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Pre-Operative Outpatient Physical Therapy Of A Torn Rotator Cuff And Suspected Nerve Injury Caused By Anterior Shoulder Dislocation: A Case Report

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The patient signed an informed consent allowing the use of medical information for this report and received information on the institutions' policies regarding the Health Insurance Portability and Accountability Act

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Abstract:

Background and purpose:

Rotator cuff repair surgeries are very common and there are many different post-operative rehabilitation protocols available, but there is little to no literature on pre-operative therapy. The purpose of this case report is to investigate the effectiveness of pre-operative passive range of motion (ROM), joint mobilization and exercises for a patient with both a torn rotator cuff and a suspected neuropraxic peripheral nerve injury.

Case Description:

The patient was a healthy 47-year-old male with no prior medical or surgical history. He was referred to outpatient physical therapy for pre-operative joint mobilization and exercise for his left shoulder, which he anteriorly dislocated in a snowboarding accident. He also reported progressive loss of function and sensation in his left distal upper extremity (UE), which began 1-2 days after his accident. He was seen for four physical therapy sessions including the initial evaluation prior to undergoing rotator cuff surgery.

Outcomes:

The patient reported decreased pain, and improved sensation and demonstrated improved motor control of his left distal UE; but showed little measurable improvement in the QuickDASH functional outcome measure during the short time before his rotator cuff surgery.

Discussion:

Although the patient was only seen for a short period of time, and demonstrated little improvements on the QuickDASH, pre-operative physical therapy may still be effective for rotator cuff repairs. The patient reported decreased pain levels and improved motor control and sensation of his left distal UE. He also reported feeling less anxious about his surgery and better prepared for post-operative rehabilitation.

Word count: 3,446

Background and Purpose:

Out of all the joints in the body, the glenohumeral (GH) joint has the greatest amount of mobility.[1] This makes the GH joint highly susceptible to instability and injury. It is one of the most frequently dislocated joints; with the overall incidence rate in the US being 23.9 per 100,000 persons-year and 48.3% of those injuries occurring during sports or recreation.[2] Hayes et al.[3] reported that up to 98% of all traumatic shoulder dislocations are in the anterior direction. There are many injuries associated with traumatic anterior shoulder dislocation, including rotator cuff tears, greater tuberosity fractures and neurological deficits. A study of the prevalence of neurological deficits, greater tuberosity fractures and rotator cuff injuries associated with a traumatic anterior GH dislocation found that the risk of neurological deficit was greater in patients who also had a greater tuberosity fracture or rotator cuff injury.[4]

The two main treatment options for rotator cuff injuries are surgical repair with physical rehabilitation afterwards, or purely conservative rehabilitation. This decision is usually based on the age and general health of the individual, their occupation and/or hobbies.

There are numerous post-surgical rehabilitation protocols. Most of which have the same basic layout but differ in the exercises used and how and when they progress the patient through the rehabilitation process. A review of the current concepts and evidence based guidelines on rehabilitation after arthroscopic rotator cuff repair by van der Meijden et al.[5] concluded that a majority of the rehabilitation protocols were not based solely on scientific rationale, but rather relied heavily on expert opinion and clinical experience.

There is some literature on whether pre-operative physical rehabilitation is beneficial for total knee and total hip replacements. One systematic review done by Gawel et al.[6] found it to improve patient satisfaction and pain reduction, but the functional outcome measures used

showed mixed results. There has been very little literature done on the effect of pre-operative physical rehabilitation for rotator cuff repairs.

This patient was selected for a case report because he had multiple injuries from a traumatic anterior dislocation of his left shoulder. These complicating injuries included: torn rotator cuff muscles, ligamentous and capsular damage and signs and symptoms indicative of neuropraxic peripheral nerve damage. A case report on this patient will be beneficial to the body of knowledge in physical therapy (PT) by taking a closer look at the effectiveness of pre-surgical PT interventions for rotator cuff tears with a suspected neuropraxic nerve injury. Despite extensive searches, there is little to no published literature to be found on pre-operative physical therapy intervention for rotator cuff injuries.

