Long term outcomes following discharge from shoulder surgery in an ambulatory setting

Mina Nishimori, Jon JP Warner+, Thomas J Gill++, Lisa Warren+++, Caroline M Carwood**, Jane C Ballantyne****

Abstract

Purpose To describe patients' recovery following discharge from shoulder surgery in an ambulatory setting.

Methods Pain and function were measured preoperatively, at 48 hours, 7 days, and 1 month postoperatively. Pain was measured on a scale of 0-10. The Quick DASH (Disabilities of the Arm, Shoulder and Hand) questionnaire was used to measure function at baseline, 7 days and 1 month.

Results Based on 93 patients, with 86 patients who completed all three follow-ups. Pain score was highest at 48 hours, had begun to lessen at day 7, and was below baseline at 1 month. DASH scores had not returned to baseline at 1 month. The number of patients who had resumed daily activities such as returning to work or engaging in household routines was 47% at 7 days, and 84% at 1 month. Patients in the rotator cuff repair group had significantly more pain, a significantly higher DASH score, and 40% were still using opioids at 1 month.

Conclusion The chief finding of this study was that the majority of patients (84%) recovered rapidly, required minimal opioids for pain control and regained full function within one month. As expected, recovery tended to be longer in elderly patients and those having complex procedures. Patient recovery appeared to be influenced by the type of surgery rather than the analgesic method used.

Keywords: Ambulatory shoulder surgery, pain and function, long term outcomes.

Authors' addresses: The Department of Anesthesia and Critical Care, and Department of Orthopaedic Surgery, Massachusetts General Hospital, and Harvard Medical School, Boston, MA. *Anesthesia Research Fellow, MGH Pain Center, Department of Anesthesia and Critical Care, Massachusetts General Hospital +Chief, Harvard Shoulder Service, Department of Orthopaedic Surgery, Massachusetts General Hospital; Professor of Orthopaedic Surgery, Harvard Medical School ++Orthopaedic Surgeon, Department of Orthopaedic Surgery, Massachusetts General Hospital; Associate Professor of Orthopaedic Surgery, Harvard Medical School +++Director, Ambulatory Anesthesia, Department of Anesthesia and Critical Care, Massachusetts General Hospital; Instructor in Anesthesia, Harvard Medical School

**Research Assistant, MGH Pain Center, Department of Anesthesia and Critical Care, Massachusetts General Hospital.

***Chief, Division of Pain Medicine, Department of Anesthesia and Critical Care, Massachusetts General Hospital; Associate Professor, Harvard Medical School.

Correspondence: Dr. Jane Ballantyne, MGH Pain Center Department of Anesthesia and Critical Care; Massachusetts General Hospital; 15 Parkman Street WACC 333B; Boston, Massachusetts 02114. *E-mail:* jballantyne@partners.org *Phone:* 617-724-2113

Introduction

Improvements in surgical and anesthesia techniques over the past several years have led to an increase in the number and types of surgeries being performed in outpatient settings. Seventy percent of all surgical procedures performed in the United States are currently done on an ambulatory or 23 hour observation stay basis [1]. With the emphasis now on early discharge, long-term outcome data is needed to improve postoperative care and to better educate patients on what to expect after discharge.

Orthopedic procedures have been shown to be amongst the most painful procedures performed in an ambulatory setting [2]. Nearly half of all orthopedic patients experience moderate to severe pain 24 hours after surgery [3], and limited function can still be a problem seven days after discharge [4]. They are also shown to have a high rate of unanticipated readmissions due to pain [5]. Orthopedic patients are the largest group who undergo peripheral nerve blocks [6], which provide excellent anesthesia during surgery, but gradually diminish within 24 to 48 hours. While a continuous infusion of local anesthetic using a disposable elastomeric infusion device [7] providing analgesia up to 48 hours is used in some centers, it is not widely available and its clinical utility has not yet been fully established.

A review of the literature shows that several studies have examined immediate postoperative pain, nausea and vomiting following ambulatory surgery. Some studies have focused on the first 24 and/or 48 hours [2,3,8-10] after surgery, while others have extended their follow up to seven days postoperatively [4,11-13]. However, there are currently no studies assessing long-term pain and function up to one month. Patient observation is needed beyond 4 seven days to assess long-term recovery and to determine how much time is needed to resume normal daily activities.

The purpose of our study was to describe patients' long-term recovery after ambulatory shoulder surgery by reporting their pain, function, resumption of daily activities and opioid use up to one month after discharge.

