Effective analgesia and decreased length of stay for patients undergoing radical prostatectomy: effectiveness of a clinical pathway

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Objectives: *To assess the impact of a clinical pathway (CP) on length of stay (LOS), complications, readmission rates, and patient satisfaction for patients undergoing a radical retropubic prostatectomy (RRP).*
Materials and methods: *A standardized CP for all patients undergoing RRP was developed and implemented. Post-operatively, patients enrolled in the CP received oral ibuprofen and acetaminophen analgesia, with oral and subcutaneous narcotics available for breakthrough pain. Patients enrolled in the CP were compared to a pre-CP historical cohort. Patients were asked to complete a short, validated satisfaction questionnaire 10 days post-operatively.*
Results: *Sixty-eight consecutive patients underwent a RRP following CP implementation and were compared to a historical cohort of 147 pre-CP patients. Median LOS decreased by 50% (4 days versus 2 days, $p < 0.0001$) while complication and readmission rates were unchanged. Patient satisfaction was high in all domains. Overall, 29.4% of patients treated within the CP required no narcotic analgesia during their admission.*
Conclusions: *The implementation of a CP for patients undergoing a RRP is a simple and effective method for reducing LOS without compromising complication, readmission rates or patient satisfaction.*

Key Words: clinical pathway, radical prostatectomy, analgesia

Introduction

Prostate cancer is the most common non-cutaneous malignancy among Canadian men, with an estimated 12.2% of men receiving this diagnosis during their lifetime.[1] It is projected that the lifetime cost of prostate cancer in males in Canada between the ages of 40 and 80 alive in 1997 will total four billion dollars,[2] with initial therapy comprising approximately 30% of this economic burden. As the population ages and a growing number of men are diagnosed with prostate cancer, this burden will likely increase. In an effort to control the increasing cost of health care, as well as improve the quality of care delivered, clinical pathways (CP) have been developed at many institutions for patients undergoing various surgical procedures, including radical retropubic prostatectomy (RRP). Such CPs have been demonstrated to decrease the post-operative length of stay (LOS) and cost associated with RRP, without an increase in complication or readmission rates or impaired patient satisfaction.[3-7]

Kirsh et al implemented a CP for RRP patients incorporating epidural anesthesia (with or without spinal anesthesia) and post-operative methadone, acetaminophen and ibuprofen analgesia.[7] Patients were discharged on post-operative day one. The majority were satisfied with their LOS and analgesia, with a favorable overall reaction to treatment, while

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maintaining acceptable complication and readmission rates. Palmer et al demonstrated that a CP can reduce average operating room time, blood loss, LOS, and expense, while maintaining patient satisfaction.[5] Patients who were discharged on post-operative day one did not indicate a desire to increase their LOS. Similar results have also been reported by Litwin et al.[4]

The management of acute post-operative pain is of interest to both patients and surgeons. Patient satisfaction, decreased morbidity, and prevention of chronic pain syndromes are all potential benefits of improved post-operative analgesia.[8] CPs devised for patients who have undergone RRP have utilized a variety of methods to achieve adequate post-operative analgesia, including: epidural infusions[3,5,9] (either intra-operatively and/or post-operatively), intravenous ketorolac,[3,4,10] spinal anesthesia,[6,7] most often combined with various combinations of oral ibuprofen, acetaminophen, or subcutaneous narcotic injections. Narcotic use in the peri-operative period is associated with adverse outcomes, including intestinal ileus, constipation, nausea and vomiting, and respiratory depression.[11] The use of opioid-sparing analgesic regimens has been shown to decrease these untoward effects, decrease LOS, and provide economic benefit while maintaining equal patient analgesia.[11,12]

We developed a comprehensive CP for patients undergoing RRP at our institution, with a focus on pre- and post-operative patient education and post-operative analgesia, incorporating an opioid sparing approach to post-operative analgesia. Our purpose was to evaluate the effectiveness of our CP in decreasing post-operative LOS, and to assess patient satisfaction with their experience, including post-operative analgesia.

Materials and methods

A CP for patients undergoing RRP was created based on a review of the literature and expert consensus. The CP was approved for use for all patients undergoing RRP by the Department of Urology at the Queen Elizabeth II Health Sciences Centre in Halifax, Nova Scotia, Canada in May, 2003. Institutional research ethics board approval was obtained.

All patients undergoing RRP were assessed pre-operatively in a clinic setting. Anesthesia and nursing assessments were performed, patients were educated about RRP and its long and short-term outcomes, and their anticipated course in hospital was discussed in detail. Each patient was provided with a written copy of the information that was discussed with them in the clinic in a pamphlet form. Patients were taught Kegel exercises.

