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Clinical Reasoning in the Use of Slings for Stroke Patients with Shoulder Subluxation: A Practice Phenomenon in California

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Clinical Reasoning in the Use of Slings for Stroke Patients with Shoulder Subluxation:

A Practice Phenomenon in California

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Abstract

Purpose: The literature reported the frequent use of shoulder slings by occupational therapy practitioners for the management of post-stroke shoulder subluxation despite the low evidence for its efficacy. We investigated the prevalence and clinical reasoning in the use of shoulder sling in order to understand the clinical context that defies the current research evidence.

Methodology: The study is a quantitative descriptive design using self-report survey questionnaire. Online and on-site surveys were distributed among the members of Occupational Therapy Association of California (OTAC) between January and April, 2012, and attendees to OTAC Spring Symposium on March 31 and April 1, 2012.

Findings: 168 occupational therapy practitioners responded to the survey. 81.5% of the California occupational therapy practitioners reported the use of shoulder sling. However, the actual sling prescription was limited to only 28.4% of their patients. The common clinical reasoning in the use of sling was for specific clinical management, such as functional mobility and pain reduction. The orthopedic sling was the most frequently used sling, followed by the GivMohr sling. The pragmatic reasoning pattern was prominent in choosing orthopedic sling, such as high availability in facility's stock and low cost. The procedural reasoning pattern was prominent in choosing GivMohr sling, such as better support and alignment for the glenohumeral joint. The results implicated that the clinical management of shoulder subluxation in post-stroke rehabilitation might be compromised by convenience and cost factors. On the other hand, occupational therapy practitioners with advanced trainings were less likely to use the orthopedic sling and more likely to choose sling based on the procedural reasoning.

Introduction

Stroke is one of the leading causes of long-term disability (Lloyd-Jones, D., et al., 2009). About 50% of the stroke survivors over the age of 64 have hemiparesis, and about 26% of the stroke survivor lost independence in activities of daily living (American Heart Association, 2011). Shoulder subluxation is one of the complications of stroke aftermath, which could lead to the loss of arm function and consequently results in loss of independence in activities of daily living.

Among various modalities applied to manage shoulder subluxation, the literature reported that shoulder slings are frequently used despite the low evidence for its efficacy (Dieruf, Poole, Gregory, Rodriguez, & Spizman, 2005; Foongchomcheay, Ada, & Canning, 2005; Gustafsson & Yates, 2008; Morley, Clarke, English, & Helliwell, 2002). In the current literature, the study of the use of sling in post-stroke rehabilitation is rare. The efficacy of the use of shoulder sling has not been researched recently. There is little to no study that surveyed the current occupational therapy practitioners probing for the reason in the use of shoulder slings. In addition, the inconsistency between the low level of evidence and the perceived prevalence of the use of sling has not been addressed recently. Considering the large population of stroke patients and the significance of the arm function for human occupation, the investigation in the use of shoulder sling in the post-stroke rehabilitation should be conducted with the utmost urgency.

Literature Review

Stroke, also known as cerebral vascular accident (CVA), is the third leading cause of death in America. About 795,000 people are affected by stroke each year (American Heart Association, 2011; Center for Disease Control, 2011). Shoulder subluxation is a

possible secondary complication from stroke. Stroke frequently results in muscle paralysis or flaccidity in a stroke patients' upper extremity, which could lead to shoulder subluxation (Williams, Taffs, & Minuk, 1988). The loss of arm function resulting from shoulder subluxation negatively affects the person's ability to participate in his/her meaningful occupations.

Occupational therapy practitioners are encouraged to use evidence-based practice to prevent and manage shoulder subluxation. Current evidence-based interventions for shoulder subluxation include modalities such as electrical stimulation, positioning, and strapping. On the other hand, the use of shoulder slings has limited research to support its effectiveness in treating shoulder subluxation (Gustafsson & Yates, 2008). Despite the fact that shoulder slings are not supported by high level evidence, Gustafsson and Yates (2008) reported that occupational therapy practitioners prescribed slings for shoulder subluxation more often than other modalities that were supported by stronger evidence. Therefore, the purpose of this study was to uncover the occupational therapy practitioners' clinical reasoning in choosing a sling for individuals with post-stroke shoulder subluxation or at risk for shoulder subluxation.

Stroke

Stroke, also termed cerebral vascular accident (CVA), is a neurological condition with a lesion in the brain. There are two types of strokes, ischemic stroke and hemorrhagic stroke. The more prevalent type of stroke is ischemic stroke. Ischemic stroke accounts for 87% of the stroke population (Center for Disease Control, 2011). Ischemic stroke is caused by restriction of blood to the brain that leads to damage in brain cells. Hemorrhagic stroke occurs when the weakened blood vessel in the brain ruptures due to high blood

pressure. The blood that flew out of the blood vessel compresses the brain cells, which ultimately causes damage to the region of the brain.

The effects of stroke vary. The location and extent of the brain cell damage determine the severity of the stroke. Stroke limits the person's cognitive and physical abilities. Stroke commonly affects one side of the cerebral hemisphere which may affect the contralateral side of the body, both upper and lower extremity. This condition is called hemiplegia or hemiparesis.

Shoulder subluxation

One of the most common complications that occur in the upper extremity after a stroke is shoulder subluxation. Shoulder subluxation is defined as partial dislocation of the glenohumeral joint (shoulder joint). The stability of the glenohumeral joint depends on the rotator cuff muscles and ligaments. Muscle paralysis or flaccidity of the upper extremity resulted from stroke significantly reduces or disables the ability of rotator cuff muscles to maintain normal muscle tone. Consequently, the flaccid or paretic upper extremity imposes a gravitational pull on the glenohumeral joint. The gravitational pull ultimately leads to the damage to the glenohumeral joint. It has been reported that the prevalence of shoulder subluxation in stroke patients is 17% to 81% (Paci, Nannetti, & Rinaldi, 2005; Zorowitz, Idank, Ikai, Hughes, & Johnston, 1995).

There are three types of shoulder subluxation: anterior, inferior, and antero-inferior subluxation. The most common type of subluxation is the antero-inferior shoulder subluxation (Morin & Bravo, 1997). If a shoulder subluxation is not managed properly, it may lead to severe pain, brachial plexus injury, and subacromial impingement (Brooke, Lateur, Diana-Rigby, & Questad, 1991; Dieruf et al., 2005; Foongchomchaey et al., 2005; Morleyet al., 2002). The pain and immobility of the shoulder limit the ability to perform

critical and valuable occupations, such as independence in self-care, work, and valued leisure activities. Consequently, the disability related to shoulder subluxation significantly alters the person's life role and affects their identity. Therefore, preventing and addressing shoulder subluxation is essential in occupational therapy practice (Peter & Lee, 2003).

Types of modalities used for post-stroke shoulder subluxation

Various modalities are used to manage post-stroke shoulder subluxation. The modalities commonly used include electrical stimulation, strapping, and slings. Positioning the hemiplegic arm while in a wheelchair or on the bed is also a widely practiced treatment approach.

Electrical Stimulation. Different types of electrical stimulation are used for the treatment of post-stroke shoulder subluxation. Neuromuscular electrical stimulation (NMES) provides electrical stimulation to contract paralyzed muscles through an intact lower motor pathway and elicits muscle response or muscle contraction to the stroke-affected muscles (Chae & Sheffler, 2009). The main effects of NMES are muscle conditioning and reduction of spasticity. Muscles that are usually treated by NMES are the supraspinatus and the posterior deltoid, which play a critical role in maintaining the glenohumeral alignment (Paci et al., 2005; Price & Pandyan, 2001). Functional electrical stimulation (FES) applies NMES to facilitate accomplishment of functional tasks. FES is designed to correlate a stroke patient's volitional movement and the provision of electrical stimulation so that functional performance can be achieved (Chae & Sheffler, 2009). Transcutaneous electrical nerve stimulation (TENS) is used for controlling the shoulder pain based on the gate-control theory of pain (Vasudevan & Vasudevan, 2008).

The stimulation frequency applied for the treatment ranges from 30Hz to 60Hz (Paci et al., 2005: Ada & Foongchomcheay, 2002; Fil, Armutlu, Atay, Kerimoglu, & Elibol, 2011). The common practice protocol for electrical stimulation is to gradually increase the duration of stimulation up to six hours per day (Paci et al., 2005).

There are two systematic review and meta-analysis that support the efficacy of electrical stimulation for reducing shoulder subluxation. A systematic review by Price and Pandyan (2001), which reviewed five randomized control studies, suggested that electrical stimulation could be used to reduce the severity of the shoulder subluxation. The meta-analysis by Ada and Foongchomcheay (2002) stratified the included studies in two categories by the criterion whether the study included participants with a stroke that occurred within two months or more than two months prior to the study. According to the findings by Ada and Foongchomcheay (2002), the use of electrical stimulation within two months after a stroke reduced the shoulder subluxation by 6.5 mm compared to the control group without electrical stimulation, whereas electrical stimulation that was applied later than two months after stroke showed only 1.9 mm reduction compared to the control group. In a recent randomized controlled study of 48 participants in an acute setting (within two days from the onset of stroke), high voltage pulsed galvanic stimulation at 60Hz was prescribed to the study group participants for 20 minutes per day for an average of 12 days. The study group showed no sign of subluxation, while 37.5% of the control group exhibited shoulder subluxation (Fil et al., 2011).

The efficacy of early intervention with FES for the reduction of shoulder subluxation was also supported by a randomized controlled study with 50 participants by Koyuncu, Nakipoglu-Yuzer, Dogan, and Ozgirgin (2010). The control group received the

standard rehabilitation program, while the study group received FES treatment on supraspinatus and posterior deltoid muscles in addition to the standard treatment. The median time from the onset of stroke to the beginning of the standard rehabilitation program was 180 days for the study group and 90 days for the control group. The results demonstrated that the study group exhibited less subluxation than the control group, and the difference of shoulder subluxation measurements between the two groups was statistically significant (Koyuncu et al., 2010).

The efficacy of the early application of electrical stimulation for functional improvement was reported in the same meta-analysis by Ada and Foongchomcheay (2002). The study participants who received the treatment with electrical stimulation within two months from the stroke onset scored the functional measurement scale of the upper limb that was 19% superior to the score of the control group. On the other hand, the participants who received the treatment with electrical stimulation later than two months after the stroke onset did not have the functional improvement that was significantly different from the score of the control group (Ada & Foongchomcheay, 2002). Fil, et al. (2011) mentioned above also measured the upper limb function of the study participants using the Motor Assessment Scale. The study group exhibited the higher scores, though the differences did not reach statistical significance (Fil, et al., 2011).

On the other hand, the efficacy of electrical stimulation for the purpose of pain reduction is inconclusive. A systematic review by Price and Pandyan (2001) reported no significant pain reduction measured by the pain-free range of motion in the affected upper limb. Another randomized controlled study suggested that electrical stimulation was

effective for pain reduction in patients whose stroke onset is within 77 weeks or less, but ineffective for those who had a stroke more than 77 weeks ago (Chae, et al., 2007).