Methods

The Massachusetts General Hospital (MGH) Institutional Review Board for Studies on Human Subjects approved this prospective study.

Patients 18 years of age and above who were scheduled to undergo ambulatory shoulder surgery in the Same Day Surgery Unit at MGH were approached the morning of surgery. All patients who agreed to participate signed a consent form. Patients were excluded if (1) they had chronic pain not related to their shoulder problem requiring opioid therapy, or (2) they anticipated being admitted after surgery for up to 48 hours. Anesthesia and postoperative analgesia were chosen without any restriction by the anesthesia and surgical teams.

Two surgeons, JW and TG, performed all surgical procedures. Only one surgeon inserted a pain catheter for postoperative pain. It

involved the placement of a small catheter into the surgical wound which provided a continuous infusion of 0.25% Bupivacine at 6cc/ hour over 48 hours

Data were collected over a 12-month period from September 2004 to August 2005. Prior to surgery, patients rated their pain on a 0-10 scale and completed the Quick DASH outcome measure. This is a shortened version of the DASH (Disabilities of the Arm, Shoulder and Hand) Outcome Measure, a self-report questionnaire designed to measure physical function 5 and symptoms in persons with any or multiple musculoskeletal disorders of the upper limb. Quick DASH has 11 questions, which gives a 0-100 score, 0 indicating least disability and 100 indicating most disability (Appendix)

Postoperative follow-up assessments were performed at 48 hours, seven-days, and onemonth via telephone interviews. At all time periods, patients were asked to rate their pain, and to name the type and dose of opioid analgesia used during the previous 24 hours. Analgesic doses were converted to standard morphine equivalents [14]. Patients were also asked if they had symptoms of nausea, vomiting, drowsiness, and fatigue, and if so, to rate how bothersome they were.

At the seven-day and one-month follow-up period, patients again completed the Quick DASH questionnaire. We also asked if they had resumed daily activities such as returning to work or engaging in household activities. Patient records were used to collect details on the type and length of surgery, type and length of anesthesia, immediate postoperative pain and other symptoms or complications.

Surgical procedures were categorized into three groups based on the length of time the shoulder was in a sling and the time to start rehabilitation exercises.

Group A included procedures such as Bankart repair and Superior Labral tear from Anterior to Posterior (SLAP) repair. These procedures are usually done for recurrent shoulder instability or dislocation and affect the younger age groups. Rehabilitation for patients in this group includes a shoulder sling for six weeks, plus activity within a limited range of motion during this period.

Group B consisted of patients who received rotator cuff repair. The patient population depends on the mechanism of injury such as degeneration due to aging or repetitive overhead 6 movements. Rehabilitation guidelines include an abduction brace for six weeks. No movement is allowed during this period except for passive range of motion exercises by a physiotherapist.

Group C included procedures such as subacromial decompression, distal clavicular excision, and acromioclavicular excision. Diagnoses in this group include subacrominal impingement syndrome and acromioclavicular joint osteoarthritis which are common painful conditions among middle age to elderly populations.

Statistical Analysis

Continuous data were summarized with mean and standard deviation except for skewed data, which were summarized as median and interquartile range. Repeated measures analysis of covariance (RM-ANCOVA) was performed to determine changes in pain and DASH scores. Factors, which may have influenced postoperative pain and function, were selected and used as covariates. The effect of the following factors on postoperative pain and DASH scores were independently evaluated as a single covariate in RM-ANCOVA: age, gender, if surgery was on dominant side, if patient had previous surgery on the same site, the type of surgery as categorized above (group A, B or C), if the procedure was arthroscopy or open surgery, if a pain catheter was used postoperatively. The factors that were found to be associated ($p<0.1$) were then included as covariates of the final RM-ANCOVA. The type of surgery, if open or arthroscopy surgery, and the use of a pain catheter were included for the analysis of pain. In the analysis of DASH, age, the type of surgery, and if open or arthroscopy surgery were included.

Results

One hundred and forty five patients were approached and informed about the study. Thirty-six patients refused. Four patients were not eligible as they were using opioids for chronic pain. After obtaining consent, four patients had surgery cancelled, seven patients did not return phone calls at the 48-hour follow up, four patients at the seven-day follow up, and four patients at the one-month follow up.

We only included patients who completed the quick DASH questionnaire preoperatively and at seven days and one month in our analysis. The study results are therefore based on 93 patients, with 86 patients who completed all three follow-ups and seven patients missing the 48- hour follow-up. With the exception of one patient who was admitted for 48-hours due to a frozen shoulder, all patients were discharged to home the same day of surgery. No patients were readmitted to the hospital.

