Development of a Regional Model of Care for Ambulatory Total Shoulder Arthroplasty

A Pilot Study

S. H. Gallay MD, J. J. A. Lobo MD, J. Baker RN,
K. Smith MD, K. Patel MD

© The Association of Bone and Joint Surgeons 2008

Abstract Total shoulder arthroplasty (TSA) has traditionally been performed as inpatient surgery to provide adequate postoperative analgesia via intermittent opioid administration. We developed a regional model for ambulatory TSA using continuous brachial plexus nerve block (CBPNB). We asked whether this regional model would allow us to select patients to undergo outpatient TSA using CBPNB while providing similar outcomes to those patients who were managed with CBPNB and a one-night or longer inpatient hospital stay. Of 16 selected patients, eight underwent outpatient TSA/CBPNB while the other eight had an overnight hospital stay. Outcome measures included readmission, duration of CBPNB use, pain scores, adjunctive analgesia use, range of motion, and

patient satisfaction. There were no readmissions. Patients used CBPNB for an average of 6 days. The average postoperative pain score was 1/10. One patient required oral analgesics while using CBPNB. All patients were very satisfied (Likert scale) and would have the surgery again. Although these data are preliminary, the development of a regional outpatient model for TSA using CBPNB permitted integration of community care and patient satisfaction and decreased length of hospital stay.

Level of Evidence: Level IV, therapeutic study. See the Guidelines for Authors for a complete description of levels of evidence.

Introduction

Total shoulder arthroplasty (TSA) has traditionally been performed as an inpatient procedure due to the need for adequate postoperative pain control, which, up to now, has only been available using modes of anesthesia compatible with an inpatient admission. This is reflected in the expected length of stay for TSA. In the province of Ontario, the expected length of stay for TSA is 2.8 days for patients aged 18 to 69 years and 3.3 days for patients over the age of 70 years [5]. Available options for adequate pain control after a TSA include intravenous patient-controlled analgesia or continuous brachial plexus nerve block (CBPNB). Complication rates for CBPNB are low (0–9.7%) [4, 6, 8] and may include inadequate anesthesia, accidental catheter removal or disconnection, and shortness of breath as minor complications. Major complications may include pneumothorax, infection, neurologic injury, and toxicity. In a recent large series of 144 cases of CBPNB [4] for shoulder surgery, the rate of major complications was 0.7% (one pneumothorax).

Each author certifies that he or she has no commercial associations (eg, consultancies, stock ownership, equity interest, patent/licensing arrangements, etc) that might pose a conflict of interest in connection with the submitted article.

Each author certifies that his or her institution has approved the human protocol for this investigation and that all investigations were conducted in conformity with ethical principles of research, and that informed consent for participation in the study was obtained.

S. H. Gallay (✉), J. J. A. Lobo
Department of Orthopaedic Surgery, Rouge Valley Health System, 601 Harwood Avenue South, Suite 200, Ajax, Ontario, Canada L1S 2J5
e-mail: sgallay@mymartsim.com

J. Baker
Department of Nursing, Rouge Valley Health System, 601 Harwood Avenue South, Suite 200, Ajax, Ontario, Canada L1S 2J5

K. Smith, K. Patel
Department of Anesthesia, Rouge Valley Health System, 601 Harwood Avenue South, Suite 200, Ajax, Ontario, Canada L1S 2J5

Oral medication alone or nurse-administered analgesia is generally considered inadequate and difficult to titrate for acute post-TSA pain. There is evidence intermittent intramuscular administration of opioids results in higher rates (20–80%) of both moderate-to-severe and severe pain [10]. Intravenous patient-controlled analgesia for acute postoperative pain control generally requires inpatient management. Patient discharge is predicated upon the time when the patient's pain can be managed with oral medication alone. Recently, ambulatory CBPNB has been reportedly effective and safe for various open shoulder procedures [3, 11–17], including CBPNB used for postoperative analgesia in TSA [12, 13]. Several studies describe clinical pathways for treating postoperative pain for many orthopaedic procedures [1, 18]. One pilot study reports one case of TSA managed as a day surgery procedure [17]. Although this study identified the importance of community support and the training of district nurses in treating CBPNB for effective analgesia in ambulatory shoulder surgery, it also demonstrated there is a paucity of such support and training in most healthcare regions.