Strapping. Along with slings and positioning techniques using supports from pillows and lap trays, strapping is one of the biomechanical approaches to manage shoulder subluxation. The stroke-affected shoulder is strapped with a variety of techniques using adhesive tapes in order to maintain the alignment of the glenohumeral joint. Depending on the orientation of the tape, it either promotes or inhibits the movement of the limb. The administration of strapping requires further training and is considered as advanced practice in the field of occupational therapy (Vasudevan & Vasudevan, 2008).

Strapping has several advantages over the other biomechanical modalities, such as slings and lap trays. Strapping allows movement of the affected limb while maintaining the joint integrity, whereas slings hold the arm in one position which may lead to possible muscle shortening due to disuse (Hanger, et al., 2000). Strapping can be worn constantly for several days until it needs to be replaced from overstretching. On the other hand, the use of slings and lap trays are limited in application contexts and cannot be applied continuously throughout the day (Hanger, et al., 2000). The proprioceptive stimuli provided through strapping may also be beneficial to patients with neglect or poor proprioception (Ancliffe, 1992; Griffin & Bernhards, 2006; Hanger, et al., 2000; Peters & Lee, 2003). One of the causes of post-stroke shoulder subluxation is mishandling of the affected shoulder by medical staff or caregivers. Strapping also provides a visual reminder to the handler and may facilitate proper handling techniques (Ancliffe, 1992; Griffin & Bernhardt, 2006; Hanger, et al., 2000; Morin & Bravo, 1997)

Several studies focused on the effect of strapping on pain reduction. Ancliffe (1992), and Griffin and Bernhardt (2006) supported the efficacy of strapping in the pain reduction in stroke patients in the acute and the sub-acute setting. Ancliffe (1992) conducted a pilot study with eight stroke patients who were admitted to the hospital within 48 hours after the onset of the stroke. Eight subjects were randomly assigned to either a study group or a control group. The study group received strapping on the affected shoulder. The control group did not receive strapping. The patients in the study group experienced significantly longer days of pain-free days (mean = 21 days), while the mean pain-free day of the control group was 5.5 days (Ancliffe, 1992). A randomized controlled study by Griffin and Bernhardt (2006) measured the number of pain-free days among the patients who had a stroke within three weeks. The study group maintained strapping for four weeks in addition to the standard stroke care, while the control group received standard care only. The difference of pain-free days between the two groups was statistically significant. The mean pain-free days of the study group was 26.2, while that of the control group was 19.1(Griffin & Bernhardt, 2006).

The randomized controlled trial of Hanger, et al (2000) applied strapping to 49 acute stroke patients throughout the hospitalization period (median 25 days), while other 49 patients in the control group did not receive strapping. Shoulder pain was assessed by pain-free range of motion in shoulder lateral abduction. Arm function was measured by the Motor Assessment Scale. Patients' overall functional status was measured by the Functional Independence Measure (FIM). Although the result did not achieve statistical significance, the researchers concluded that the improvement in motor function and pain

reduction observed in the study implied the potential of strapping as an effective treatment modality (Hanger, et al., 2000).

Appel , Mayston and Perry (2011) tested the efficacy of strapping on functional improvement in the stroke-affected limb. Their small randomized controlled study recruited a total of 13 acute stroke patients whose stroke onset was within 10 days. Six patients in the study group received strapping treatment for one month in addition to routine rehabilitation, while seven patients in the control group received only routine rehabilitation. The level of arm function was measured by the Motor Assessment Scale, the Arm section of the Fugl Meyer Scale, and the Nine Hole Peg Test. The study found a small-to-moderate effect size on functional improvement in the study group (Appel et al., 2011).

Strapping was also shown to be effective in supporting a subluxed shoulder when used concurrently with the sling (Morin & Bravo, 1997). In a single group study by Morin and Bravo (1997), 15 hemiplegic patients with shoulder subluxation of at least one half finger widths were treated with both strapping and a sling for five days. X-ray of the patients' subluxed shoulders were taken on the first and last day of the treatment and three days after the completion of the treatment. The average baseline subluxation among the patients was 11.73mm, while the measurement at the last day of the treatment was 2.05mm, indicating an 86% reduction. However, three days after the support from strapping and the sling were removed, the subluxation level increased to10.17mm. Morin and Bravo (1997) concluded that the clinical value of this reduction was insignificant although 1.5mm reduction from the baseline was statistically significant.

In summary, an outlook of the efficacy in the use of strapping is positive. However, strapping is a relatively new treatment modality for the management of shoulder subluxation. Currently a variety of strapping techniques were used in the literature, and the long-term effects of strapping on the shoulder subluxation have not been reported yet (Paci et al., 2005).

Positioning. The use of lap trays and pillows to support the stroke-affected upper limb is recommended in the Clinical Practice Guideline for the post-stroke rehabilitation issued by the Department of Health and Human Services (Paci et al. 2005; U.S.Dept. of Health and Human Services. 1995). The Canadian Best Practice Recommendations for Stroke Care recommends positioning and supporting the affected limb for the purpose of shoulder pain management with middle to low level evidence (Lindsay, Gubitz, & Bayley, 2010). Lap trays or arm troughs attached to the wheelchair support the stroke-affected upper limb while sitting. Some literature recommended the use of lap trays for not only supporting the affected limb but also for keeping the arm in abduction and external rotation to counteract the effect of flexion synergy (Brooke et al. 1991). Gustafsson and Yates (2008) reported the prevailing use of pillows by the medical staff as a support while patients were in bed. However, there is no evidence to support the application of a pillow.

Sling. A sling can be used to decrease stress and the gravitational pull on the glenohumeral joint in order to maintain the anatomical alignment of the shoulder. The use of sling is best to be combined with an exercise program in order to prevent soft tissue contractures that may result from keeping the affected arm in a stationary position for a prolonged period of time (Brook et al. 1991; Vasudevan & Vasudevan, 2008). Although early intensive therapy to mobilize the affected upper extremities has been shown to

improve arm function and prevent contractures from shoulder subluxation, it was suggested that this type of therapy should be avoided for the first seven days after the appearance of the shoulder subluxation in order to prevent worsening of the shoulder subluxation (Dieruf et al. 2005).

types of slings. A variety of shoulder slings were designed and applied in post-stroke rehabilitation. The Bobath sling is designed to provide comfort for the patients and to manage shoulder subluxation (Brooke et al. 1991; Morely et al. 2002). The straps go behind the unaffected side as well as the affected side with the shoulder subluxation. Additional straps within the two straps on each side of the shoulder connect together in a figure-of-eight across the trunk. In addition, the shoulder with the subluxation has a pad beneath the proximal humerus for support. The pad is designed to position the humerus into abduction and to avoid internal rotation of the humerus. The main purpose of the Bobath sling is to decrease the shoulder subluxation, normalize muscle tone, as well as prevent internal rotation of the humerus and a flexed-arm position. This technique is aimed to decrease the chance of developing contractures by placing the arm in a neutral position and allowing arm movement (Brooke et al. 1991; Morely et al. 2002).

The Rolyan sling has an arm cuff that holds the humerus of the affected extremity proximally. The Roylan sling is designed to allow adjustment of both vertical and rotational position of the humerus. The Rolyan sling also provides a bilateral axillary support to correct the subluxation. The sling has straps that position the humeral head. There is also a brace placed between the scapulae to provide support. Overall, this sling positions the humerus in external rotation and the scapula in a retracted position in order

to decrease shoulder subluxation (Morley et al. 2002; Williams et al., 1988; Zorowitz et al., 1995).

Moodie, Brisbin and Morgan (1986) indicated that the original triangular sling has proved to be the most effective, comparing to the Bobath, Hook hemi harness, arm trough, and lap tray in reducing shoulder subluxation. However, there are several disadvantages with the conventional triangular sling. The triangular sling positions the shoulder in an adducted and internally rotated position, which may lead to a flexor synergy pattern of the affected upper extremity (Morley et al. 2002).

Brooke et al. (1991) described that the Harris hemisling consists of an elbow pad and an additional pad that supports the wrist and hand. The wrist and hand straps have adjustable loops extended from each of the two pads to wrap around the patient's trunk. The elbow straps run in front and behind the shoulder. The Harris sling is designed to provide optimal shoulder support and comfort. The study by Brooke et al. (1991) with 10 study participants compared the degree of subluxation in the affected shoulder that was supported by the Harris sling to that of the non-affected shoulder. The results indicated, "Harris hemisling provided good correction and was consistent." (pp. 585).

Mortimer (as cited in Morley, et al., 2002) studied two types of hemi slings, the Devore and Denny sling, and the other type of hemi sling with a 'criss-cross back'. Mortimer concluded that there was no objective evidence provided to support the use of both types of slings. In addition, Mortimer (as cited in Morley, et al., 2002) stated as follows.

> The resultant position of the upper limb within all of the hemi slings is one of shoulder adduction, flexion and internal rotation, with the upper limb

> being strapped to the body, with similar disadvantages to those associated with a triangular sling. (Morley, et al., 2002, pp. 212)

GivMohr sling is a uniquely designed sling that allows weight bearing and functional mobility of the arm during walking. The GivMohr sling is designed to normalize muscle tone by applying joint compression on the upper extremity of the affected shoulder. The sling is found to be effective with patients with shoulder subluxation because of how the sling positioning the shoulder. GivMohr sling positions the arm in a functional position where the shoulder is externally rotated with a small amount of abduction and the elbow is in an extended position (Dieruf et al. 2005). The Givmohr sling is highly adjustable. Dieruf et al. (2005) described the design of the GivMohr sling as follows.

> The sling holds the arm …with a modified figure-8 strap of nonelastic webbing that loops around the anterior aspect of the unaffected shoulder and axilla and crosses between the scapulae. These straps are adjustable with buckles to modify the fit. (p2325)

effectiveness of the slings. Various studies have compared the effectiveness of each sling in reducing and/or managing shoulder subluxation. Radiology analysis was often used to measure before and after results. In addition, the radiographs were also used to compare the unaffected shoulder with the affected shoulder as a measure of improvement with the affected shoulder after wearing a shoulder sling. Vertical and horizontal displacements of the arm were two factors in measuring the degree of shoulder subluxation (Brooke et al. 1991; Williams et al. 1988; Zorowitz et al. 1995).

Williams et al. (1998) compared the effectiveness of two slings, the Henderson sling and the Bobath sling, in reducing shoulder subluxation. This study also compared the effectiveness of each sling against the subluxed shoulder with no sling. The Henderson sling has a strip of polyethylene foam that saggitally surrounds the affected shoulder. The foam is secured by a strap that runs through the chest, axilla, and the back to connect the front and back sides of the foam. Twenty-six subjects participated in this study. All of the participants had hemiplegia (either left or right) with shoulder subluxation. Out of the 26 subjects, 22 subjects had a Brunnstrom's stage of recovery of one to three, indicating that their involved upper extremities were nonfunctional. The other four subjects were in Brunnstrom's stage of recovery four to six. Those four subjects had some control of their arm movements. Anteroposterior radiographs were taken both on the uninvolved shoulder and the involved shoulder in order to compare the alignment of the two shoulders before and after using the sling. Each of the 26 participants received either the Bobath sling or the Henderson sling. The results showed that there was no significant difference in the effectiveness of the Bobath sling comparing to the Henderson sling. Both had a mean alignment of 5mm with the 26 subjects. The difference between the Bobath and the Henderson sling in correcting shoulder subluxation was 0.6mm, which was not significant. When comparing the involved shoulder without using shoulder sling to the involved shoulder with one of the two slings, there was a significant difference in the measurement of subluxation ($p<.001$) (William et al. 1998).