Patient Details

Table 1 shows demographic and surgical details. The age range of patients was 22-72 years and the majority was Caucasian (94%). Surgeries were done by arthroscopy except for seventeen patients who had open shoulder surgery. Since most patients received regional anesthesia combined with general anesthesia (80% n=74), we were unable to look at the effect the choice of anesthetic may have had on long-term outcome. Fifty patients received a pain catheter for postoperative pain.

Table 1 Demographic and Surgical Data.

Age (mean±SD)	47.9±13.0
Male (n, %)	n=61, 66%
Type of surgery (n, %)	Type A (19,20%) Type B (39,42%) Type C (35,38%)
Previous surgery on the same site (n, %)	n=26, 28%
Surgery on dominant side (n, %)	n= 57, 0.61
Duration of surgery (mean±SD)	131.4±29.1
Duration of anesthesia (mean±SD)	68.1±24.1
Arthroscopic surgery (n, %)*	n=76, 82%
Pain catheter inserted (n, %)$	n=50, 53%

*The remaining patients had open shoulder surgery.
$Pain Buster Reservoir contained 0.5% Bupivacaine delivering 4-6cc every hour over a 48-hour period.

One patient was admitted for 48 hours due to a frozen shoulder. This patient, a 59-year old female, underwent arthroscopic capsular release and subacromial decompression (Group C) 8 with combined regional and general anesthesia. Management included a brachial plexus catheter and passive range of motion for 48 hours as an inpatient. After discharge this patient was able to resume her normal daily activities within one week.

Pain and Function

Figures 1 and 2 show changes in pain and DASH scores for all patients at each follow up period.

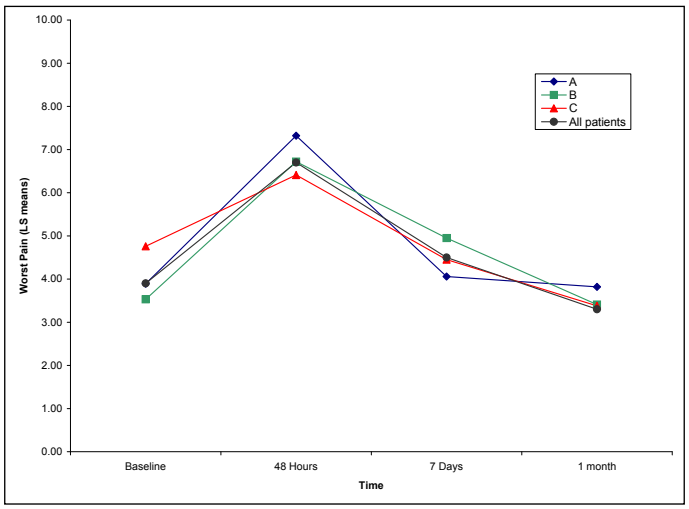

Figure 1 Changes in pain score for all patients and each surgical group.

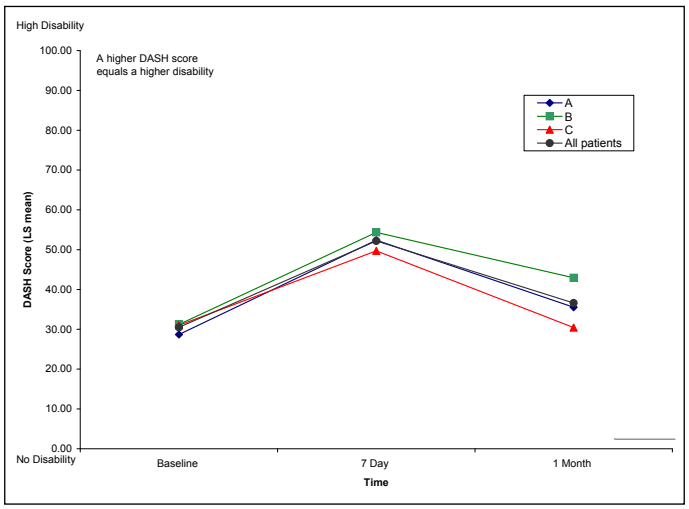

Figure 2 Changes in DASH score for all patients and each surgical group.

At baseline (preoperatively) mean worst pain was 3.9 ± 2.6 on a scale of 0-10. Prior to discharge patients' pain was well controlled (range 0-2). Patients' pain score was highest at 48 hours but had begun to lessen by postoperative day seven. By one month the mean pain score was below baseline (RM-ANCOVA [F (3, 79) = 6.06, p<0.01]).