Our standard of practice before developing this model was to use CPBNB while the patient was admitted to hospital and discontinue its use upon discharge. For some patients, this led to a relatively longer hospital stay to adequately control pain. Upon discharge, pain control was provided in the form of either oral opioid analgesics or patient-controlled opioid analgesia, which was monitored by home-care nurses. Our goals were to (1) develop a regional model of care for ambulatory TSA using CBPNB with its postoperative management provided in the patient's home by a home-care nurse and (2) retrospectively review the results of a case series of patients whose treatment was provided according to the newly developed program.

We asked whether the use of a regional model of care would allow us to select patients to undergo outpatient TSA using CBPNB while providing similar outcomes to those patients managed with CBPNB and a one-night or longer inpatient hospital stay.

Materials and Methods

Our study consisted of two phases. In the first phase, we developed our regional model of care for ambulatory TSA using CBPNB using the following steps: (1) consultation with the stakeholders; (2) identification of the goals for the model; (3) development of patient and system tools for the model; and (4) development of a community nurse education program. In the second (pilot) phase, we retrospectively reviewed a case series of 16 patients using the newly developed program.

The implementation of a new model of care should commence with an understanding of the complete process from the perspective of all of the key people involved in the change. With this in mind, the first step in the development of our model was for the development team to meet with the key players involved in our process design. This included representation from our Chief of Anesthesia, Chief of Surgery, and the Manager of Client Services from our Regional Community Care Access Centre (CCAC). CCAC is the organization responsible for the contracting of service to various care providers (home-care nurses) within our hospital's community of Durham, Ontario, Canada, and is also a key stakeholder in the care of our shoulder patients after discharge home from hospital. These home-care nurses are registered nurses or registered practical nurses who are employed by either a nursing agency or the region of Durham. The nurses are remunerated indirectly from funds provided by the Ministry of Health and Long Term Care in the province of Ontario. After meeting as a group, it was determined our model would be built around the following goals: (1) improved service to our patients, (2) increased consistency of care, and (3) a seamless transfer of care from hospital to community.

To facilitate the stated goals, we worked in collaboration with CCAC to develop patient tools. Patient educational brochures were created to inform the patient about what to expect before, during, and after the surgery. The rationale for the brochures was, if patients understood the processes they were to undergo, it would ease their anxiety and ensure a smoother process overall.

When CCAC contracts care out to various agencies, there is the potential for a large number of people to be involved in caring for the patient. To facilitate consistency of care, we developed several system tools, including a service pathway for CBPNB (Appendix 1), a nerve block preprinted order form (Appendix 2), and a nerve block checklist (Appendix 3). The service pathway provides the sequence of events that are expected to occur from the time the patient is seen in the preadmit clinic to the time they are discharged from the care of CCAC. The pathway provides a clear vision for all care providers involved with the patient. The preprinted order form is used for patients receiving CBPNB to help provide more consistent care. Both the surgeon and the anesthesiologist complete this form before the patient is discharged from the hospital to the care of the community nurses. The nerve block checklist was developed to promote a seamless transfer of care from the hospital to the community. Before being discharged from the hospital, the nurse completes an assessment of the patient and the status of the nerve block and then faxes it to CCAC so that the information can be communicated to the agency providing the care. These tools were initially developed in draft and were finalized

after receiving input from the frontline healthcare providers. We wanted to ensure the tools were clearly understood by the user group.

Once the tools were completed, we focused on educating the nurses from the various agencies within our hospital's region. The CBPNB is a fairly new concept, which has not been seen by many community nurses. The nurse education program we developed was based on the same "competency training tools" we use in our hospital to ensure our ward nurses receive competency training on this particular skill set. The education program included a 2-hour lecture, completion of a self-learning package, and completion of a test with a passing grade of 90%. The self-learning package and test were modified to reflect community nursing. The self-learning package was given out to the community nurses before the lectures. The answers to the tests were provided to the "manager" or "educator" at the various nursing agencies. We had further followup sessions with the agencies. These sessions were provided to answer questions that developed after the healthcare providers had had the opportunity to work with patients with CBPNB. We also trained certain people to be "super users." These people were usually the managers or educators from the agencies and were invited to come to the hospital and observe the insertion of the CBPNB and the care provided for the patient.