The results from Brooke et al. (1991) and Zorowitz et al. (1995) indicated that the Bobath roll, comparing to the Harris hemisling and the Roylan sling, was the least effective in reducing the displacement of the affected shoulder.

In particular, the study by Brook et al. (1991) indicated that the Bobath sling was not effective in treating vertical and horizontal subluxation when comparing to the Harris sling. This study recruited ten subjects with shoulder subluxation from stroke. The results showed that the Harris sling had significant improvement in correcting the vertical alignment of the shoulder. The results of the Harris sling averaged 37.8mm in vertical distance, as comparing to 38.5mm of the uninvolved shoulder. The Bobath sling did not have a significant result in the mean vertical correction of the shoulder subluxation when compared to the mean measurement of the uninvolved arm. The Bobath sling was found to have an average of 43.2mm in vertical correction of the subluxed shoulder comparing to the mean vertical distance of the uninvolved arm of 38.5mm (Brooke et al., 1991). In addition, Moodie et al (1986) indicated that the Bobath sling was not able to reduce subluxation to 20% of normal shoulder alignment.

The study by Zorowitz et al. (1995) showed that the Rolyan cuff sling produced the best total asymmetry correction of the shoulder when comparing to subjects with no support, Hemisling, Bobath, and the Cavalier sling. For correcting both vertical and horizontal displacement of the shoulder, Zorowitz et al. (1995) and Morley et al. (2002) indicated that the Rolyan humeral cuff sling was the most effective comparing to the single strap hemi sling or the Bobath sling. Dieruf et al. (2005) also explained that although the Rolyan cuff sling was the best at correcting the total displacement of shoulder subluxation, its effectiveness of correcting vertical displacement was not significant comparing to the GivMohr sling.

Comparing to the Bobath sling and the Rolyan humeral cuff sling, the single strap hemi sling, which is similar to the Harris hemisling, was the best in correcting vertical

displacement of the affected shoulder. (Zorowitz et al. 1995). The study by Zorowitz et al. (1995) consisted of 20 subjects. Each subject wore three types of the shoulder slings in sequence, first the single strap hemisling, second the Rolyan sling, and third the Bobath sling. Results showed that single strap hemi sling had the best vertical correction in 55% of the subjects (11 subjects), the Rolyan sling 40% of the subjects (8 subjects), and the Bobath 20% of the subjects (4 subjects). The overall results indicated that both the Harris hemisling and the single strap hemi sling were effective in correcting vertical displacement for shoulder subluxation (Brooke et al. 1991;Morley et al. 2002; Zorowitz et al. 1995).

The study by Dieruf et al. (2005) showed that the GivMohr sling greatly reduced vertical displacement of the shoulder while preventing overcorrection of both vertical and horizontal displacement of the affected shoulder compared to the Rolyan humeral cuff sling. However, Dieruf et al. (2005) concluded that neither the GiveMohr sling nor the Rolyan humeral cuff sling had a significant impact in correcting horizontal displacement. In fact, some researchers suggested that horizontal displacement was often caused by the use of shoulder slings itself, not by shoulder subluxation (Dieruf et al. 2005; Zorowitz et al. 1995).

Overall, as evidenced by Williams et al. (1998), Brooke et al. (1991) and Zorowitz et al. (1995), the use of shoulder slings exhibited a significant reduction of subluxation in the affected shoulder when compared to the affected shoulder with no support at all. However, each sling type showed various degree of efficacy in reducing shoulder subluxation. The literature frequently warned the disadvantage of some sling types that

facilitate the flexor synergy pattern and increase the risk of contracture (Moodie et al., 1986; Morley et al., 2002).

Use of shoulder slings in occupational therapy practice

Management of the shoulder subluxation with supportive devices, such as slings or arm trough, is a challenge. Lack of agreement on the cause of shoulder subluxation and absence of large scale randomized controlled studies for treatment modalities make it difficult for healthcare practitioners to navigate for sound clinical decision (Dieruf et al., 2005; Foongchomcheay et al., 2005; Morley et al., 2002)

Gustafsson and Yates (2008) conducted a survey-based study to investigate if the current occupational therapy practice for stroke patients with shoulder subluxation correlated with the available evidence in the literature. In this study, 55 occupational therapy practitioners completed the survey. The results showed that occupational therapy practitioners frequently chose treatment techniques that did not have significant supporting evidence, such as pillows (98%) and slings (61%). On the other hand, treatment modalities with high evidence, such as electrical stimulation, were used less frequently (39%). The discrepancy between the frequently-used clinical practice and evidence-based practice was significant. However, this study did not include an investigation on the clinical reasoning behind the choice of the low evidence techniques. As there is literature that investigated the clinical reasoning in the use of supporting device, the reason for prevailing use of supporting device remains unknown.

The reason for the persistent use of sling has not been investigated to this day. In addition, the discrepancy between the frequency in using sling and the level of supporting evidence has not been addressed recently. Some studies explained that the sling plays a

protective role for paralyzed upper limb during the transfer (Griffin & Bernhardt, 2006; Gustafsson & Yates, 2008). As stroke patients recover and regain mobility, the protection for the stroke-affected limb becomes a valid concern.

Smith and Okamoto (1981) formulated a guideline for selecting slings for the hemiplegic patient in the occupational therapy practice. The factors to be considered when selecting a sling included appropriate joint positioning, weight distribution, effect of changes in body positioning, allowance for hand function, effect on skin integrity, cost, durability, and easy donning/doffing to facilitate patient's compliance (Smith & Okamoto, 1981). The guideline emphasized the importance of individualized therapy in the decision process when determining and selecting an appropriate sling within the patient's physical and personal context. For instance, a patient with strong neglect may need a sling that limits mobility in order to protect the limb, while a patient without neglect should use a sling that allows movements and discourages the flexion synergy. This guideline provides a path for possible clinical reasoning which occupational therapists might apply.

Statement of Purpose

The purpose of this study is to survey occupational therapy practitioners practicing in the state of California in order to investigate the prevalence and the clinical reasoning in the use of shoulder sling in the management of post-stroke shoulder subluxation.

Although different types of slings are often used in occupational therapy practice in post-stroke rehabilitation, there is no substantial evidence that supports the efficacy of slings to manage shoulder subluxations. There is limited research to the clinical reasoning behind the use of sling and the selection of different types of slings. We regard that it is critical to examine the current state of occupational therapy practice that involves the use

of shoulder sling. Investigation of the clinical reasoning for the use of sling will provide a better understanding of the clinical context that defies the evidence against the sling. Our survey will also guide the direction of future research related to the treatment modality for the individuals with post-stroke shoulder subluxation. In addition, investigation of the clinical reasoning will bring an attention to and thus re-evaluation of the practice that is prevalent without evidence (Gustafsson & Yates, 2008).

To investigate the clinical reasoning for the use of the sling in the post-stroke rehabilitation, we developed a questionnaire to survey occupational therapy practitioners who practice in stroke rehabilitation in California. The survey is designed to answer the following research questions.

1. What is the prevalence of the use of shoulder sling in the post-stroke occupational therapy practice across the clinical settings?
2. What is the clinical reasoning for using the sling?
3. What types of sling are commonly used in the post-stroke occupational therapy practice?
4. What is the clinical reasoning for the selection of the particular sling?

Theoretical Framework

Clinical reasoning

Occupational therapists are encouraged to use evidence to guide practice. Deploy & Gitlow (as cited in Gustafsson & Yates, 2008) defined evidence based practice as research evidence that supports the efficacy of the interventions. Deploy and Gitlow (as cited in Gustafsson & Yates, 2008) also explained the efficacy of an intervention is further

determined by the practitioner's clinical reasoning to make optimal decisions in choosing the intervention that best fit the individual (as cited in Gustafsson & Yates, 2008).

Clinical reasoning is a thought process used by occupational therapy practitioners to guide the best possible intervention for the patients. Rogers (1983) stated that clinical reasoning is a critical core of clinical practice. Clinical reasoning process incorporates multiple modes of thought process that include scientific thought process, phenomenological thought process, and situational/pragmatic thought process (Schell & Cervero, 1993) Different forms of clinical reasoning are employed for different purpose, or for responding to specific clinical need (Schell & Cervero, 1993).

There are different types of clinical reasoning; procedural reasoning, narrative reasoning, pragmatic reasoning, conditional reasoning, and interactive reasoning.

Procedural reasoning. Procedural reasoning provides a biomedical and biomechanical approach to clinical problem solving (Pedretti, Pendelton, & Scholtz-Krohn, 2006). An example of procedural reasoning is that an occupational therapist determines the most effective modality to address shoulder subluxation based on patient's muscle tone or motor recovery stages after stroke. (Mendez & Neufeld, 2003; Pedretti et al., 2006; Schell & Cervero, 1993). In case of prescribing a shoulder sling to a stroke patient, the examples of procedural reasoning are to correct glenohumeral alignment of the subluxed shoulder, to protect affected upper extremity during transfers, or to reduce stress from the gravitational pull when the patient is seated or standing.

Narrative reasoning. Narrative reasoning follows a phenomenological approach that identifies the values, goals, or preference of the patient and guides intervention based on what is important to the patient (Pedretti et al., 2006). Narrative reasoning incorporates

patient's motivation, action, and compliance to the prescribed intervention by matching the treatment to the patient's needs. Occupational therapy practitioners gather information from the patients through active listening to formulate narrative reasoning for the treatment. Examples of narrative reasoning in selecting a shoulder sling for the patient are the comfort of the sling, good appearance that does not impair the body image, or easy donning/doffing. How easy or difficult it is to don or doff the sling may also affect the patient's level of compliance. Patient may not feel comfortable wearing a sling in public due to impoverished image of disability. Narrative reasoning incorporates such narrative from the patient's perspective in order to facilitate the patient's active participation in therapy (Mendez & Neufeld, 2003; Pedretti et al. 2006; Schell & Cervero, 1993).

Pragmatic reasoning. Pragmatic reasoning uses a situational approach. This reasoning takes in consideration of organizational, political, or economic realities that surround the clinical practice. Such external factors can affect occupational therapists decision in selecting interventions for patients. The lack of financial resources can limit the choices of intervention that may be beneficial to the patient. Another external factor may be that the shoulder sling prescription was made by the physician and the therapist simply has to plan an intervention following the prescription. In certain sling that has more complex structure, patients may need to have the assistance from a caregiver to don and doff, which could be inconvenient for both the patient and the caregiver. In such a case, the occupational therapy practitioner may settle for a sling that is easily worn, instead of prescribing the most effective one. The modalities readily available or not available at the facility may also affect the occupational therapy practitioner's decision-making. If the clinic does not have electrical stimulation, the therapist has no choice but

to use a sling to manage shoulder subluxation. In addition, the occupational therapists may have a particular vendor where the sling may be readily accessible. Many external factors can affect the occupational therapy practitioner's decision in prescribing a certain sling. In some cases, it is important for occupational therapy practitioners to use pragmatic reasoning to accommodate to the situational demand in choosing the intervention (Mendez & Neufeld, 2003; Pedretti et al. 2006; Schell & Cervero, 1993).