Prior to surgery, the mean DASH score was 30.5 ± 17.2. At seven days functional disability had increased, mean score 52.2 ± 13.9. By one month the DASH score had improved but had not returned to preoperative levels, mean score 36.6 ± 15.8 (RM-ANCOVA [F(2, 87) = 15.6, p<0.01])

The following factors were included as covariates in RM-ANCOVA to see if they may have influenced postoperative pain and function: age, gender, if surgery was on dominant side, if patient had previous surgery on the same site, the type of surgery as categorized above (group A, B or C), if the procedure was arthroscopy or open surgery, if a pain catheter was used postoperatively. In the analysis of pain the type of procedure (arthroscopy or open) was found to have a significant effect after adjusting for the other factors (RM-ANCOVA [F(3, 79) = 15.6, p=0.04]). Pain was higher at both 48 hours and 7 days for patients who had open surgery, but this difference had disappeared by one month (Figure 3). None of the covariates were found to 9 be significantly associated with postoperative DASH scores after adjusting for the above factors (data not shown).

Analgesic Use

Table 2 shows postoperative opioid analgesic usage and the incidence of nausea, fatigue and drowsiness at each follow up period. During

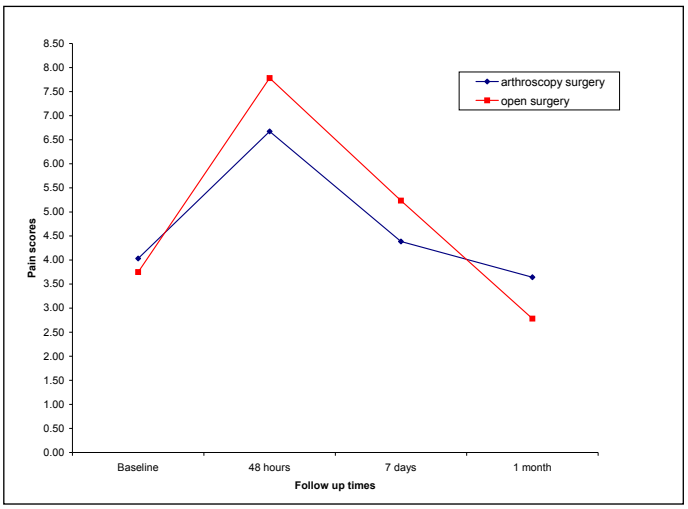

Figure 3 Comparison of pain scores with arthroscopy and open surgery.

Table 2 Opioid Usage and Side Effects at each follow up period.

	48 Hour (n=86)	7 Days (n=93)	1 month (n=93)
Patients using opioid (n, %):	n=84, 98%	n=55, 59%	n=16, 17%
controlled released oxycodone (n)	53	7	1
oxycodone (n)	11	7	3
oxycodone and acetaminophen (n)	50	32	6
hydrocodone and acetaminophen (n)	16	13	6
hydromorphone (n)	2	1	0
dose of opioid* (mg, median with			
interquartile range)	53 (30-70)	15 (5-25)	10 (5-19)
Side Effects:			
nausea (n, %)	n=31, 36%	n=15, 16%	0%
fatigue (n, %)	n=65, 76%	n=58, 62%	n=28,30%
drowsiness (n, %)	n=69, 80%	n=45, 48%	n=12, 13%

* morphine equivalent dose

the initial postoperative period (prior to discharge) 65% (n=60) of patients received opioid medication for pain regardless of whether they had a pain catheter placed during surgery. While the number of patients experiencing nausea decreased as patients stopped using opioids, fatigue and drowsiness were prevalent at all follow-ups. Comparisons among surgical groups showed no difference in the proportion of patients using opioids, or in the mean opioid dose (morphine equivalence). There was no significant association between the use of a pain catheter and opioid use at each time period (data not shown).

Time to Resume Activities

At 7 days 47%(n=44) of study patients had resumed daily activities such as returning to work or engaging in household routines. By 1 month that number had increased to 84% (n=78). Of the 78 patients

who had resumed activities at this time period, the mean duration was as follows: group A 12 ± 1.4 days, group B 12 ± 1.6 days, and group C 8 ± 1.3 days (n.s.). When compared between open and arthroscopy surgery, the mean duration was 10 ± 2.0 days and 11 ± 0.9 days, respectively (n.s).