The purpose of this case report is to investigate the use of pre-operative passive range of motion (PROM), joint mobilization and exercises for a patient with both a torn rotator cuff and a suspected neuropraxic peripheral nerve injury.

Patient History

"BC" was a healthy 47-year-old male with no prior medical or surgical history. He was referred to outpatient physical therapy for pre-operative joint mobilization of his left shoulder and an exercise program for weak muscles, one month after he anteriorly dislocated his left shoulder in a snowboarding accident. He stated that he was unable to lift his left arm to shoulder level after the medical team reduced his dislocated shoulder in the ER and had a progressive loss of function and sensation in his left distal upper extremity (UE), which began 1-2 days after his accident. An X-ray was done on his left shoulder both pre- and post-shoulder reduction to rule out any fractures, and to ensure proper relocation of humeral head in the glenoid fossa. One week after his injury an MRI confirmed a full supraspinatus tear, a moderate-high grade

subscapularis tear, a moderate infraspinatus tear and a subluxed biceps brachii tendon. BC was already scheduled for rotator cuff repair surgery three weeks after the initial physical therapy evaluation.

BC reported his son was living with him and they were in the middle of remodeling his entire house. Prior to his injury, he worked as a heavy machinery electrician/mechanic working on the northern slope (oil field), but due to his inability to functionally use his left arm, he was unable to work. He reported that he lead an active lifestyle prior to his injury, and enjoyed mountain biking, snowboarding and camping.

BC's chief complaint was pain and inability to functionally use his left arm and hand. He could not lift his left arm, grip with his left hand, flex first three digits; he also had sharp shooting pain into left forearm and hand and reported altered sensation in left hand and forearm. He had had recently regained some motor control in his fourth and fifth digits. BC's primary goal was to regain functional use of his left arm and hand, so he could return to work and be able to participate in his hobbies and recreational activities. Some of his secondary goals include decreased pain and increased strength and range of motion (ROM) of his left UE.

Systems review

The results from the review of the cardiopulmonary system were within normal limits (WNL) for heart rate, respiratory rate and blood pressure. There were apparent abnormalities in the musculoskeletal system which included: limited gross ROM, marked weakness of left UE and a slight subluxation of left GH joint. The abnormalities found during the review of the neuromuscular system were impaired motor control of the left hand and impaired sensation of left distal UE. The integumentary system was intact with no apparent abnormalities.

Clinical Impression 1

Due to the mechanism of injury, the presentation of symptoms and the imaging results, it was clear that BC had a rotator cuff tear of his left shoulder; and possible neuropraxic nerve injury. The extent of nerve damage was undetermined at the time of the initial physical therapy evaluation. Further examination was warranted, including: manual muscle testing of his shoulder girdle, elbow, wrist and digits, grip strength, goniometric measurements of impaired PROM and active range of motion (AROM), deep tendon reflexes (DTR) at the biceps brachii, brachioradialis and triceps brachii, the QuickDASH functional outcome measure (Appendix A), and clinical special tests assessing the biceps brachii. It was also decided that BC would benefit from a referral to a neurologist for a nerve conduction study (NCS) to localize the peripheral nerve lesion, to aid in determining the correct plan of care.

BC was a good candidate for physical therapy. Due to the upcoming rotator cuff surgery it was decided that he would benefit most from: manual therapy and PROM of his left glenohumeral joint, stabilization exercises of the shoulder girdle and from exercises aimed at specifically strengthening the muscles in his left distal UE.

Examination/test and measures

Muscle performance

UE strength was assessed using the standard manual muscle testing (MMT) techniques as described by Kendall.[7] This method of testing has been shown by Cuthbert and Goodheart[8] to be valid and reliable. The standard 0 – 5/5 scale was used in grading the muscle strength. BC scored a 5/5 on all right UE muscles tested, and demonstrated marked weakness for the left UE (Table 1).