Conditional reasoning. Conditional reasoning is a predictive approach that incorporates the present context and future scenario and formulates the intervention that focuses on the long term outcomes. Conditional reasoning also builds on therapist's experience in order to hypothesize the expected outcome of the treatment for the patient and be able to make the best decision in choosing the best possible intervention (Mendez & Neufeld, 2003; Pedretti et al. 2006; Schell & Cervero, 1993). This type of reasoning often requires re-appraisal of the intervention in the course of treatment (Pedretti et al., 2006).

Interactive reasoning. Interactive reasoning occurs when the patient and the occupational therapy practitioner communicates with one another. It is essential for occupational therapy practitioners to use interactive reasoning in order to understand the client and find out what motivates the client. Similar to Narrative reasoning, interactive reasoning will also assist to identify patient's specific factors such as level of comfort when wearing the sling or how the donning and doffing of the sling may affect patient's fatigue level. (Mendez & Neufeld, 2003; Pedretti et al. 2006; Schell & Cervero, 1993). Interactive reasoning navigates the occupational therapy practitioner toward better understanding of the patient as a whole person, instead of a subject in the medical

intervention. As a consequence, interactive reasoning helps therapists to access patient's phenomenological view of the illness experience and facilitates formulation of more finely tailored treatment for the patient (Schell & Cervero, 1993).

Biomechanical frame of reference

This study investigates the clinical reasoning in the use of sling and is concerned with the body function of the patient. Biomechanical frame of reference concerns with strength, range of motion, endurance, and kinetics of the human body. The biomechanical frame of reference also applies to adaptive equipment that facilitates the maintenance or improvement of strength, endurance, range of motion, and kinesiology of a person and consequently establishes or restores a person's functional skills (Sladyk, Jacobs, & MacRae, 2010). This study is largely guided by the biomechanical frame of reference because the use of shoulder slings is aimed towards preventing or reducing the severity of shoulder subluxation and shoulder slings are evaluated based on the efficacy in improving the client factors of the alignment in the stroke-affected shoulder. Occupational therapy practitioners who work with stroke patients with shoulder subluxation may be more likely to utilize the biomechanical frame of reference in their clinical reasoning when making decisions in the use of shoulder slings.

Definitions and Variables

Sling

In this study, the sling is a supportive device that a stroke patient wears on his/her body to manage or prevent shoulder subluxation. The types of slings surveyed in this

study include the Bobath sling, the Rolyan sling, the Harris hemisling, the GivMohr sling, C.V.A. sling, North Coast Hemi sling, and an orthopedic (triangular) sling.

Shoulder subluxation

Shoulder subluxation is defined as a partial or incomplete dislocation of the shoulder joint. Shoulder subluxation occurs when muscles around the shoulder complex are paralyzed due to stroke and the structural integrity of muscles, joint capsules and ligaments is lost (Thomas, 1997; Paci et al., 2005)

Occupational therapist / occupational therapy practitioner

In this study, the terms, occupational therapist and occupational therapy practitioner, are used interchangeably, and they include both occupational therapists and certified occupational therapy assistants. The American Occupational Therapy Association defines occupational therapist as an individual who is nationally certified to practice occupational therapy and met state requirements for licensure or registration: The occupational therapy assistant is defined as an individual who is nationally certified to practice occupational therapy under the supervision and in partnership with the occupational therapist (American Occupational Therapy Association, 2010a).

Variables

To investigate the clinical reasoning in the use of shoulder sling, and to answer our research questions, we used the conceptual description by Creswell (2009) which inter-relates the variables in the descriptive statistical data, research questions, and the survey questions in order to provide a clear mapping of the research process. The statistical data that are obtained through the survey questions were cross-referenced to investigate the

correlation among the variables. The table below describes the inter-related construct of our research questions, variables, and the survey questions.

Variable Name	**Research Question**	**Survey Question** (See Appendix A)
<u>Independent variable 1:</u> Prevalence of the sling use	<u>Descriptive research question 1:</u> What is the prevalence of the sling use in the post-stroke occupational therapy practice across the clinical settings?	1. How many stroke patients with shoulder subluxation or at risk of shoulder subluxation did you see in the last 12 months? 2. Among those stroke patients, approximately for what percentage of them did you use a shoulder sling?
<u>Dependent variable 1:</u> Clinical reasoning for the sling use	<u>Descriptive research question 2:</u> What is the clinical reasoning for the sling use?	3. What was the reason for using a shoulder sling for those patients?
<u>Moderating variable 1:</u> Factors that may influence correlation between Independent variable 1 and Dependent variable 1		7. Which clinical setting best describes your current work place? 8. How many years have you been working as an occupational therapy practitioner? 9. You are a COTA/OTR with bachelor's degree/OTR with master's degree/OTR with doctor's degree. 11. You have you been working with stroke patients Less than 1 year / 1-5 years / 6-10 years / more than 10 years. 12. Indicate if you have any additional training. 13. Indicate if you have any additional training in these areas.

		NDT/Neuro-IFRAH: Electrical Stimulation (FES or NMES): Taping/strapping: Other training not listed
Independent variable 2: Types of shoulder sling used	Descriptive research question 3: What types of sling are commonly used in the post-stroke occupational therapy practice?	4. In the last 12 months, did you use the following slings? 5. Which sling did you use MOST in the last 12 months?
Dependent variable 2: Clinical reasoning for the selection of sling	Descriptive research question 4: What is the clinical reasoning for the selection of the sling?	6. What is your clinical reasoning for choosing the one you used most?
Moderating variable 2: Factors that may influence correlation between Independent variable 2 and Dependent variable 2		7. Which clinical setting best describes your current work place? 8. How many years have you been working as an occupational therapy practitioner? 9. You are a COTA/OTR with bachelor's degree/OTR with master's degree/OTR with doctor's degree. 11. You have you been working with stroke patients; Less than 1 year / 1-5 years / 6-10 years / more than 10 years. 12. Indicate if you have any additional training. 13. Indicate if you have any additional training in these areas. NDT/Neuro-IFRAH: Electrical Stimulation (FES or NMES): Taping/strapping: Other training not listed

Methodology

Design

This study employed a quantitative descriptive design in order to illustrate the current occupational therapy practice phenomenon in the use of shoulder sling for the post-stroke shoulder subluxation. We conducted online and onsite surveys using a self-report questionnaire which we developed to identify the prevalence of the use of sling, the clinical reasoning in the use of sling, types of slings that occupational therapy practitioners prescribe, and the clinical reasoning behind the selection of slings (See Appendix A). The questionnaire used for the online survey and the onsite surveys were identical (See Appendix A and B).

Subjects

The target population of this study was the occupational therapy practitioners in the state of California who practice in stroke rehabilitation across the various clinical settings. The clinical settings of the occupational therapy stroke rehabilitation included acute and sub-acute care facilities, acute rehabilitation facilities, skilled nursing facilities, home care, and outpatient clinic. Due to the exploratory nature of this study, a convenience sampling method was used. The online survey was conducted among 2,000 members of the Occupational Therapy Association of California (OTAC). We estimated that about 1,200 OTAC members practiced in the clinical field related to post-stroke rehabilitation. This estimation was calculated by applying the national level ratio based on the workforce study by American Occupational Therapy Association (AOTA, 2010b). According to AOTA's work force study (2010b), about 59% of its members worked in clinical settings that include stroke rehabilitation. The onsite survey was conducted

among the attendees of OTAC's Spring Symposium which took place on March 31, and April 1, 2012 in Anaheim, California. The approximate number of the total attendees was 500, based on verbal communication with the OTAC staff.

The inclusion criterion for sampling was that the participant of this study must be an occupational therapy practitioner who is practicing in the field of stroke rehabilitation at the time of the survey under the licensure of either Occupational Therapist Registered (OTR) or Certified Occupational Therapy Assistant (COTA).

Ethical consideration

The research participant recruitment was conducted with the consideration of Occupational Therapy Code of Ethics to ensure the research participants' autonomy and confidentiality. The approval from Dominican University Institutional Review Board for the Protection of Human Subjects (IRBPHS) was obtained prior to the implementation of this study (IRBPHS identification number 9031). Anonymity of the research participant was maintained by excluding survey questions that solicit the participants' personal identification information. For those participants who provided us with their contact information through Request for CVA Sling Survey Result Information (Appendix C), we collected the form separately from the survey to maintain their anonymity. The collected forms were stored in a locked box in the office of the thesis advisor, Dr. Kitsum Li, in the Occupational Therapy Department until the research results were ready to be distributed. The access to the research result request forms was limited to the thesis advisor and the student researchers, Simon Chi and Naoko Murai. All data and records are scheduled to be destroyed after a period of one year following completion of the research project.

To maintain the research participants' autonomy, we provided the participants with information in the invitation for research participation describing the purpose and procedure of our research, potential risks and benefits to the participants, and cost or reimbursement to the participants (Appendix D). The information provided to the participants included the statements that the participation to this research is voluntary, and that the participants' response to our survey serves as their consent of participation. Research Participant's Bill of Rights (Appendix E) was provided to the participants addressing the participants' autonomy. For online survey, same information was provided prior to the start of the survey, and participants were reminded that response to the survey served as consent of participation (Appendix B).

Data collection

Data collection

Data were collected through an anonymous survey using a self-report questionnaire, CVA Shoulder Sling Survey (Appendix A and B), which we developed in order to identify the prevalence of sling use, types of slings that occupational therapy practitioners prescribe, and the clinical reasoning for the selection of slings.

Data were collected between January 30 and April 1, 2012. Two modes of data collection were used: online survey and onsite survey with printed questionnaire. Both online survey (Appendix B) and paper survey (Appendix A) retained identical formats in the questionnaire in order to prevent extraneous factors that may influence survey participants' responses. Online survey was distributed on January 30, 2012, among OTAC members through e-blast service provided by OTAC (Appendix F). In order to enhance

research participant recruitment, a reminder announcement was distributed on February 22, 2012 (Appendix G).

Research participants were also recruited at OTAC Spring Symposium which took place on March 31 and April 1, 2012, in Anaheim, California. Printed questionnaires (Appendix A) were handed out to those who agree to participate in our research and were collected onsite. Since majority of the symposium attendees were expected to be a member of OTAC, we took measure to prevent double entries in both online and onsite surveys by the same individual. Before the attendees agreed to participate in the onsite survey, we provided a verbal reminder that the same survey was offered online previously. We placed a graphic of penguin, the mascot of Dominican University of California, on the prominent places in both online and onsite surveys to aid the study participants recalling if they had already responded to the online survey previously.

Data analysis

Descriptive statistics was used to delineate the prevalence of the use of sling and its clinical reasoning. Additional analysis, using z-test for proportion, was conducted to further assist our understanding in the factors that influence the use of slings and its clinical reasoning.