Our regional model of care for ambulatory TSA was completed and implemented by December 2004. From December 2004 until December 2006, the senior author (SHG) performed a TSA on 22 consecutive patients with an underlying diagnosis of either osteoarthritis or rheumatoid arthritis. All patients provided written and informed consent. All patients were seen in the anesthetic care unit for preoperative consultation by an anesthesiologist and by a Durham Access to Care Case Manager to determine their eligibility for ambulatory TSA using CBPNB (Group 1) versus TSA with CBPNB requiring one night of observation in hospital for medical reasons with discharge on the next day (Group 2). Eligibility criteria for Group 1 included American Society of Anesthesiologists (ASA) Grade 1 or 2; no major medical reasons for postoperative monitoring; residency in the same region as the hospital; and availability of a family member/friend during the first 24 hours after surgery. Eligibility criteria for Group 2 included ASA Grades 2 or 3; medical reason(s) requiring one night of observation in the hospital; residency in a region other than that of the hospital; and lack of availability of a family member/friend at home the night of the surgery.

Of the initial 22 patients, eight were eligible for Group 1 and eight for Group 2; the remaining six patients were not eligible for either of the two groups and were excluded from the study. The average age for patients in Group 1

was 53 years, and that of Group 2 was 61 years. The ASA grade for patients in Group 1 was equally distributed as either 1 or 2, whereas the ASA grade for patients in Group 2 mostly ranged from 2 to 3 (Table 1). Followup ranged from 9 to 32 months.

All patients received preoperative intravenous antibiotics (cefazolin, a first-generation cephalosporin) and oral postoperative antibiotics (cephalexin, a first-generation cephalosporin) until the CBPNB was removed. All patients had general anesthesia for their procedure after insertion of the CBPNB catheter. The CBPNB was inserted preoperatively using a standard technique [3, 15] with a nerve stimulator and the catheter was tunneled subcutaneously. The CBPNB received a bolus with 0.2% bupivacaine in normal saline preoperatively. Ropivacaine has been used in other studies because of its slightly lower toxicity and higher motor-sparing effect [5, 11, 12, 15]. Bupivacaine was chosen by the regional home-care provider system primarily because its cost is lower than that of ropivacaine. For the Group 1 patients who were discharged the same day from the same-day surgery unit, their CBPNB was given a bolus before discharge from the unit and then started at 6 PM on the day of surgery by a community nurse in their home. Group 2 patients were observed in hospital for one night and discharged the following morning at 9 AM. Their CBPNB was given a bolus before discharge and then started by the community nurse in their home. Infusions were initiated at home because patients received their pumps directly from the home-care provider system at their place of residence.

Once discharged from the hospital, all of the patients' postoperative care was provided according to the service pathway for CBPNB (Appendix 1). Based on previous literature [16, 17], our goal was to maintain the CBPNB for a minimum of 3 days with a maximum of 7 days. All patients received daily prophylactic antibiotics due to the presence of the indwelling CBPNB. In addition, all patients received a rescue prescription for Statex[®] (oral morphine sulfate analgesic; Columbian Chemicals Co, Marietta, GA) and Graval[®] (dimenhydrinate antiemetic; Church & Dwight Co, Princeton, NJ) upon discharge. The CBPNB could be removed by the community nurse or by the anesthesiologist. All patients were assessed in the surgical followup clinic at 1 week by the anesthetic service and at 2 weeks by the treating orthopaedic surgeon.

Outcomes for each group included the following: (1) readmission rate; (2) number of postoperative emergency room visits; (3) average number of days the CBPNB was used; (4) postoperative pain with CBPNB; (5) need for postoperative intravenous opioid analgesia and oral opioid analgesia; (6) postoperative range of motion; (7) patient satisfaction; and (8) whether or not a Group 1 patient would consider ambulatory TSA again. Postoperative pain