Range of Motion

BC's UE ROM was tested initially through observation; any noticeable impairment was then tested using standard goniometric measurements as described by Norkin and White.[9] BC demonstrated full active and passive ROM of the right UE and significant impairments of the left UE (Table 1). Goniometry has been shown to be both reliable and valid method for assessing ROM.[10]

Reflex integrity

DTR of the biceps brachii, brachioradialis, and triceps brachii were assessed using the technique described by Gutman and Schonfeld.[11] The triceps brachii DTR elicited a brisk response, and the biceps brachii and brachioradialis DTR were normal (table 1). DTR has been described to be a useful tool in determining reflex integrity.[12] DTR results may be considered clinically significant if asymmetries are present between bilateral reflexes.[13]

Sensory integrity

Due to lack of time, only a quick preliminary assessment of sensory integrity could be done during the initial evaluation. A tactile localization assessment was done using techniques described by Gutman and Schonfeld.[11] Tactile localization has been described as a useful physical examination technique in confirming the extent nerve damage and may be helpful in determining the location of a peripheral nerve lesion.[13] The patient demonstrated impaired sensation in his left distal UE.

Functional outcome measure

The UE specific functional outcome measure used was the QuickDASH. This has been shown by Gummesson et al.[14] to be a reliable and valid measure based on comparison to the full-length DASH questionnaire.

Orthotic, protective and supportive device

The patient was wearing a shoulder sling to alleviate pain and prevent further stretching of intact ligamentous and capsular tissues and further subluxation.

Pain

BC's pain levels were assessed throughout the exam using the numerical pain rating scale; which has been shown by Williamson and Hoggart[15] to be a valid and reliable way to measure pain levels, with careful interpretation of the results. At rest, the patient reported only minimal to moderate pain (1-3/10). Any AROM of left UE increased pain levels between 6-7/10, and PROM of left UE past normal mid-range elicited increased pain levels between 4-5/10 (Table 1).

Special tests

Due to time constraints only a few special tests were performed. These special tests were; the Popeyes' bicep, Speeds' bicep test and Yergasons' biceps test (Table 1). These tests have been described as useful clinical evaluation tools to confirm bicep brachii pathology when performed in accordance with the technique described by Magee.[13(p.308-309)]

Clinical impressions 2

The patient had no prior medical issues and reported having a healthy active lifestyle. The impairments found during the system review were decreased strength and ROM of his left UE, impaired sensation and motor control of left distal UE, and pain in the patients left UE; the rest of the systems review findings were unremarkable. The tests and measures performed confirmed the findings in the system review. The results of the systems review and the test and measures were congruent with commonly seen impairments of rotator cuff injuries, as well as peripheral nerve damage.

BC's impairments include: impaired glenohumeral joint mobility, impaired left shoulder girdle ROM and strength, impaired strength of left proximal UE and impaired motor function and altered sensation of left distal UE, wrist and hand. His functional limitations include: the inability to independently complete many of his ADL's requiring the use of his left UE, such as dressing, cooking, home maintenance, or any activity requiring the use of two hands. His disabilities include the inability to work, or participate in any of the his usual recreational activities or hobbies. Many of the anticipated goals were directed towards regaining functional ROM, and strength of his left UE.

Diagnosis

Pattern 4D: Impaired Joint Mobility, Motor Function, Muscle Performance, and Range of Motion Associated With Connective Tissue Dysfunction

Pattern 5F: Impaired Peripheral Nerve Integrity and Muscle Performance Associated With Peripheral Nerve Injury