Results

A total of 168 California occupational therapy practitioners completed the survey. The online survey yielded 129 participants, and the onsite survey at OTAC's Spring Symposium yielded additional 39 participants. The followings are the results of the survey categorized by the corresponding research questions.

Research Question 1

'What is the prevalence of the use of slings in the post- stroke occupational therapy practice across the clinical settings?'

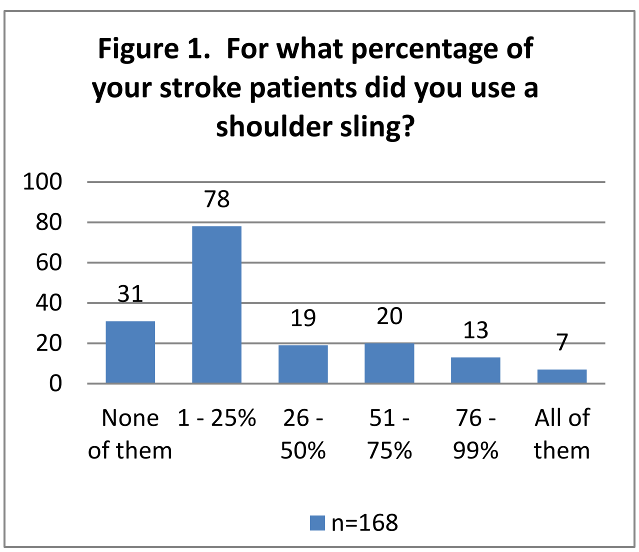
Survey questions that corresponds to Research Question 1

Survey Question 1: ' How many stroke patients with shoulder subluxation or at risk of shoulder subluxation did you see in the last 12 months?'

All 168 respondents answered this question. Ninety two participants reported that they provided occupational therapy to less than 12 post-stroke patients in the last 12 months. Forty one respondents reported that they have seen 12 to 23 patients, while twenty one respondents reported seeing 24 to 35 patients. Fourteen respondents reported that they have seen more than 35 patients.

Survey Question 2: ' Among those stroke patients, approximately for what percentage of them did you use a shoulder sling?'

All 168 respondents answered this question. The multiple choice answers offered in this question were "None of them", "1 – 25%", "26-50%", "51 – 75%", "76 – 99%", and "All of them" (Figure 1). Thirty one respondents replied "None of them." Seventy eight respondents replied "1 – 25%". Nineteen replied to "26 – 50%". Twenty replied to "51 – 75%". Thirteen replied "76-99%". Seven replied "All of them". The result indicated that 81.5% of the respondents prescribed a shoulder sling to their patients. On average, 28.4% of



stroke patients with shoulder subluxation or a risk of shoulder subluxation were prescribed shoulder slings by the respondents. This average ratio of the patients who were prescribed shoulder slings was calculated by multiplying the midpoint percentage of each choice range and the frequency of each choice.

Research Question 2

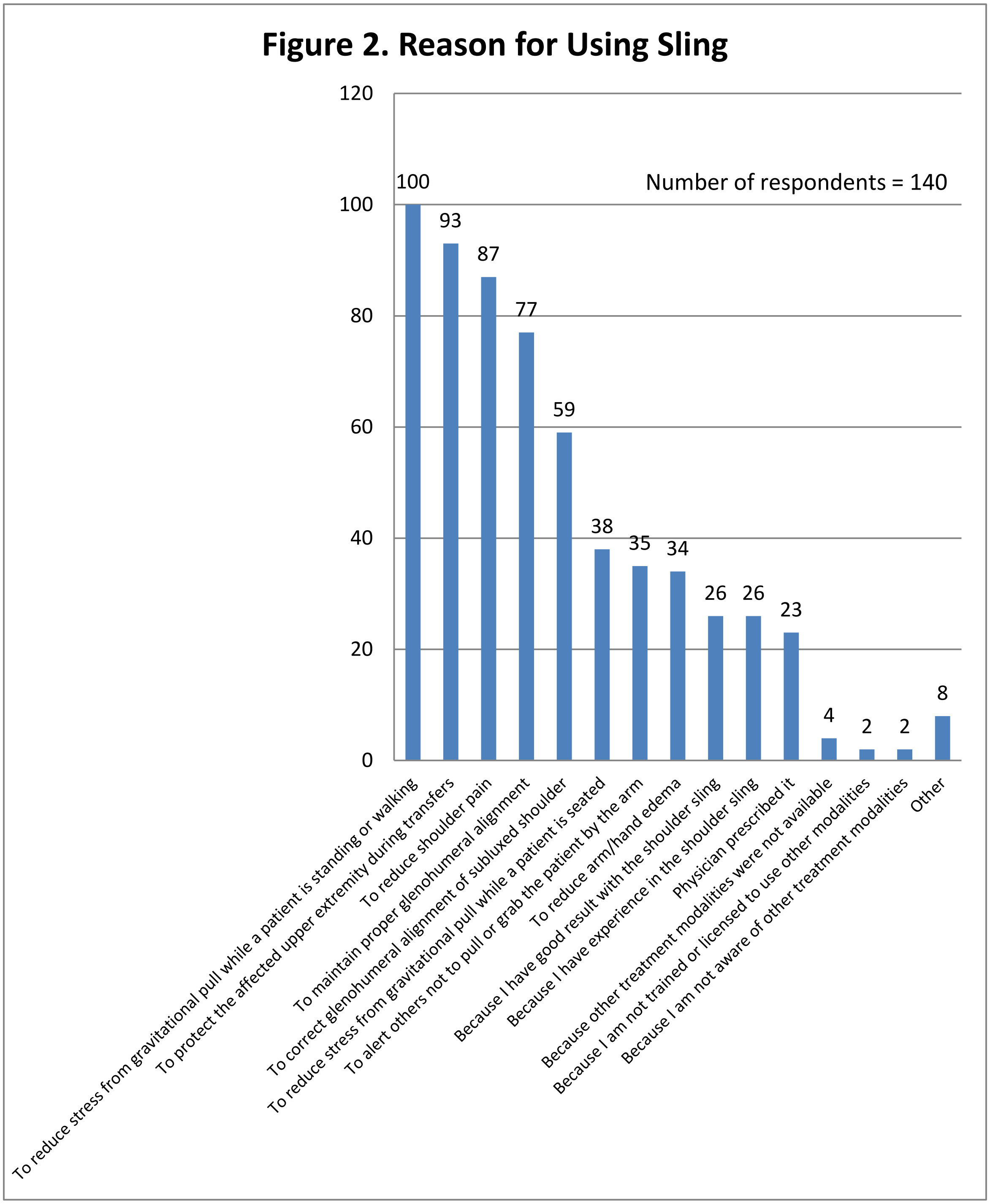
'What is the clinical reasoning for using the sling?'

Survey question that correspond to Research Question 2

Survey Question 3: ' What was the reason for using a shoulder sling for those patients?'

Fourteen clinical reasoning choices plus the choice of "other" were offered in this question. Among the clinical reasoning choices, the procedural reasoning choices offered were "To correct glenohumeral alignment of subluxed shoulder", "To maintain proper glenohumeral alignment", "To reduce shoulder pain", "To reduce arm/hand edema", "To protect the affected upper extremity during transfers", "To reduce stress from gravitational pull while a patient is standing or walking", and "To reduce stress from gravitational pull while a patient is seated". The pragmatic reasoning choices offered were "Physician prescribed it", "Because other treatment modalities were not available". "Because I am not trained or licensed to use other modalities" and "Because I am not aware of other treatment modalities". The conditional reasoning choices offered were "Because I have good result with the shoulder sling", "Because I have experience in the shoulder sling", and "To alert others not to pull or grab the patient by the arm".

The respondents were asked to select as many choices as applicable. The result of this question is exhibited in Figure 2. One hundred forty respondents answered this question. The results indicated that the most frequently occurring clinical reasoning among these respondents' choices was "To reduce stress from gravitational pull while a patient is standing



or walking" (count = 100). The second most frequently chosen clinical reasoning was "To protect the upper extremity during transfer" (count = 93). The third most frequently chosen clinical reasoning was "To reduce shoulder pain" (count=87). The fourth was "To maintain proper glenohumeral alignment" (count=77), and the fifth was "To correct glenohumeral

alignment of subluxed shoulder" (count=59). The top 3 choices represent interventions to address functional mobility and pain reduction. The fourth and the fifth choices represent the remediation of the glenohumeral alignment. Among 89 respondents who chose the clinical reasoning for correction or maintenance of glenohumeral alignment, 85 respondents also chose the clinical reasoning choices for functional mobility or for pain reduction, and 4 respondents chose these two reasons as a sole reason for the sling use.

The least chosen clinical reasoning for using shoulder sling for stroke patients with shoulder subluxation are " Because I am not trained or licensed to use other modalities" (count= 2) and "Because I am not aware of other treatment modalities" (count=2).

Research Question 3.

'What types of sling are commonly used in the post stroke occupational therapy practice?'

Survey questions that correspond to Research Question 3.

Survey Question 4: 'In the last 12 months, did you use the following slings?'

One hundred thirty four respondents answered this question. Sling choices given in this question were GivMohr sling, Bobath sling, orthopedic (triangle) sling, North Coast hemi sling, C.V.A sling, Rolyan sling, and other types of slings that were not offered in the questionnaire choice. The respondents were allowed to select multiple slings as applicable. The result of this question was exhibited in

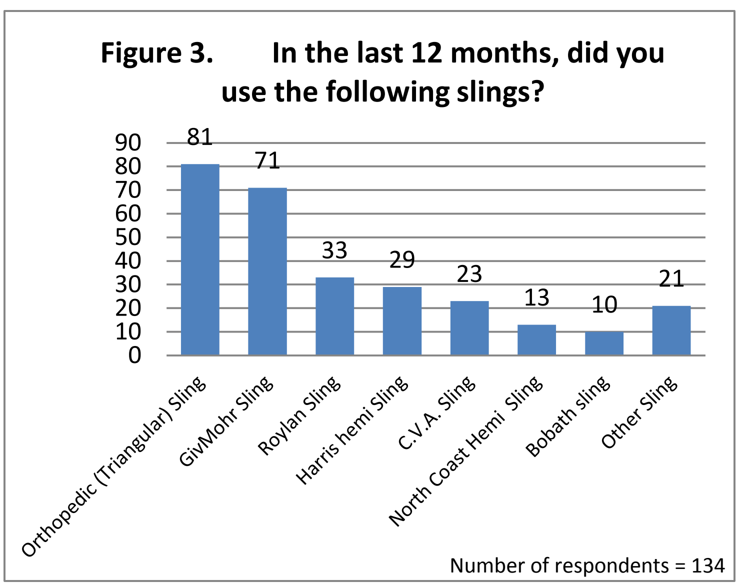
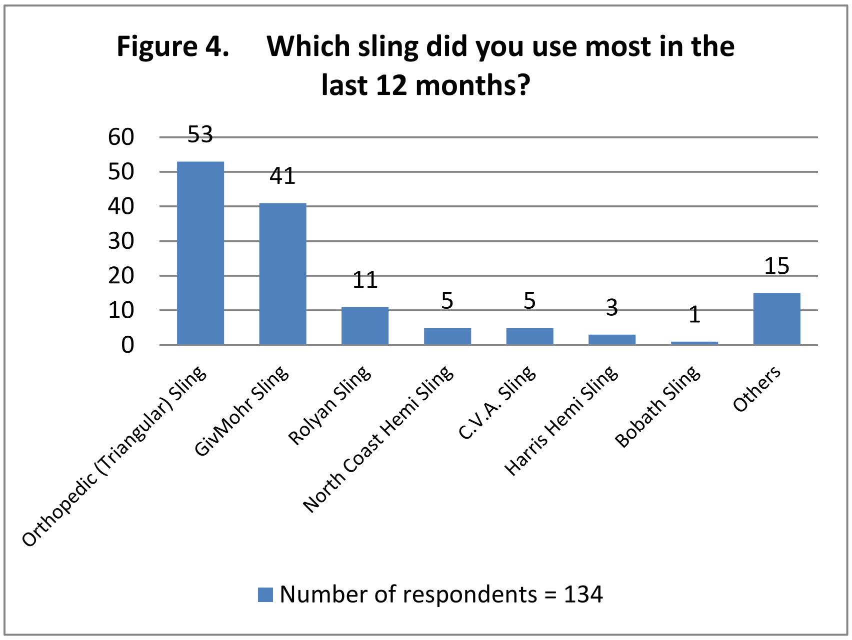