Fifteen patients (16%) had not resumed normal daily activities at the 1-month follow up. When compared with patients who had resumed activities, these patients had a significantly higher DASH score (mean 50 ± 14.3 v 34 ± 14.9) and significantly more pain (mean 4.3 ± 2.0 v 1 0 3.1 ± 2.2, $p<0.05$). The proportion of these patients still on opioids at one month was also significantly higher (40% v 13%, $p<0.05$).

Discussion

The purpose of our study was to assess the quality of recovery in patients discharged from same day surgery. Our results showed that the majority of our patients actually did well with minimum opioid requirements at home and a return to functionality in a short period of time

We followed 93 opioid naïve patients up to one month after ambulatory shoulder surgery. Although pain was well controlled prior to discharge, most patients (83%) had moderate (pain score 4-6) to severe (pain score 7-10) pain two days after surgery. While pain started to lessen by day seven, there were still patients experiencing severe (30%) and moderate (36%) pain. However, 35% of the moderate pain patients reported at the seven-day follow up that they were no longer using opioids to treat their pain. In addition patients who reported adverse effects to the opioid medication at 48 hours (36% complained of nausea had chosen by day seven to switched to over the counter medication.

Fatigue and drowsiness were prevalent at all follow-ups. While this is to be expected within the first few days (at 48 hours 76% and 80% complained of fatigue and drowsiness, respectively), this symptom can persist up to one month following surgery. In our study, more than half of the patients still had fatigue (62%) and 48% had drowsiness at the seven day follow up. At this time period patients reported they found these symptoms bothersome.

We measured perioperative disability using the QuickDASH questionnaire. This questionnaire consists of function and pain related questions, and questions related to role function and social activities. The results of our study were similar to known group comparisons of being able to work (average score 27.5) versus unable to work (average score 52.6) due to an upper limb problem [15]. At one month patients who had resumed their daily activities had a mean DASH score of 34, versus 50 for patients who had not. This shows that Quick DASH was able to distinguish between the two groups, and was sensitive enough to evaluate functional outcomes in our patient population.

At one month 15 patients had yet to resume their daily activities. These patients had higher pain and DASH scores at this time period and six of them were still using opioids. However, 12 of these patients were part of group B, rotator cuff repair. As patients in this group tended to be older and had a longer rehabilitation protocol, this result is not surprising. Three of the 12 patients also had open surgery, which was shown to significantly increase pain at 48 hours and seven days, further delaying a resumption of activities.

The limitations of this study (non random design and the small number of participants) prevented us from making any solid conclusions on which factors may have influenced longterm pain and function. In our study, it appeared patient recovery was influenced by the type of surgery rather than the analgesic method used. However, the number of patients who received open surgery was small, and the decision to use a pain catheter was based on surgeon preference. Since most patients received general anesthesia combined with regional anesthesia we could not assess the effect of anesthetic methods on long-term outcomes. Future randomized control studies may be needed to determine if a pain catheter and/or the choice of anesthetic method influences patient long term recovery.

Conclusion

The results of our study confirm that patients overall do well after ambulatory shoulder surgery, and most regain full function within one month with minimal opioid requirements. In patients whose recovery was longer it appeared their recovery was influenced more by the type of surgery rather than the analgesic method used. While it was not possible to draw conclusions about the influence of anesthetic choice, future studies assessing alternative choices to GA with brachial plexus block will need to show an improvement over the present results.

Acknowledgement

Mina Nishimori PhD, is supported by the Japanese Society for Promotion of Science Postdoctoral Fellowships for Research Abroad (starting April 2003)