Prognosis

Based on the patient's health and activity level, it is likely that the patient will have close to a full recovery of shoulder function after his rotator cuff surgery. However, with the peripheral nerve damage the patient sustained in the accident it is difficult to determine whether or not the patient will regain full functional use of his left UE. The patient's initial prognosis is somewhat guarded due to the possibility that the patient will not regain full motor control and sensation of his left distal UE. Incomplete recover of motor control is common with moderate to severe nerve injury is common.[16] With peripheral nerve injuries the amount of nerve regeneration and functional reconnections is dependent on the age of the patient, the nerve trunk affected, the site and type of lesion, the type and delay of surgical care and the distance over which axons must regrow.[17]

Even though the patients initial prognosis is guarded, the patient is showing signs of nerve regeneration (e.g. intermittent burning and pain sensation of left distal UE, and slight increases in AROM in most of his digits). It is suspected that the nerve damage was minimal to moderate, which may indicate an increased likelihood the patient will regain functional use of his left arm and be able to return to work.

Short and long term goals

The short and long term goals were created immediately after the initial examination. The goals do not address all of the impairments that BC presented with, because he was scheduled for rotator cuff surgery three weeks after he started therapy. The goals primarily focused on improving strength and functional movement of his left distal UE, and improving PROM of his left shoulder.

The short term goals that were made for the patient include:

1) The patient will be able to hold a two pound weight in his left hand while it is pronated within 2 weeks
2) The patient will independent in a HEP that strengthens his left hand and arm and increases PROM his left shoulder within 2 weeks so patient will be physically prepared for surgery.
3) The patient will demonstrate a grip strength of 40 pounds with his left hand within 4 weeks

The long term goals that were made for the patient include:

1) The patient will demonstrate a grip strength of 40 pounds with his left hand within 4 weeks to improve functional use of his left hand.
2) The patient will demonstrate a grip strength of 80 pounds with his left hand within 8 weeks to be able to return to work when his shoulder heals from surgery.

3) The patient will achieve 180 deg. PROM in left shoulder flexion and abduction within 4 weeks so patient will be better prepared for surgery.

Interventions

Coordination, communication, documentation:

Documentation included: BC's current status and progress the he has made, what procedural interventions were used during the therapy sessions, how the patient tolerated the therapy session and/or the home exercise program, any patient education given during the therapy session and any progression of the exercises preformed during the therapy session or at home.

The communication was with the patients' primary care physician and the patients' surgeon to inform them of the patients' progress throughout the patients' plan of care. BC was only seeing PT, so there was no need for any coordination with other therapies.

Patient/client/family – related instructions:

BC was instructed on strengthening and stretching exercises to do at home, number of repetitions/sets per day, and the proper form/technique to use to perform the exercises. He was also educated on what to expect with rotator cuff surgery and the prognoses of that surgery.

Procedural interventions:

BC was scheduled for 1-hour PT sessions two times a week for three weeks. He missed one session and was 30-minutes late to his last session. This resulted in him having only four full therapy sessions including the initial evaluation and only half a session for the re-evaluation.

From the evaluation and diagnosis it was decided that strengthening exercises of the GH joint musculature would not be beneficial until after the surgery. The focus of therapy was to: improve PROM and capsular mobility/tissue pliability of BC's left GH joint, strengthen his scapular stabilizing muscles and distal UE musculature, and improve over all function of his left

UE (Table 2). The procedural interventions used consisted of manual therapy, soft tissue mobilization, therapeutic exercise and neuromuscular re-education.

Manual therapy Techniques and Soft Tissue Mobilization

The joint mobilization techniques utilized were short arm traction, posterior and inferior glides and oscillations (grade 1-2) of the GH joint, with the primary purpose of decreasing pain levels and muscle guarding as described by Kaltenborn et al.[18] Scapular mobilization in all directions was also used to improve AROM of the shoulder joint complex, and PROM (within limits of pain) of the GH joint was utilized to increase tissue laxity around the GH joint.

Soft tissue mobilization was performed on the left distal UE to minimize swelling. Due to BCs decreased AROM of his left distal UE he had an increased risk of swelling. It is believed that soft tissue mobilization can improve circulation and lymphatic flow for a short period of time.[19] Soft tissue mobilization was also performed on the Trapezius, levator scapulae, pectoralis major/minor, and rhomboids to decrease muscle guarding and pain.