Patients were maintained without oral intake after midnight the day before surgery. Patients did not receive enemas or bowel preparation. Prior to surgery, the expected course in hospital and operative outcomes were discussed as reinforcement with each patient and their relatives. A standard RRP was performed under general anesthesia. Pelvic lymph node dissections were performed if the patient had a Gleason grade of 6 or less and a PSA greater than 20 or a Gleason grade greater than 6 and PSA greater than 10. Neither spinal nor epidural anesthesia was used as part of the CP. Intravenous narcotics were administered intra-operatively at the discretion of the anesthesiologist. Intravenous cefazolin (1 g) and 5000 U of subcutaneous heparin were administered to each patient pre-operatively. Operative room utilization time was defined as the interval between the anesthesiologist entering the operating theatre and the patient leaving for the post-anesthetic care unit. Estimated blood loss was obtained from the anesthetic record. No patient underwent autologous blood donation.

Post-operatively, 0.9% normal saline was administered to each patient until the morning following surgery. Routine serum chemistries and complete blood counts were not performed. A fluid diet was provided post-operatively for the evening meal on the day of surgery. Early ambulation was encouraged, with patients sitting in a chair the evening of surgery and ambulating the morning after. On post-operative day one, patients received a full diet if abdominal distention and emesis were absent. Throughout their hospital stay, patients received 5000 U of subcutaneous heparin twice daily, and performed incentive spirometry and lower extremity exercises. Drains were removed when drainage was less than 150 cc over a 24 hour period.

Post-operative analgesia was initiated with 30 mg of intravenous ketorolac given by the anesthesiologist at the end of the surgical procedure. In the post-anesthesia care unit, patients received intravenous narcotics at the discretion of the attending anesthesiologist. The remainder of the post-operative analgesia was provided with 975 mg of oral acetaminophen and 600 mg of oral ibuprofen every 6 hours for the first 48 hours. Immediate release oral (30 mg-60 mg) or subcutaneous (5 mg-10mg) morphine was available to patients for breakthrough pain as required. Patients with renal insufficiency or peptic ulcer disease did not receive ibuprofen.

Our institution provides services to a large geographic, rural area. Discharge criteria and orders were uniform for all patients, regardless of their origin. Patients were discharged home when they were:

TABLE 1. **Patient questionnaire completed on post-operative day 10**

1. How do you feel about the number of nights you spent in hospital?
   Much too short – A little too short – Very appropriate – A little too long – Much too long
2. Would you have preferred to stay in hospital longer?
   Definitely no – Probably no – Not sure – Probably yes – Definitely yes
3. Describe your reaction to the type of anesthesia used.
   Very satisfied – A little satisfied – Not sure – A little dissatisfied – Very dissatisfied
4. Describe the effect of the pain medication you received. Pain controlled:
   All of the time – Most of the time – Some of the time –Not most of the time– Not at all
5. Rate your overall reaction to your treatment.
   Very satisfied – A little satisfied – Not sure – A little dissatisfied – Very dissatisfied
6. Would you choose to undergo surgery again?
   Definitely yes – Probably yes – Not sure – Probably no – Definitely no

ambulating, requiring oral or no analgesics, afebrile, tolerating a full diet, no complications were present, and routine catheter care had been taught. Skin staple and Foley catheter removal was carried out by the patient's primary care physician. Patients were not given prescriptions for narcotic analgesia. A cystogram was not routinely performed before catheter removal.

For this study, all patients undergoing a RRP from May 1 until October 30, 2003 were enrolled in the CP group. Primary outcome measures included: LOS, complication rates (within 30 days post-operatively), and readmission rates (within 30 days post-operatively). A historical cohort of patients that was not enrolled in the CP group (was utilized for comparison purposes (June 30, 2000 until June 30, 2001). Narcotic use intra-operatively, in the post-anesthetic care unit, and on the ward was recorded for each patient in the CP cohort. At discharge, 42 consecutive patients enrolled in the CP were provided with a questionnaire which they were asked to complete 10 days post-operatively and return in a self-addressed, stamped envelope. This questionnaire has been used previously and assesses patients' satisfaction with various aspects of their peri-operative experience, Table 1.[6]

All continuous variables were compared using the Student's T-test, and categorical data were compared using Fisher's exact test. Statistical significance was defined as $p < 0.05$.