References

1. Capdevila, X. and Dadure, C. Perioperative management for one day hospital admission: regional anesthesia is better than general anesthesia. ***Acta Anaesthesiologica Belgica*. 55 Suppl**:33-6, 2004 .
2. Chung, F., Ritchie, E., and Su, J. Postoperative pain in ambulatory surgery. ***Anesthesia & Analgesia* 85(4)**, 808-16. 1997.
3. McGrath, B. and Chung, F. Postoperative recovery and discharge. ***Anesthesiology Clinics of North America* 21(2)**, 367-86. 2003.
4. Beauregard, L., Pomp, A., and Choiniere, M. Severity and impact of pain after day-surgery. ***Canadian Journal of Anaesthesia* 45(4)**, 304-11. 98.
5. Coley, K. C., Williams, B. A., DaPos, S. V., Chen, C., and Smith, R. B. Retrospective evaluation of unanticipated admissions and readmissions after same day surgery and associated costs. ***Journal of Clinical Anesthesia* 14(5),** 349-53. 2002.
6. Capdevila, X. , Macaire, P., Aknin, P., Dadure, C., Bernard, N., and Lopez, S. Patientcontrolled perineural analgesia after ambulatory orthopedic surgery: a comparison of electronic versus elastomeric pumps. ***Anesthesia & Analgesia* 96(2)**, 414-7. 2003.
7. Crews, J. C. Multimodal pain management strategies for office-based and ambulatory procedures. ***JAMA* 288(5)**, 629-32. 2002.
8. McHugh, G. A. and Thoms, G. M. The management of pain following day-case surgery. Anaesthesia 57(3), 270-5. 2002.
9. Pavlin, D. J., Chen, C., Penaloza, D. A., and Buckley, F. P. A survey of pain and other symptoms that affect the recovery process after discharge from an ambulatory surgery unit. ***Journal of Clinical Anesthesia* 16(3)**, 200-6. 2004.
10. Rawal, N., Hylander, J., Nydahl, P. A., Olofsson, I., and Gupta, A. Survey of postoperative analgesia following ambulatory surgery. ***Acta Anaesthesiologica Scandinavica* 41(8)**, 1017- 22. 97.
11. Carroll, N. V., Miederhoff, P., Cox, F. M., and Hirsch, J. D. Postoperative nausea and vomiting after discharge from outpatient surgery centers. ***Anesthesia & Analgesia* 80(5)**, 903-9. 95.
12. Swan, B. A., Maislin, G., and Traber, K. B. Symptom distress and functional status changes during the first seven days after ambulatory surgery. ***Anesthesia & Analgesia* 86(4)**, 739-45. 98.
13. Watt-Watson, J., Chung, F., Chan, V. W., and McGillion, M. Pain management following discharge after ambulatory same-day surgery. ***Journal of Nursing Management* 12(3)**, 153-61. 2004.
14. Agency for Health Care Policy and Research (AHCPR): Acute Pain Management: Operative or Medical Procedures and Trauma. Clinical Practice Guidelines. 1992, p Appendix C: Dosing Data for Opioid Analgesics
15.Institute for Work and Health. The Quick Dash Outcome Measure. Information for Users. http://www.dash.iwh.on.ca/assets/images/pdfs/quickdashbro.pdf

Appendix

*Quick*DASH

Please rate your ability to do the following activities in the last week by circling the number below the appropriate response.

	NO DIFFICULTY	MILD DIFFICULTY	MODERATE DIFFICULTY	SEVERE DIFFICULTY	UNABLE
1. Open a tight or new jar.	1	2	3	4	5
2. Do heavy household chores (e.g., wash walls, floors).	1	2	3	4	5
3. Carry a shopping bag or briefcase.	1	2	3	4	5
4. Wash your back.	1	2	3	4	5
5. Use a knife to cut food.	1	2	3	4	5
6. Recreational activities in which you take some force or impact through your arm, shoulder or hand (e.g., golf, hammering, tennis, etc.).	1	2	3	4	5

	NOT AT ALL	SLIGHTLY	MODERATELY	QUITE A BIT	EXTREMELY
7. During the past week, *to what extent* has your arm, shoulder or hand problem interfered with your normal social activities with family, friends, neighbours or groups?	1	2	3	4	5

	NOT LIMITED AT ALL	SLIGHTLY LIMITED	MODERATELY LIMITED	VERY LIMITED	UNABLE
8. During the past week, were you limited in your work or other regular daily activities as a result of your arm, shoulder or hand problem?	1	2	3	4	5

Please rate the severity of the following symptoms in the last week. *(circle number)*	NONE	MILD	MODERATE	SEVERE	EXTREME
9. Arm, shoulder or hand pain.	1	2	3	4	5
10. Tingling (pins and needles) in your arm, shoulder or hand.	1	2	3	4	5

	NO DIFFICULTY	MILD DIFFICULTY	MODERATE DIFFICULTY	SEVERE DIFFICULTY	SO MUCH DIFFICULTY THAT I CAN'T SLEEP
11. During the past week, how much difficulty have you had sleeping because of the pain in your arm, shoulder or hand? *(circle number)*	1	2	3	4	5

*Quick***DASH DISABILITY/SYMPTOM SCORE** = $\left(\left[\frac{\text{(sum of n responses)}}{n}\right] - 1\right) \times 25$, where n is equal to the number of completed responses.

A *Quick*DASH score may <u>not</u> be calculated if there is greater than 1 missing item.