Therapeutic Exercise and Neuromuscular Re-education

Strengthening exercises for the scapular stabilizing muscles and musculature that crosses the elbow, wrist and hand were used to improve the stability of the shoulder joint complex and restore functional strength and grip strength of the distal UE, respectively. The exercises prescribed initially consisted of no weight, high repetition AROM. Although AROM exercises will not speed up or improve peripheral nerve regeneration; it can improve the efficiency of the motor unit firing and after sometime result in muscle hypertrophy of the available muscles, which will result in better functional outcomes.[20]

As BC improved, we initiated active assistive range of motion of his left shoulder using a pulley, and added hand dexterity exercises to work on improving the fine motor control. We also

added light resistance for some of the strengthening exercises of the wrist and intrinsic hand musculature, with the GH joint supported by resting the elbow and forearm on a table/mat. Stretching exercises were also included for wrist musculature, and extrinsic/intrinsic hand musculature to prevent contracture from the imbalance of motor control in the distal UE. The strengthening and stretching exercises were all included in a home exercise program once the patient demonstrated he could do them correctly and in a safe manner.

Outcome:

BC was seen for a total of five sessions including the initial evaluation and re-evaluation sessions over the 2 ½ weeks before his surgery. Due to the short duration of treatment, there was little measureable improvement shown by the QuickDASH functional outcome measure. The minimal detectable change and minimal importance difference for the Quick dash have been reported by Polson et al.[21] to be 11 points and 19 points, respectively.

Although BC only had a change of 4 ½ points on the QuickDASH, he did report decreased pain and improved sensation and motor control of his left distal UE (Table 1). Based on the time between BCs' initial injury and when improvements in sensation and motor control of his left distal UE started to occur, it is likely that much of these improvements can be attributed to the peripheral nerve changes occurring.[20]

The initial therapy goals for BC were made under the assumption that he would be returning for post-operative rehabilitation once he was cleared to do so by his surgeon. Unfortunately, he was unable to return to our clinic for post-operative rehabilitation due to insurance issues. Due to the abrupt end to treatment BC was only able to accomplish one of the short term PT goals that were made for him. That being said, he did report feeling less anxious about his upcoming surgery and better prepared for rehabilitation process after surgery.

Discussion:

This case report describes one method of pre-operative PT for a patient with a rotator cuff. The primary purpose of treatment was to improve capsular mobility and surrounding tissue pliability to increase the likelihood of the surgery going smoothly and possibly improve the outcome and overall prognosis. Unfortunately, the patient was unable to return for post-operative rehabilitation; therefore, we were unable to determine the effectiveness of the pre-operative physical therapy for the long term outcome.

Due to the short time frame of treatment and the complicating comorbidity of the suspected neuropraxic nerve injury, BC demonstrated only minimal improvements on the QuickDASH and was unable to achieve most of the PT goals. However, the PT goals were made under the assumption that we would be seeing the patient for post-operative rehabilitation. This made the goals set for the patient unrealistic and unattainable for such a short duration of treatment.

At first glance, based solely on the measureable data and achievement of goals, it could seem that pre-operative PT for rotator cuff repair is not really effective. However, the patient did report decreased pain levels, improved motor control and sensation of his left distal UE, and feeling more prepared and less anxious about his upcoming rotator cuff repair.

The patient satisfaction and pain reduction found in this case study does coincide with findings of the systematic review done by Gawel et al.[6] which looked at the effectiveness of pre-operative treatment for total knee and hip replacements. One of the studies included in that review found that pre-operative exercise intervention prior to total joint arthroplasty can decrease the odds of discharge to an inpatient rehabilitation by 73%.[22] Due to the reported effectiveness

and potential decreases in healthcare costs, further investigation of pre-operative PT for total joint arthroplasty and rotator cuff repair would be beneficial.