Table 1. Patient demographics and outcomes

Patient number	Age (years)	ASA grade	Block removed (days)	Readmit	ER visits	Pain (VAS 1–10)	SC/IV opioids (with block)	Oral opioids (with block)	ROM (E,V,G,G,F,P)	Satisfaction (Likert 1–5)	Outpatient next time	Medical history
<i>Group 1 (outpatient surgery)</i>												
1	59	1	7	No	No	2	No	No	VG	1	Yes	None
2	36	2	5	No	No	1	No	No	VG	1	Yes	Overweight
3	42	2	3	No	Yes	1	No	No	VG	1	Yes	None
4	61	1	5	No	Yes	3	No	Yes	VG	1	Yes	None
5	66	2	6	No	No	1	No	No	G	1	Yes	CAD/MI (from out of region)
6	65	2	6	No	No	0	No	No	VG	1	Yes	None
7	54	1	7	No	No	1	No	No	VG	1	Yes	None
8	44	1	7	No	Yes	0	No	No	E	1	Yes	None
<i>Group 2 (overnight stay in hospital)</i>												
1	60	2	6	No	No	2	No	No	E	1	NA	Hypertension, sleep apnea (CPAP)
2	71	3	7	No	No	1	No	No	VG	1	NA	Obesity, NIDDM
3	55	2	8	No	No	1	No	No	G	1	NA	Sleep apnea (CPAP), obesity
4	50	3	5	No	No	0	No	No	VG	1	NA	Hepatitis C, heavy smoker
5	59	2	6	No	No	2	No	No	VG	1	NA	NIDDM, HBP, hypothyroid
6	71	1	7	No	No	0	No	No	VG	1	NA	None (from out of region)
7	57	2	6	No	No	0	No	No	VG	1	NA	CAD, NIDDM, dyslipidemia, DVT
8	61	2	6	No	No	3	No	No	VG	2	NA	None (from out of region)

ASA = American Society of Anesthesiologists; ER = emergency room; VAS = visual analog scale; SC = subcutaneous; IV = intravenous; ROM = range of motion; E = excellent; VG = very good; G = good; P = poor; NA = not applicable; CAD = coronary artery disease; MI = myocardial infarction; CPAP = continuous positive airway pressure therapy; NIDDM = non-insulin-dependent diabetes mellitus; HBP = high blood pressure; DVT = deep vein thrombosis.

with CBPNB was assessed by the patient using a 10-point visual analog scale (VAS) [7], where 1 = no pain and 10 = worst pain. Patient satisfaction was measured using a 5-point Likert scale [9], where 1 = very satisfied and 5 = very dissatisfied. The postoperative pain score with CBPNB (using VAS) was determined upon followup in the outpatient clinic by the attending anesthetist at the time the CBPNB was removed. The patient satisfaction score (Likert) was determined at 6 weeks (the time of second surgical followup) by the treating orthopaedic surgeon and senior author. Postoperative range of motion measurements were obtained by the senior author in the clinic.

Results

All the Group 1 patients deemed capable of going home the same day of surgery were able to do so using the CBPNB (Table 1). In addition, all the Group 2 patients who were expected to require a one-night stay in the hospital for observation of their medical comorbidity(s) were also able to do so using the CBPNB. Once discharged, no patient in either group had readmission to the hospital. The CBPNBs were removed at an average of 6 days for both groups (Group 1, range, 3–7 days; Group 2, range, 5–8 days). There were three emergency room visits made by three patients of Group 1 and none for the patients of Group 2. One patient in Group 1 required a wound check on the evening after surgery due to bloody discharge on the dressing. The dressing was changed and the patient required no further visits until the CBPNB was removed at 7 days postoperatively. Another patient in Group 1 required a dressing check for the CBPNB due to seepage around the catheter. It was redressed and removed in clinic after the third day. A final patient in Group 1 requested the CBPNB be removed and preferred oral opioid analgesics. The average pain score (VAS) while the CBPNB was in place was 1.0 for Group 1 (range, 0–3) and 1.1 for Group 2 (range, 0–3). No patient in either group required either subcutaneous or intravenous opioid analgesics while their CBPNB catheters were in place. One patient from Group 1 (Patient 4) required oral opioid analgesics while the CBPNB was in place. The average patient satisfaction score for both groups was 1 (very satisfied). All patients in Group 1 said they would prefer their next TSA performed as an outpatient procedure using CBPNB. Finally, the postoperative ranges of motion of the shoulder for all patients in both groups were considered within normal limits when compared to a similar group of patients who underwent TSA without CBPNB. Mean ranges of motion for Group 1 were abduction 136° (range 120°–160°), external rotation 32.5° (range, 20°–50°), and internal rotation to L3 (range, T12 to L5). There were no long-term

complications (followup range, 9–33 months) in either group.