Figure 3. The most frequently used sling was the orthopedic (triangle) sling (count = 81), followed by the GivMohr sling (count = 71). The count for the Rolyan sling was 33; that of the Harris hemi sling was 29; the C.V.A. sling was 23; the Bobath sling was 10. Twenty one respondents indicated that they used other type of slings, such as Brown hemi sling and Patterson Medical Glenohumeral Joint Sling.

Survey Question 5: 'Which sling did you use Most in the last 12 months?'



One hundred thirty four respondents answered this question. The sling choices offered in this question was the same as above. The result of this question is exhibited in Figure 4. The type of sling that is used most frequently by the respondents was the orthopedic (triangle) sling (count = 53), followed by the GivMohr sling (count = 41). These two slings were chosen with much higher frequency than the other slings.

Research Question 4.

'What is the clinical reasoning for the selection of the sling?'

Survey questions that correspond Research Question 4.

Survey Question 6: 'What is your clinical reasoning for choosing the one you used most?'

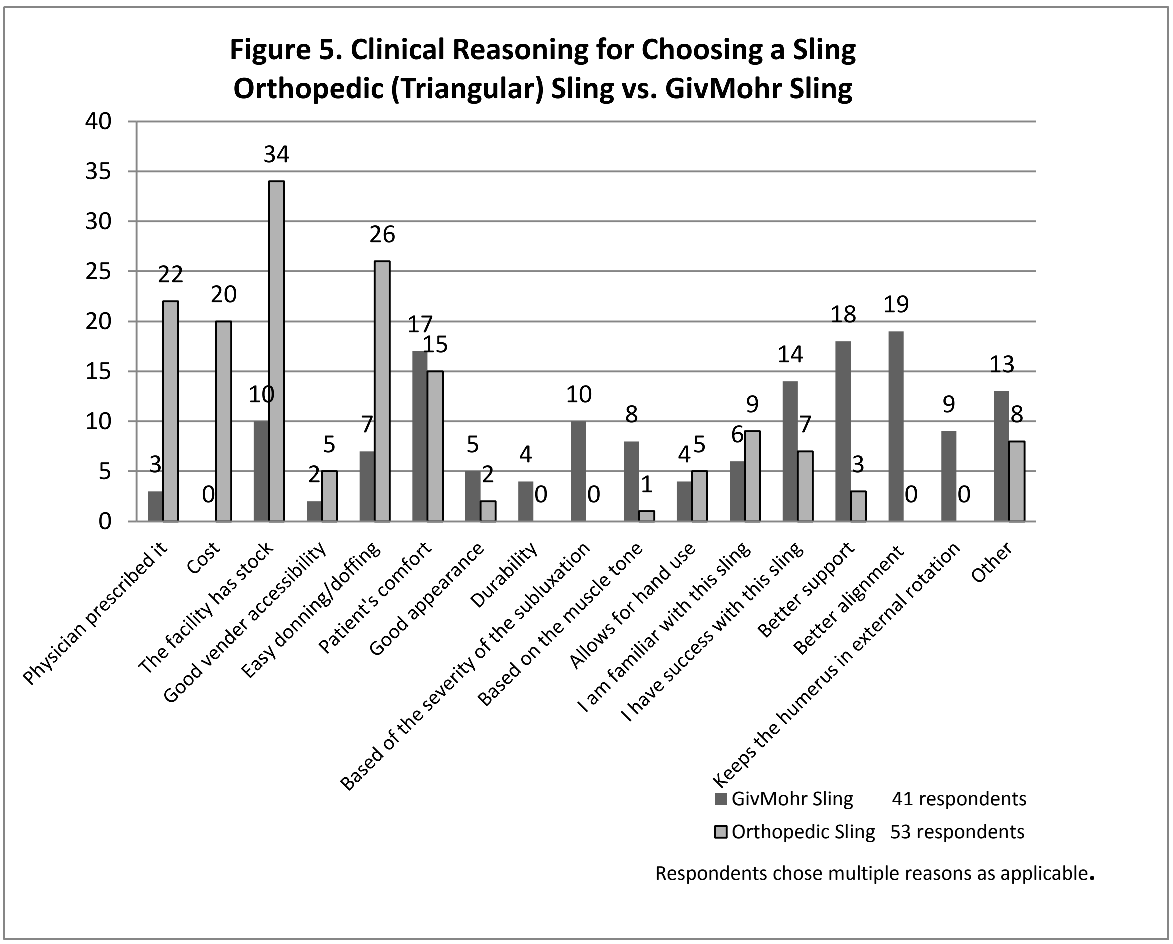
One hundred thirty nine respondents answered this question. Sixteen clinical reasoning choices plus "other" choice were offered in this question. The respondents were asked to select as many choices as applicable. Among the clinical reasoning choices, the procedural reasoning offered in this question included "Based on the severity of the subluxation". "Based on the muscle tone", "It gives better support for the arm", "It gives better alignment to the glenohumeral joint", "It positions the humerus in external rotation", and "It allows for hand use". The pragmatic reasoning choices offered in this question were "Physician prescribed it", "Cost", "The facility I work has stock", and "Has good vendor accessibility". The conditional reasoning choices offered were "Because I am familiar with

Table 1. Reason for Sling Selection

	Answer choices	Orthopedic (triangular) sling	GivMohr sling	Rolyan sling	North Coast Hemi Sling	C.V.A. Sling	Harris Hemi Sling	Bobath Sling
Procedural reasoning	Based on the severity of the subluxation		10	1	1	2		1
	Based on the muscle tone	1	8	1	1	1		
	It gives better support for the arm	3	18	4	4	2	2	
	It gives better alignment to the glenohumeral joint		19	6	6			1
	It positions the humerus in external rotation		9	3	3			
	It allows for hand use	5	4	3	3	1		
Pragmatic reasoning	Physician prescribed it	22	3	1	1			
	Cost	20		2	2	1		
	The facility has stock	34	10	3	3	1		
	Has good vendor accessibility	5	2					
Conditional reasoning	Because I am familiar with this type of sling	9	6	3	3	2	3	
	Because I have success with this type of sling	7	14	4	4		1	
Narrative reasoning	Easy donning/doffing	26	7	1	1	4	1	
	Patient's comfort	15	17	2	2	3	3	1
	Good appearance	2	5					
	Durability		4					
Other	Other	13	13	3	3			

this type of sling", and "Because I have success with this type of sling". The narrative reasoning choices offered in this question were "Easy donning/doffing for patients and caregivers", "Patient's comfort", "Good appearance", and "Durability". The result of this question was exhibited in Table 1.

Between the two most chosen slings, the orthopedic (triangular) sling and the GivMohr sling, a different clinical reasoning pattern appeared (Figure 5). The pragmatic reasoning pattern was found to be more prominent in selecting the orthopedic (triangular) sling than in selecting the GivMohr sling. On the other hand, the procedural reasoning pattern was found to be more prominent in selecting the GivMohr sling than the orthopedic (triangular) sling. Using the Z-test for proportion, we compared the proportions of the GivMohr sling usage and that of the orthopedic (triangular) sling among the respondents who



considered at least one procedural reasoning choice and among those who did not consider procedural reasoning. The respondents who considered procedural reasoning were more likely to select the GivMohr sling (59.5%) than those who did not consider procedural reasoning (14.5%) (z=5.21, p< .001, 95% CI = 0.4507+/- 0.1666, α= .05). On the other hand, the respondents who did not consider procedural reasoning were more likely to select the orthopedic (triangular) sling (60.24%) than those who considered procedural reasoning (2.38%) (z=6.22, p< .001, 95% CI = 0.5786 +/- 0.1149, α= .05).

Demographic data

The distribution of the respondents' worksites, education levels, years of practice, experience in stroke rehabilitation, and additional trainings in stroke rehabilitation were exhibited in Figure 6, 7, 8, 9, and 10.

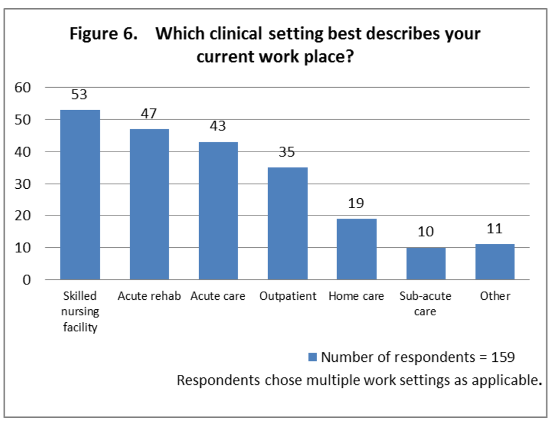


Figure 6. Which clinical setting best describes your current work place?