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413 **Table 1. Test and measures at initial evaluation and re-evaluation**

Quick Dash (% - disability)						
	Initial Evaluation			Re-evaluation		
	95.45%			90.91%		
Grip Strength (measured in pounds (lbs.))						
	Initial Evaluation			Re-evaluation		
	Left – 25		Right – 85	Left – 7		Right – 105
Manual Muscles testing (muscle grades 1-5/5)						
	Initial Evaluation			Re-evaluation		
Muscles tested	Left		Right	Left		Right
Scapular retraction	4/5		5/5	+3/5		5/5
Shoulder abduction	-2/5		5/5	-2/5		5/5
Shoulder Flexion	+2/5		5/5	2/5		5/5
Shoulder Ext. Rotation	+2/5		5/5	+2/5		5/5
Shoulder Int. Rotation	+3/5		5/5	3/5		5/5
Elbow extension	+3/5		5/5	+3/5		5/5
Elbow flexion	-4/5		5/5	-4/5		5/5
Wrist extension	4/5		5/5	-4/5		5/5
Wrist flexion	+3/5		NT	4/5		NT
Finger flexion	+2/5		NT	-3/5		NT
Finger extension	4/5		NT	4/5		NT
Thumb abduction	-4/5		NT	-4/5		NT
Thumb adduction	3/5		NT	+3/5		NT
Thumb extension	4/5		NT	4/5		NT
Thumb flexion	+3/5		NT	+3/5		NT
Radial deviation	+3/5		NT	+3/5		NT
Ulnar deviation	+3/5		NT	+3/5		NT
Deep Tendon Reflex (0 - 3+)						
	Initial evaluation			Re-evaluation		
Reflex Tested	Left		Right	Left		Right
C5-6 Biceps brachii	2+ - normal		NT	NT		NT
C6 brachioradialis	2+ - normal		NT	NT		NT
C7-8 Triceps brachii	3+ - brisk		NT	NT		NT
Special Tests						
	Initial Evaluation			Re-evaluation		
	Left		Right	Left		Right
Popeyes' bicep	Observable deformity		Normal	NT		NT
Speeds' bicep	positive		negative	NT		NT
Yergasons' bicep	positive		negative	NT		NT
Range of Motion (measured in degrees)						
	Initial Evaluation			Re- evaluation		
	Left-active	Left-passive	Right-active	Left-active	Left-passive	Right-active
Shoulder flexion	32	108*	WNL	40	115*	WNL
Shoulder abduction	20	112*	WNL	30	130*	WNL

Shoulder Ext. rotation (45 deg)	32	NT*	WNL	32	NT*	WNL
Shoulder Int. rotation (45 deg)	20	NT*	WNL	20	NT*	WNL
Elbow flexion	WNL	WNL	WNL	WNL	WNL	WNL
Elbow extension	WNL	WNL	WNL	WNL	WNL	WNL
Pain (0 -10/10 numerical rating scale)						
	Initial Evaluation			Re-evaluation		
	Left-active	Left-passive	Right-active	Left-active	Left-passive	Right-active
Reported pain levels	6-7/10	4-5/10	0/10	4-6/10	3-4/10	0/10

*- limited or not tested due to pain; NT= not tested; WNL= within normal limits; Ext. = external; Int. = internal

Table 2. Procedural Interventions

Therapy Session schedule	Additions made on session 3
10 minute warm up – bicycle ergometer/(patient preference) - To increase overall blood flow and warm up tissues	
GH mobilization (grade 1-2) - posterior/inferior/short arm traction Scapular mobilization - depression/elevation/retraction/ protraction	
PROM of GH joint (within limits of pain)	
AROM exercises - Finger - abduction/adduction/extension/flexion Wrist- - flexion/extension/ pronation/ supination Scapular clock - depression/elevation/protraction/ retraction bicep curls (hammer curls –wrist neutral) tricep extensions	- Added finger-tip to thumb dexterity exercises - Added light resistance to wrist motions (with forearm supported on table)
Wrist and finger extensor/flexor stretches	- Added AAROM pulley exercises – flexion/abduction (left arm just along for the ride and within limits of pain)
STM of the left distal UE to control/reduce swelling and relax tight tissues STM of pectoral muscles, trapezius, levator scapulae and tissues surrounding the GH joint - to decrease muscle guarding and reduce pain and improve tissue pliability.	