Discussion

Patients undergoing TSA have traditionally been admitted to hospital for their postoperative care. The reasons for admission are varied and may include management of medical comorbidities, providing early postoperative rehabilitation, and optimization of postoperative analgesia. Patients without medical comorbidities and with a suitable postoperative home environment including family support may be admitted for the sole purpose of postoperative pain control. This can be achieved with a combination of intermittent intravenous or oral opioid-based analgesics and neural blockade for postoperative pain. With the advent of regional anesthesia, and specifically CBPNB, the potential has arisen to manage pain in these patients on an outpatient basis, thereby decreasing or eliminating hospital stay while still providing an optimal level of postoperative analgesia. While the coordination of services to provide this level of care is integrated in most hospitals, there is a paucity of literature [17], whereby the infrastructure, implementation, and coordination of services for outpatient CBPNB are described. Several studies describe clinical pathways for treating postoperative pain for many orthopaedic procedures [1, 18]. Our goal was to develop a regional model for ambulatory TSA using CBPNB. We then asked whether the use of a regional model of care would allow us to select patients to undergo outpatient TSA using CBPNB while providing similar outcomes to those patients who were managed with CBPNB and a one-night or longer inpatient hospital stay.

Limitations of the study include its retrospective nature, small sample size, lack of control group and randomization, and preliminary nature of the data. Our sample size was too small to determine the optimal timing for removal of CBPNB. It would be useful to compare preoperative, immediate postoperative, and delayed postoperative ranges of motion and shoulder strength. Furthermore, future directions for study may include a comparison of outcomes for a larger number of patients to satisfy the power requirement for statistical analysis and to use a blinded examiner not involved in the treatment. This would allow for identification of complications that may arise with varying frequency when a larger sample size is considered. Finally, a cost-per-case analysis with a larger group of patients would be useful to identify potential cost savings using this methodology.

TSA surgery in our institution, as in most other care centers, typically requires an inpatient hospital stay due to the need for intravenous opioid analgesics. When CBPNB

anesthesia was introduced to our facility, it also required management in hospital, even though the patients did not require intravenous opioid analgesics. Without a community-based and regional approach to care for these patients, it was not logistically reasonable to perform TSA as an outpatient procedure because of the frequent need to adjust the CBPNB pump settings, requiring the patients to make daily visits to the hospital to control their pain. By developing and implementing our regional model of care for ambulatory TSA using CBPNB, our study has shown no patient required readmission to the hospital for pain management or for an adjustment to their CBPNB pump. Furthermore, the results of the pain questionnaires indicated all patients experienced very low levels of pain when using the CBPNB with little need for supplemental oral opioid analgesics. Patient satisfaction questionnaires indicated all patients were satisfied with the care provided to them by the program and that all patients in Group 1 would choose to have an outpatient TSA again. By implementing this program, the Rouge Valley Health System has been able to reduce the length of stay for TSA to well below the benchmark for the province of Ontario. Finally, none of the patients selected for either outpatient surgery or a one-night stay in hospital required an alternate level of care. This illustrates, by using the service pathway developed for this program (Appendix 1), the surgical team, including anesthesiologist, orthopaedic surgeon, and community nurse case manager could predict whether a patient was eligible for outpatient surgery or an overnight stay in hospital using a set of predetermined eligibility criteria.

Our patients currently have their infusions initiated at home because pumps are provided directly from the home-care provider system at the patient's residence. We are planning a transitional process whereby pumps will be delivered to our surgical center on behalf of the patient and will then be set up before discharge from our day surgery department.

Our study protocol allowed for the use of oral antibiotics during the period in which patients had the interscalene catheter indwelling. There was no literature to support this practice, which had been initiated previously by our anesthesiologists in response to a single case of erythema

surrounding the subcutaneous exit site of the catheter. There are potential negative side effects of continuous antibiotics with CBPNB including mild antibiotic-associated diarrhea. The incidence of antibiotic-associated diarrhea differs with the antibiotic and varies from 5% to 25% [2]. The major form of intestinal disorders is pseudomembranous colitis (caused by *Clostridium difficile*) occurring in approximately 0.5% of patients. There is no guideline in the literature for our method and there is a mild degree of inherent risk with antibiotic use in our method.

Our literature review indicates most studies have used a 3-day cutoff for the removal of the CBPNB catheter [16, 17]. Our anesthetic team decided to leave the CBPNB in place for a minimum of 3 days (if possible) to a maximum of 8 days. Our study determined the average number of days patients used the CBPNB was 6, during which no patients, with the exception of one, required any oral opioid analgesics. One future direction of this study should therefore include the determination of the ideal timeframe for removal of the CBPNB. Furthermore, the set of guidelines developed in this study could serve as useful inclusion/exclusion criteria for a further double-blinded randomized controlled trial in a group of patients that satisfy Group 1 criteria.