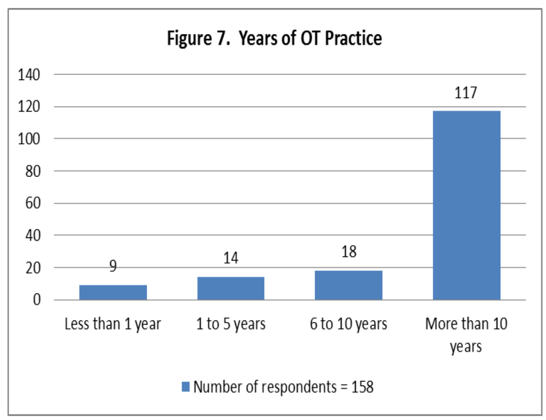


Figure 7. Years of OT Practice

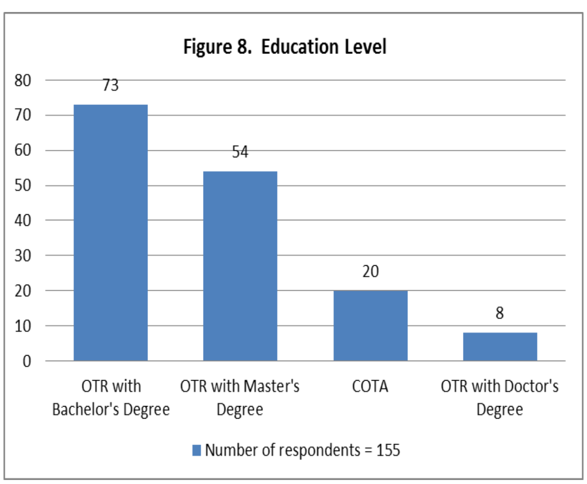


Figure 8. Education Level

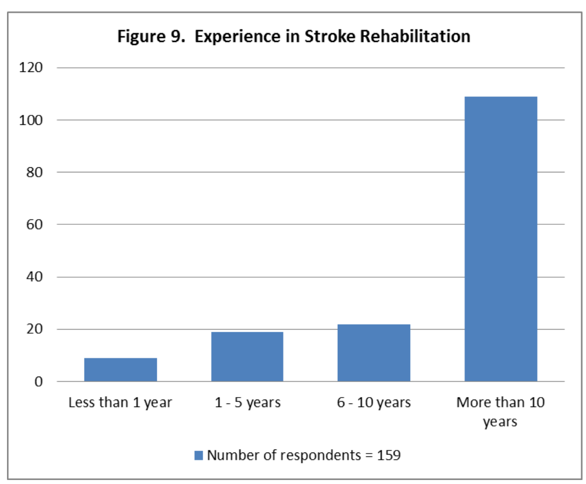
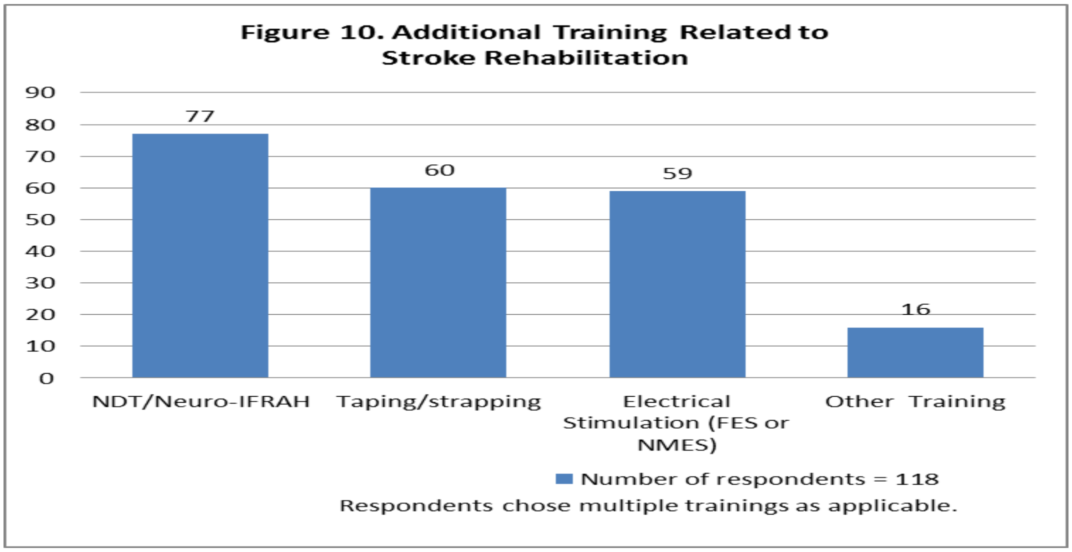


Figure 9. Experience in Stroke Rehabilitation



Influence of additional trainings on selecting a sling

Among 134 respondents who responded to the questions of sling choice and its clinical reasoning, we investigated if the attainment of additional trainings in the field of post-stroke rehabilitation influenced their sling selection and the reasoning patterns.

Occupational therapy practitioners who have post-graduate trainings in NDT(Neuro Developmental Treatment)/NeuroIFRAH (Neuro-Integrative Functional Rehabilitation And Habilitation), electrical stimulation (FES/NMES), or taping/strapping were less likely to choose orthopedic (triangular) sling. There was a significant difference between the proportions of practitioners with at least one of the above-mentioned trainings who selected the orthopedic (triangular) sling (27.8%) and the proportion of those without the training (56.4%) ($z = 3.32$, $p < 0.001$, CI=0.28515 +/- 0.16415, $\alpha = .05$).

When selecting a sling, occupational therapy practitioners who have trainings in NDT/NeuroIFRAH, electrical stimulation, or taping/strapping were less likely to use pragmatic reasoning and more likely to use procedural reasoning than those without the training. Among the practitioners with some of the listed trainings, 48.10% (95% CI+/-

0.1102, α= .05) of the practitioners chose at least one pragmatic reasoning choice in selecting a sling, while the proportion of that for the practitioners without training was 74.55% (95% CI +/- 0.1151, α= .05). These two proportions for utilizing the pragmatic reasoning are significantly different (z=3.06, p<.01, 95% CI= 0.2645 +/- 0.1594, α= .05). On the other hand, among the practitioners with some of the listed trainings, 44.30% (95%CI+/-0.1095, α = 0.05) of the practitioners chose at least one procedural reasoning choice in selecting a sling, while the proportion of that for the practitioners without the training was 12.73% (95% CI+/-0.0881, α = 0.05). These two proportions for utilizing the procedural reasoning are significantly different (z=3.88, p< .001, 95% CI = 0.3158 +/- 0.1406, α= .05).

Discussion and Limitation

Discussion

This study confirmed the study by Gustafsson and Yates (2008) that reported the frequent use of slings in post-stroke rehabilitation by the occupational therapy practitioners they surveyed (61% of their survey respondents used a shoulder sling). In our results, as much as 81.5% of the surveyed occupational therapy practitioners reported the use of shoulder sling in the practice. However, the actual prescription of the sling was limited to only 28.4% of the stroke patients with shoulder subluxation or at risk of shoulder subluxation. Our result implies that occupational therapy practitioners use discretion and apply individualized clinical reasoning in the use of shoulder sling for the management of shoulder subluxation.

Specific clinical contexts emerged in the use of shoulder sling. Shoulder slings were often used in the context of supporting the involved upper limb during functional mobility and in pain management. The use of shoulder sling solely for correcting subluxation and maintaining joint integrity was very rare. From our results, the use of shoulder sling for

functional mobility was one of the primary contexts when the shoulder sling was applied. However, efficacy study of the use of shoulder sling in functional mobility is rare. Two studies investigated the effects of shoulder slings on walking speed, energy consumption, and the gait pattern (Han et al., 2011; Yavuzer & Ergin, 2002). The results of these studies exhibited positive effects. The study by Yavuzer and Ergin (2002) with 31 study participants demonstrated the use of the arm sling decreased the walking speed and improved the gait pattern in stroke patients with hemiparesis, comparing to their walking speed and gait without an arm sling. Han et al. (2011) reported that 47 study participants with post-stroke hemiparesis demonstrated increased gait speed and reduced oxygen consumption when they walked with an arm sling on the affected limb, compared to the gait speed and oxygen consumption while walking without an arm sling. However, whether or not the shoulder sling is the best modality for functional mobility should be further examined.

The efficacy of the shoulder sling specifically for pain reduction has yet to be demonstrated. The complex etiology of shoulder pain with or without subluxation in stroke-affected upper limb increases the challenge of its clinical management. Attention should be called upon to the practitioners' reliance on the shoulder sling for pain management without investigation and evidence.

This study revealed the high prevalence in the use of the orthopedic (triangular) sling and the Givmohr sling. The clinical reasoning patterns for using these two most chosen slings were distinctively different. While the GivMohr sling was chosen mainly for the management of joint integrity, the orthopedic (triangular) sling was chosen because of non-procedural reasoning, such as cost, the high availability in the facility, easy donning/doffing, and other external influence, such as "Physician prescribed it". The clinical reasoning pattern in selecting the orthopedic (triangular) sling exhibited a deviation from the original clinical

reasoning to use a sling, which was intended for the clinical management in the context of functional mobility and the pain management. Although the orthopedic (triangular) sling provides support to the humerus, its adverse effects of encouraging immobilization and flexor synergy were well documented (Moodie et al., 1986; Morley et al., 2002). These incongruent reasoning patterns between the prescription and the selection of shoulder slings implicated that the occupational therapy practitioners' clinical management might have been compromised by convenience and cost factors. Considering the shoulder sling is not a reimbursable item by the payer of the health care services, pragmatic clinical reasoning appears to have won over the originally intended procedural reasoning in actual practices.

The attainment of additional trainings in post-stroke rehabilitation appeared to have an influence on the practice patterns in the use of shoulder slings. Our results indicated that practitioners with additional trainings demonstrated the lower usage of the orthopedic (triangular) sling, higher reliance on procedural reasoning, and the lower reliance on pragmatic reasoning. These results imply that additional trainings may have increased awareness of the possible adverse effects from certain sling types and enhanced therapists' assertiveness in procedural reasoning that promotes better clinical management.

The results of our study indicate that the current practice phenomenon in the use of shoulder sling does not represent the best practice in post-stroke rehabilitation. The practice that resorts to convenience and cost factors may not be serving the best interest of our stroke patients. Considering the high prevalence of stroke conditions in our current population and the importance of arm functions, occupational therapy practitioners are encouraged to advocate for patients by calling for increased research, stepping up their post-graduate professional development education, and promoting the best practice available with increased assertiveness in the health care industry.

Limitation

This study has several limitations. The sampling was limited within one organization whose membership represents only 15% of the registered California occupational therapy practitioners, thus the results may not represent the entire practice phenomenon in California. The study relied on a multiple choice self-report survey. This method may not have captured the whole range of clinical reasoning employed in post-stroke rehabilitation. To address this limitation, study participants were allowed to select all applicable clinical reasoning choices in the survey and put in additional answer to the “other” choice when appropriate. The data on the prevalence in the use of shoulder sling should be interpreted with caution. The data were not based on the actual clinical records and were relied on the assumptive calculation using midpoint range of the multiple choice answers offered in the questionnaire.

Summary, Conclusion, and Recommendations

The purpose of this study was to investigate the prevalence and the clinical reasoning in the use of shoulder sling for the stroke patient with shoulder subluxation or at risk of shoulder subluxation, and to understand the clinical context in which the use of sling is continued despite the low evidence for its efficacy. The online survey was conducted among OTAC members, and the onsite survey was conducted among the attendees of 2012 OTAC Spring Symposium. A total of 168 occupational therapy practitioners responded to the survey. The results implicated the use of sling by the high proportion (81.5%) of the California occupational therapy practitioners. However, the actual prescription of the sling was limited to 28.4% of the stroke patients with or at risk of shoulder subluxation, which implies the use of sling was practiced with discretion and individualized clinical reasoning. Shoulder slings were used most frequently in the context of functional mobility and in pain management. The most popular sling was the orthopedic (triangular) sling, followed by the

GivMohr sling. The pragmatic reasoning pattern was more prominent in selecting the orthopedic (triangular) sling, while the procedural reasoning pattern was more prominent in selecting the GivMohr sling.