Results

In total, 68 patients were enrolled in the CP and 147 patients were comprised the historical cohort. Patient demographics and pre-operative tumor characteristics are summarized in Table 2. There were no statistically significant differences in patient age, prostate specific antigen levels, and Gleason grade between the two treatment groups, Table 2. All patients had clinically localized adenocarcinoma of the prostate (T1 – T2). Table 3 outlines operative room time, EBL, transfusion rate and post-operative tumor characteristics. There were statistically significant differences between the two groups in post-operative Gleason scores, with an increase of patients with Gleason 2-6 and a decrease of patients with Gleason 7 tumors.

Within 6 months after implementation of our CP, the median LOS decreased from 4.0 days to 2.0 days for ($p < 0.0001$). Post-operative complication rates were unchanged (13.2% in CP group versus 21.8% historically, $p = 0.19$), with no complications directly attributable to the CP. There were no complications due to hemorrhage or non-steroidal anti-inflammatory use observed in the CP group. Readmission rates were unchanged (2.9% in the CP versus 0.7% historically, $p = 0.24$). One patient treated on the CP was readmitted with an ileus on post-operative day three with spontaneous resolution 2 days later. A second patient was admitted on post-operative day 27 with epididymitis. One patient in the historical cohort group was readmitted 1 day after discharge with an ureteric injury that required a reimplantation.

The use of specialized anesthesiology services decreased dramatically after implementation of the CP. The majority (94.1%) of patients enrolled in the CP had their pain controlled strictly via the CP, Table 4. One patient received patient controlled analgesia at his insistence, while three patients had subcutaneous narcotic orders written by the acute pain service for no obvious indication (CP breach). Of the patients in

TABLE 2. **Pre-operative patient characteristics**

Characteristic	Pathway	Historical	P-value
Mean Age (yr)	61 (43-72)	62 (44-76)	0.37
Pre-op PSA	8.1 (0.7-33)	8.3 (0.6-27)	0.88
Clinical stage (%)			
T1	61.8	79.6*	0.007
T2	36.8	13.7*	0.01
NA	1.5	6.7	0.11
Gleason Grade (%)			
2-6	77.9	69.4	0.32
7	16.2	17.7	0.85
8-10	2.9	5.4	0.51
NA	2.9	7.5	0.24

TABLE 3. **Operative and post-operative patient characteristics**

Characteristic	Pathway	Control	P-value
OR time (min)	145	153	0.18
Blood loss (cc)	745	726	0.79
Transfusion (%)	7.4	5.4	0.77
+ Margin (%)	19.7	19.7	1.00
Pathologic stage (%)			
T2	72.1	64.6	0.35
T3	25.0	36.6	0.51
N+	2.9	0	0.10
NA	2.8	2.7	0.99
Gleason Grade (%)			
2-6	73.5	51.0	0.003
7	22.1	36.7	0.02
8-10	1.5	8.2	0.07
NA	2.9	4.1	0.99

TABLE 4. **Ordering service and narcotic utilization before and after implementation of the clinical pathway**

Ordering service/Analgesic method	Pre-pathway	Post-pathway
Urology service (%)		
SC/PO narcotic	40.1	94.1
Anesthesiology (%)	59.9	5.9
SC narcotic	13.6	4.4
Neuraxial	38.1	0
Pt controlled	7.5	1.5
Epidural	0.7	0

TABLE 5. **Responses to patient questionnaire completed 10 days post-operatively**

Patient Response	**1**	**2**	**3**	**4**	**5**
Question 1	0	14.3%	85.7%	0	0
Question 2	34.3%	42.9%	2.9%	14.3%	5.7%
Question 3	88.6%	2.9%	5.7%	2.9%	0
Question 4	52.4%	42.6%	4.7%	0	0
Question 5	91.4%	8.6%	0	0	0
Question 6	55.9%	34.3%	5.7%	2.9%	0

the historical cohort, 59.9% of patients had the involvement of anesthesiology in their analgesic regimen, Table 4. Patients enrolled in the CP received an average of 23.8 mg and 10.8 mg of intravenous morphine intra-operatively and in the post-anesthetic care unit respectively. On the ward, 29.4% of patients required no narcotic analgesia. Those requiring narcotic analgesia only required the equivalent of a single dose of oral (26 mg) and/or subcutaneous (9 mg) morphine.

Of the 42 questionnaires that were distributed to patients, 34 (83.3%) were returned. There was no statistically significant difference in the median LOS of the respondents compared with the remainder of patients from the CP group (mean = 2 days). LOS was deemed very appropriate by 85.7% of patients and 77.2% of patients definitely or probably would not want to have increased their LOS, Table 5. Patient satisfaction with their analgesia was very high, with 95.3% stating that their pain was controlled all or most of the time. Importantly, 91.4% of patients were satisfied with their treatment, and no patient reported dissatisfaction. The vast majority (90.2%) of patients would definitely or probably undergo a RRP again.