The development and implementation of our regional model of care for ambulatory TSA using CBPNB allowed for a safe and seamless transfer of care from hospital to community, an increased consistency of care, and an improved service to our TSA patients while achieving excellent patient satisfaction and recovery and decreased length of stay. Future studies will require a larger sample size and longer-term outcomes. In addition, they will look at the optimal timing for removal of the CBPNB catheter, associated complications, and the effect of this outpatient model of care on the cost per case for TSA.

Acknowledgments We thank the Departments of Anaesthesia, Surgery, and Rehabilitation at Rouge Valley Health System, Ajax Site, for their ongoing support. We also wish to acknowledge the dedication of the staff at the Durham Regional Community Care Access Centre, without whose support this project would not be possible.

Appendix 1

Service Pathway: For Durham Access to Care (DATC) and Rouge Valley Health System (RVHS) Continuous Brachial Plexus Nerve Block (CBPNB)

Pre-op consulting hospital	OR Day 1	PM of OR Day 1	OR Day2	OR Day 3 (and ongoing until d/c)
Anesthetic consult completed.	Nerve Block catheter placed and monitored until client's discharge home.	Community Nurse visits client after 6 p.m. and completes assessment.	Nursing visit in a.m. Assessment of client	Ongoing assessment and client teaching.
Client assessed for eligibility in relation to the Nerve Block Protocol by DATC Hospital Case Manager	DATC Hospital Case Manager confirms service plan and receives completed pre-printed orders from Surgeon/Anesthesiologist.	Continuous infusion of Nerve Block medication initiated in the home.	Ensure client has booked ACU appointment for catheter removal as ordered. Informs DATC Case Manager of ACU appointment and client condition.	Client visited by nurse the day prior to expected discontinuation of block.
Eligibility Criteria:				
<ul style="list-style-type: none"> Resident of Durham Region Family member available during first 24 hours of post-op period Client and family competent and capable to understand all education criteria 	<ul style="list-style-type: none"> Orders are faxed to Coram and Nursing Provider. 	<ul style="list-style-type: none"> Education of client/family continues. 		Report for ACU visit completed by Community Nurse.
If eligible, client admitted to DATC and nursing secured.	DATC Hospital Case Manager provides supplies for 1 st dressing change.	2 nd p.m. visit may be required.	Dressing change as ordered. Community Nurse contacts Anesthesiologist with update on client's condition.	Client assessed in ACU by Anesthesiologist and catheter removed if appropriate.
ACU staff introduce client to Service Pathway and provide information related to the post-op period.	Discharge instructions given to client and family/significant other by Day Surgery staff.			Client to contact nursing agency with ongoing care/discharge needs.
	Nerve Block checklist completed by hospital staff and faxed to DATC and copy provided to client upon discharge.			Client discharged by nursing agency and DATC when treatment completed and catheter removed.
				Nursing agency contacts Coram to pick up pump in client home.

Appendix 3

Durham Access to Care/ Rouge Valley Hospital Nerve Block Checklist

**To be completed by staff at Rouge Valley Hospital prior to client discharge

DATC Tel: (905) 430-3308 1-800-263-3877 Fax (905) 430-3297

Client Information

Caregiver Present upon Discharge? ☐ Yes ☐ No Comments:	
Health Teaching in Hospital? ☐ Yes ☐ No Comments:	
Catheter Labelled? ☐ Yes ☐ No Comments:	
☐ Axillary ☐ Infra-clavicular ☐ Supra-clavicular ☐ Inter-scalene ☐ Other	
Visual Analogue Pain Scale: 0: – No Pain 10: – Worst Pain	Medication Administered Post-Op:
Color, Sensation, Movement (CSM) Color: Assess color of arm, temp of arm, capillary refill Sensation: Rub a tissue along both sides of the arm Movement: Ask client to wiggle fingers and flex wrist, bend elbow and elevate arm	
Date/Time	On Discharge
Temp	
RR/P	
BP	
Pain (0-10)	
Chest Assessment	
CSM	

Comments:

References

- Berger RA, Sanders S, D'Ambrogio E, Buchheit K, Deirmengian C, Paprosky W, Della Valle CJ, Rosenberg AG. Minimally invasive quadriceps-sparing TKA: results of a comprehensive pathway for outpatient TKA. *J Knee Surg.* 2006;19:145–148.
- Bergogne-Berezin E. Treatment and prevention of antibiotic associated diarrhea. *Int J Antimicrob Agents.* 2000;16:521–526.
- Boezaart AP. Continuous interscalene block for ambulatory shoulder surgery. *Best Pract Res Clin Anaesthesiol.* 2002;16:295–310.
- Bryan NA, Swenson JD, Greis PE, Burks RT. Indwelling interscalene catheter use in an outpatient setting for shoulder surgery: technique, efficacy and complications. *J Shoulder Elbow Surg.* 2007;16:388–395.
- Canadian Institute of Health Information (CIHI) Web site. Fiscal 2005 CMG Description for Total Shoulder Replacement. Available at: <http://www.cihi.ca>. Accessed on 7 Sept 2007.
- Capdevila X, Pirat P, Bringuier S, Gaertner E, Singelyn F, Bernard N, Choquet O, Bouaziz H, Bonnet F; French Study Group on Continuous Peripheral Nerve Blocks. Continuous peripheral nerve blocks in hospital wards after orthopedic surgery: a multicenter prospective analysis of the quality of postoperative analgesia and complications in 1,416 patients. *Anesthesiology.* 2005;103:1035–1045.
- Carlsson A. Assessment of chronic pain. I. Aspects of the reliability and validity of the visual analogue scale. *Pain.* 1983;16:87–101.
- Cohen NP, Levine WN, Marra G, Pollock RG, Flatow EL, Brown AR, Bigliani LU. Indwelling interscalene catheter anesthesia in the surgical management of stiff shoulder: a report of 100 consecutive cases. *J Shoulder Elbow Surg.* 2000;9:268–274.
- Drinkwater BL. A comparison of the direction-of-perception technique with the Likert method in the measurement of attitudes. *J Soc Psychol.* 1965;67:189–196.
- Hutchison RW. Challenges in acute postoperative pain management. *Am J Health Syst Pharm.* 2007;64(6 Suppl 4):S2–S5.

11. Ilfeld BM, Morey TE, Wright TW, Chidgey LK, Enneking FK. Continuous interscalene brachial plexus block for postoperative pain control at home: a randomized, double-blinded, placebo-controlled study. *Anesth Analg*. 2003;96:1089–1095.
12. Ilfeld BM, Vandenborne K, Duncan PW, Sessler DI, Enneking FK, Shuster JJ, Theriaque DW, Chmielewski TL, Spadoni EH, Wright TW. Ambulatory continuous interscalene nerve blocks decrease the time to discharge readiness after total shoulder arthroplasty: a randomized, triple-masked, placebo-controlled study. *Anesthesiology*. 2006;105:999–1007.
13. Ilfeld BM, Wright TW, Enneking FK, Mace JA, Shuster JJ, Spadoni EH, Chmielewski TL, Vandenborne K. Total shoulder arthroplasty as an outpatient procedure using ambulatory perineural local anesthetic infusion: a pilot feasibility study. *Anesth Analg*. 2005;101:1319–1322.
14. Klein SM, Evans H, Nielsen KC, Tucker MS, Warner DS, Steele SM. Peripheral nerve block techniques for ambulatory surgery. *Anesth Analg*. 2005;101:1663–1676.
15. Klein SM, Nielsen KC. Brachial plexus blocks: infusions and other mechanisms to provide prolonged analgesia. *Curr Opin Anaesthesiol*. 2003;16:393–399.
16. Nielsen KC, Greengrass RA, Pietrobon R, Klein SM, Steele SM. Continuous interscalene brachial plexus blockade provides good analgesia at home after major shoulder surgery—report of four cases. *Can J Anaesth*. 2003;50:57–61.
17. Russon K, Sardesai AM, Ridgway S, Whitear J, Sildown D, Boswell S, Chakrabarti A, Denny NM. Postoperative shoulder surgery initiative (POSSI): an interim report of major shoulder surgery as a day case procedure. *Br J Anaesth*. 2006;97:869–873.
18. Salinas FV, Liu SS, Mulroy MF. The effect of single-injection femoral nerve block versus continuous femoral nerve block after total knee arthroplasty on hospital length of stay and long-term functional recovery within an established clinical pathway. *Anesth Analg*. 2006;102:1234–1239.