STM – soft tissue mobilization; PROM – passive range of motion; AROM – active range of motion; AAROM – active assisted range of motion; GH - glenohumeral

Appendix A

THE QuickDASH OUTCOME MEASURE

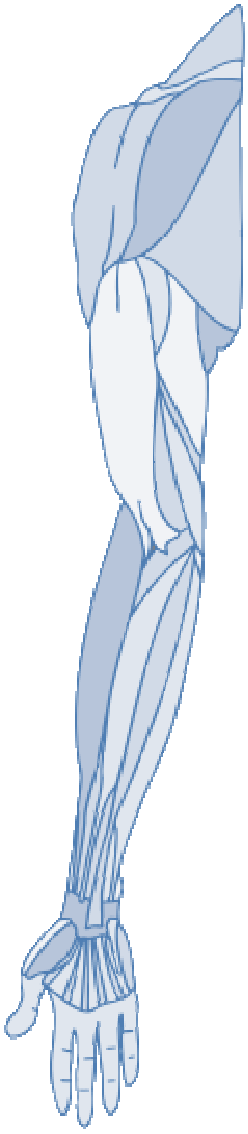
INSTRUCTIONS

This questionnaire asks about your symptoms as well as your ability to perform certain activities.

Please answer *every question*, based on your condition in the last week, by circling the appropriate number.

If you did not have the opportunity to perform an activity in the past week, please make your *best estimate* of which response would be the most accurate.

It doesn't matter which hand or arm you use to perform the activity; please answer based on your ability regardless of how you perform the task.



WORK MODULE (OPTIONAL)

The following questions ask about the impact of your arm, shoulder or hand problem on your ability to work (including homemaking if that is your main work role).

Please indicate what your job/work is:____

❑ I do not work. (You may skip this section.)

Please circle the number that best describes your physical ability in the past week.

Did you have any difficulty:	NO DIFFICULTY	MILD DIFFICULTY	MODERATE DIFFICULTY	SEVERE DIFFICULTY	UNABLE
1. using your usual technique for your work?	1	2	3	4	5
2. doing your usual work because of arm, shoulder or hand pain?	1	2	3	4	5
3. doing your work as well as you would like?	1	2	3	4	5
4. spending your usual amount of time doing your work?	1	2	3	4	5

SPORTS/PERFORMING ARTS MODULE (OPTIONAL)

The following questions relate to the impact of your arm, shoulder or hand problem on playing *your musical instrument or sport or both*. If you play more than one sport or instrument (or play both), please answer with respect to that activity which is most important to you.

Please indicate the sport or instrument which is most important to you:__________________________

❑ I do not play a sport or an instrument. (You may skip this section.)

Please circle the number that best describes your physical ability in the past week.

Did you have any difficulty:	NO DIFFICULTY	MILD DIFFICULTY	MODERATE DIFFICULTY	SEVERE DIFFICULTY	UNABLE
1. using your usual technique for playing your instrument or sport?	1	2	3	4	5
2. playing your musical instrument or sport because of arm, shoulder or hand pain?	1	2	3	4	5
3. playing your musical instrument or sport as well as you would like?	1	2	3	4	5
4. spending your usual amount of time practising or playing your instrument or sport?	1	2	3	4	5

SCORING THE OPTIONAL MODULES: Add up assigned values for each response; divide by 4 (number of items); subtract 1; multiply by 25.
An optional module score may not be calculated if there are any missing items.

QuickDASH

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

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

A QuickDASH score may not be calculated if there is greater than 1 missing item.