgery decreased from 46.3 MME to 12 MME. A reduction in hospital-based opioid consumption can diminish both short-term and long-term complications.⁴ Short-term complications related to opioid dose include sedation, respiratory depression and paradoxical worsening of pain despite higher opioid doses. Long-term complications can include opioid

Table 2: Total morphine milligram equivalents consumed (N=303)

		Mean	SD	t-value	p-value
Day of surgery	Traditional recovery	46.3	32		
	Enhanced recovery	12	15.0	11.3	<.01
Day 1 post-surgery	Traditional recovery	35.9	29.2		
	Enhanced recovery	7.2	13.8	10.45	<.01
Day 2 post-surgery	Traditional recovery	12.2	21.3		
	Enhanced recovery	2.2	7.6	5.1	<.01
Entire duration of post-surgical hospital stay	Traditional recovery	97.2	71.5		
	Enhanced recovery	21.6	30.7	5.08	<.01

Table 3: Mean pain score day of surgery (on a scale of 0–10)

	Mean	SD	t-value	p-value
Traditional recovery	4	2		
Enhanced recovery	2.2	1.9	7.8	<.01

Table 4: Length of stay in hours (N=303)

	Mean	SD	t-value	p-value
Traditional recovery	57.4	25.4		
Enhanced recovery	44.5	16.8	5.07	<.01

dependence, immunosuppression, depression and diversion.⁵ As adverse effects of short-term opioid use tend to accrue over time, decreasing the total MME consumed over the length of stay, as occurred in this study (97.2 MME to 21.6 MME), could reduce the risk of opioid-related, long-term adverse outcomes.

Mean pain scores on the day of surgery differed from 4 (on a scale of 0–10) in the traditional recovery group to 2.2 in the BHLEX-UEP group. In the presence of decreased opioid consumption, patients in the BHLEX-UEP group consistently rated their pain lower than those who received traditional care. This finding may reflect several factors integral to the

BHLEX-UEP. For example, patients in the BHLEX-UEP group received scheduled non-opioid analgesic medications such as acetaminophen and gabapentin. Scheduled administration of these medications provided patients with continuous analgesic therapy, preventing pain from flaring to a level that could require opioid intervention.¹⁰

Another component of the BHLEX-UEP that likely contributed to lower pain scores was early and frequent mobility. Clinical nurses on the unit where this study was conducted reported that prior to implementation of the BHLEX-UEP, patients commonly complained of abdominal gas pain resulting from anaesthesia. Patients

undergoing full nephrectomy or prostatectomy who experienced the BHLEX-UEP were encouraged to walk as soon as one hour after surgery. Patients undergoing partial nephrectomy who experienced BHLEX-UEP, however, were restricted to walking until the morning after surgery, given the safety concern for bleeding. Walking as soon as permitted following surgery promotes gastric motility and is associated with decreased length of stay and decreased pain.¹¹

Length of stay changed from a mean of 57.4 hours in the traditional recovery group to 44.5 hours (approximately half a day) in the BHLEX-UEP group. Reducing the

length of stay for the 170 BHLEX-UEP patients saved 92 days and a supply cost of over US\$15 000. While financial savings are important, the reduction of pain and opioid use are clearly the most meaningful findings in this study.

Nurse and patient education is an important component of the BHLEX-UEP and findings may not have been as meaningful without it. Nurses caring for patients recovering from prostatectomy or nephrectomy surgery received information regarding the pharmacological attributes of scheduled non-opioid analgesics. This education helped nurses to understand that continuous pain management using non-opioids can lead to a decreased need for opioid analgesia. Patient education is also crucial to providing effective pain management, given society's present understanding that opioids are best for pain control. Prior to surgery, patients are educated regarding what to expect during recovery with a focus on scheduled non-opioid pain medication. The intent of educating patients regarding medications is to help them understand that their post-operative pain can be managed effectively without opioids. That knowledge can help them to accept non-opioids as the major component of their pain management plan.

Study limitations

Findings are limited in that the BHLEX-UEP was tested in one community hospital in the south-eastern USA.

Conclusion and recommendations

Results of this study suggest that implementing the BHLEX-UEP in urology surgery for patients undergoing prostatectomy or nephrectomy may lead to a decrease in opioid consumption, patients' pain and length of stay in hospital. Findings are in agreement with prior research with other patient populations. Overall, there is growing evidence to suggest that the use of ERAS protocols promote positive surgical outcomes related to pain and opioid use.

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