Discussion

Our finding that implementation of a CP for patients undergoing a RRP reduces LOS without subsequent rises in either complication or readmission rates is encouraging and in keeping with previous reports.[3-6,9,10] Klein et al found that the mean LOS post-RRP decreased immediately after the beginning of CP administration, and that this effect became more pronounced with further utilization and modification of the CP over time.[3] Such a trend was observed at our institution during the second 6-month period after implementation of the CP, during which patients have been discharged as soon as 24 hours following their RRP (unpublished data). The satisfaction rates with LOS of our patients are comparable to previously published series with a shortened LOS.[3,6]

Our study is unique in that we have virtually eliminated the use of spinal, epidural, and patient controlled analgesia, as well as the need for the use of the acute pain service in the post-operative period. Our chosen opioid-sparing analgesic regimen draws from those reported by Litwin et al and Kirsh et al.[4,7] Litwin et al reported the use of intravenous ketorolac combined with subcutaneous morphine without the use of epidural or spinal anesthesia until post-operative day two.[4] Oral analgesics were initiated on post-operative day two. Kirsh et al combined the use of spinal and epidural anesthesia with intramuscular methadone and oral ibuprofen and acetaminophen analgesia in the post-operative period.[7] We have modified these two analgesic protocols and have eliminated the use of intravenous ketorolac beyond the initial dose received at the termination of the procedure. We also administer oral ibuprofen and acetaminophen in the immediate post-operative period on a regular schedule with oral or subcutaneous morphine for breakthrough pain. Utilizing our opioid sparing oral analgesia regimen, almost 30% of all patients did not require any narcotic analgesia while on the ward and of those who required narcotic analgesia, the average utilization was equivalent to one oral or subcutaneous dose during the entire hospital admission. The majority of our patients (95%) stated that their pain was controlled all or most of the time, a result comparable to those previously published.[7] Although our study was not specifically designed to compare the effects of two analgesic regimens on post-operative pain, we feel that that our data provide evidence for the effectiveness of opioid-sparing techniques for post-RRP analgesia.

The benefits of spinal, epidural, and general anesthesia for patients undergoing RRP have been investigated by various authors. General anesthesia

has been reported to be associated with increased intra-operative blood loss when compared with epidural or spinal anesthesia.[13,14] Our average blood loss of 745 cc is less than that reported with the use of epidural[7,13] or spinal anesthesia,[14] suggesting that our patients suffered no increase in intra-operative blood loss despite the use of general anesthesia only. Regarding oral intake, Salonia et al concluded that the passage of flatus on post-operative day one was more likely when patients receive spinal anesthesia versus general anesthesia.[14] We do not feel that the passage of flatus is a requirement for dietary advancement after this extra-peritoneal surgery, and all of our patients routinely receive a full diet on post-operative day one and all patients must tolerate a full diet as a criterion for discharge. In terms of superior pain control with epidural anesthesia for patients undergoing a RRP, our post-operative narcotic analgesia requirements are low and patients are clearly satisfied with their pain control. We feel that this negates any benefit of intra-operative epidural analgesia,[13] allowing us to exclude it and use simpler and equally effective analgesic methods.

Our study did not assess the impact of a CP on the cost of RRP. That CPs decrease the cost of RRP is firmly established, with savings ranging from 32%-43%.[3,5,9] These savings are obtained in all domains of care for hospitalized patients[9]. We believe our CP has undoubtedly reduced the cost associated with RRP at our institution by reducing LOS and ancillary testing, as well as eliminating the need for specialized anesthesiology services.

The lack of a satisfaction survey from our historical cohort of patients who underwent RRP is an obvious shortcoming of this paper. The retrospective collection of this data compounded by recall bias would have made the results of such a survey incomparable to our prospective CP group, making such information invalid. Our goal was to assess the satisfaction of patients enrolled in our CP with their experience in the peri-operative period. Patients were asked to complete their survey 10 days post-operatively to minimize recall bias and to minimize the effect of long-term complications such as incontinence or erectile dysfunction on their responses.

Conclusions

The use of oral acetaminophen and ibuprofen provides effective pain control in the early post-operative period for patients who undergo a RRP. Effective analgesia, combined with vigorous and consistent patient and family education, are integral components to the success of our CP.

The effectiveness of CPs in reducing LOS without compromising complication and readmission rates, as well as high patient satisfaction, mandate their utilization for patients undergoing a RRP. We believe that in this era of laparoscopic prostatectomy, comparisons of post-operative pain and analgesia, as well as LOS and patient satisfaction, should be reserved for modern series such as this one. □

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