The study of the clinical reasoning in the use of shoulder sling is rare. Our study identified the prevalence of the use of sling, clinical contexts where the sling is used, the most commonly used sling type, and the reason for its popularity. The current practice phenomenon in California implicated that the clinical management may have been compromised by factors such as convenience and cost. Advanced education in post-stroke rehabilitation appears to have played a critical role in the promotion of better practice. Future studies are necessary to test the generalizability of the results from this study, especially the trend in our national and international practices. Further investigation in the role of professional development education will be highly beneficial since additional education may serve as a pivotal point that influences the occupational therapy practice phenomena.

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Appendix A

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CVA Shoulder Sling Survey

1. **How many stroke patients with shoulder subluxation or at risk of shoulder subluxation did you see in the last 12 months?**

   ( ) Less than 12 ( ) 12 to 23 ( ) 24 to 35 ( ) More than 35

2. **Among those stroke patients, approximately what percentage of them did you use a shoulder sling? (Your sling use can be either a sole modality or accompanied by other modalities in your intervention.)**

   ( ) None of them
   ( ) 1-25%
   ( ) 26-50%
   ( ) 51-75%
   ( ) 76- 99%
   ( ) All of them

3. **What was the reason for using a shoulder sling for those patients? (Select as many as applicable.)**

   ( ) To correct glenohumeral alignment of subluxed shoulder
   ( ) To maintain proper glenohumeral alignment
   ( ) To reduce shoulder pain
   ( ) To reduce arm/hand edema
   ( ) To protect the affected upper extremity during transfers
   ( ) To reduce stress from gravitational pull while a patient is seated
   ( ) To reduce stress from gravitational pull while a patient is standing or walking
   ( ) To alert others not to pull or grab the patient by the arm
   ( ) Physician prescribed it
   ( ) Because other treatment modalities were not available
   ( ) Because I am not trained or licensed to use other modalities
   ( ) Because I am not aware of other treatment modalities
   ( ) Because I have good result with the shoulder sling
   ( ) Because I have experience in the shoulder sling
   ( ) Other (Please specify)

   ____
   ____
   ____

DOMINICAN UNIVERSITY of CALIFORNIA 1890

4. In the last twelve months, did you use the following slings? (Select Yes or No)

GivMohr sling ( ) Yes ( ) No	Bobath sling ( ) Yes ( ) No
Orthopedic (Triangular) sling ( ) Yes ( ) No	North Coast hemi sling ( ) Yes ( ) No
Harris hemi sling ( ) Yes ( ) No	C.V.A. sling ( ) Yes ( ) No
Roylan sling ( ) Yes ( ) No	In the last twelve months, what other slings did you use? ________________ ________________ ________________

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5. **Which sling did you use MOST in the last 12 months? (Select ONLY ONE.)**

( ) GivMohr sling
( ) Bobath sling
( ) Orthopedic sling
( ) North Coast hemi sling
( ) Harris hemi sling
( ) C.V.A. sling
( ) Roylan sling
( ) Other (Please specify) _______________

6. **What is your clinical reasoning for choosing the one you used most? (Select as many as applicable.)**

( ) Physician prescribed it
( ) Cost
( ) The facility I work has stock
( ) Has good vender accessibility
( ) Easy donning/doffing for patients and caregivers
( ) Patient's comfort
( ) Good appearance
( ) Durability
( ) Based on the severity of the subluxation
( ) Based on the muscle tone
( ) It allows for hand use
( ) Because I am familiar with this type of sling
( ) Because I have success with this type of sling
( ) It gives better support for the arm
( ) It gives better alignment to the glenohumeral joint
( ) It positions the humerus in external rotation
( ) Other (Please specify)
____
____
____

7. **Which clinical setting best describes your current work place? (Select as many as applicable.)**

( ) Acute care
( ) Acute Rehab
( ) Sub-acute care
( ) Skilled nursing facility
( ) Home care
( ) Outpatient
( ) Others (Please specify) _______________________

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8. **How many years have you been working as an occupational therapy practitioner?**

( ) Less than one year ( ) 1-5 years ( ) 6-10 years ( ) More than 10 years

9. **You are** ( ) a COTA ( ) an OTR with bachelor's degree
( ) an OTR with master's degree ( ) an OTR with doctor's degree

10. **Your gender is** ( ) Male ( ) Female

11. **You have been working with stroke patients**

( ) Less than 1 year ( ) 1-5 years ( ) 6-10 years ( ) More than 10 years

12. **Indicate if you have any additional training?**

( ) Yes ( ) No

13. **Indicate if you have any additional training in these areas. (Select as many as applicable.)**

( ) NDT/Neuro-IFRAH
( ) Electrical Stimulation (FES or NMES)
( ) Taping/strapping
( ) Other training not listed (Please specify)
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____
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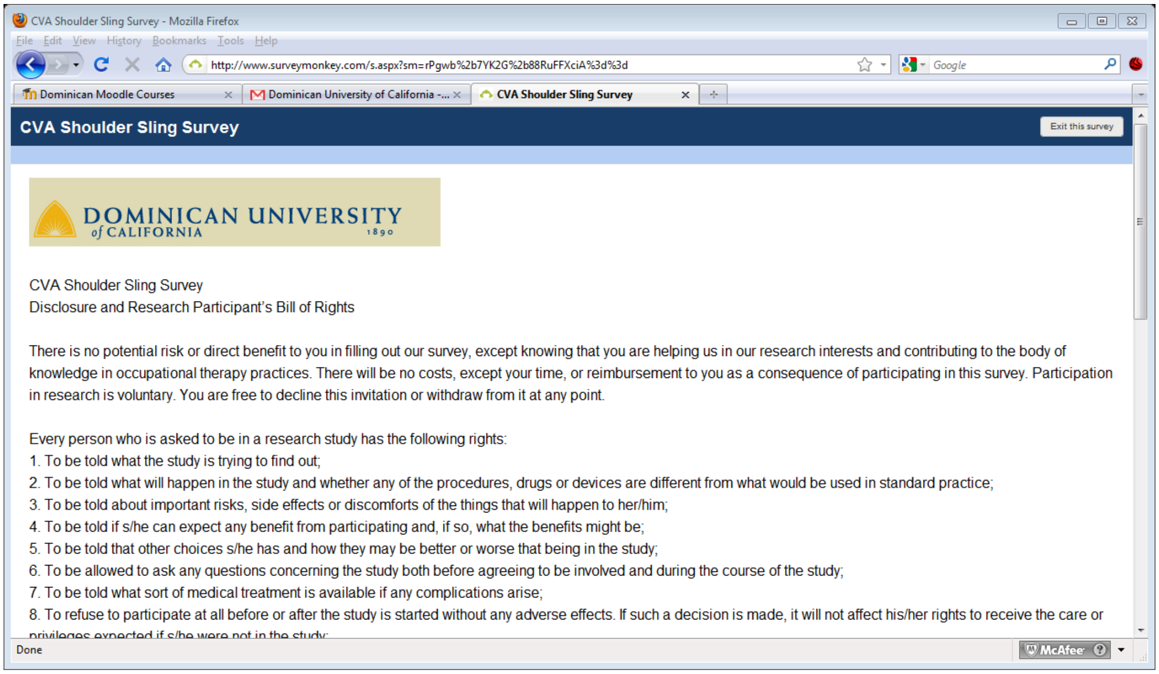
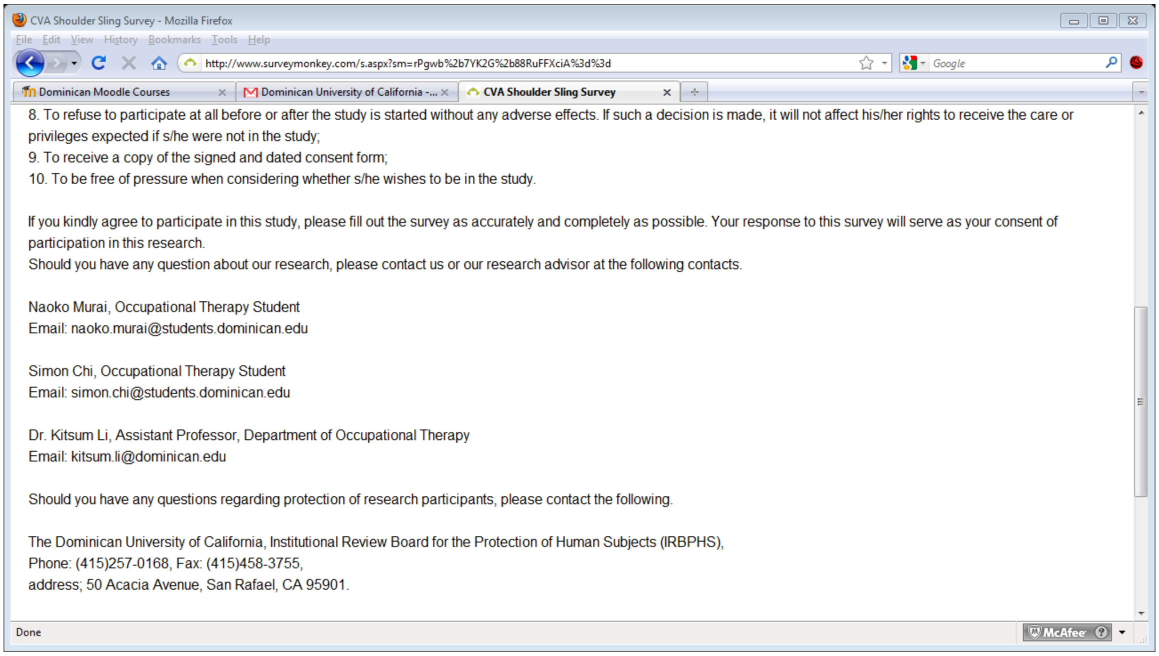
Appendix B



CVA Shoulder Sling Survey
Disclosure and Research Participant's Bill of Rights

There is no potential risk or direct benefit to you in filling out our survey, except knowing that you are helping us in our research interests and contributing to the body of knowledge in occupational therapy practices. There will be no costs, except your time, or reimbursement to you as a consequence of participating in this survey. Participation in research is voluntary. You are free to decline this invitation or withdraw from it at any point.

Every person who is asked to be in a research study has the following rights:
1. To be told what the study is trying to find out;
2. To be told what will happen in the study and whether any of the procedures, drugs or devices are different from what would be used in standard practice;
3. To be told about important risks, side effects or discomforts of the things that will happen to her/him;
4. To be told if s/he can expect any benefit from participating and, if so, what the benefits might be;
5. To be told that other choices s/he has and how they may be better or worse that being in the study;
6. To be allowed to ask any questions concerning the study both before agreeing to be involved and during the course of the study;
7. To be told what sort of medical treatment is available if any complications arise;
8. To refuse to participate at all before or after the study is started without any adverse effects. If such a decision is made, it will not affect his/her rights to receive the care or privileges expected if s/he were not in the study;



8. To refuse to participate at all before or after the study is started without any adverse effects. If such a decision is made, it will not affect his/her rights to receive the care or privileges expected if s/he were not in the study;
9. To receive a copy of the signed and dated consent form;
10. To be free of pressure when considering whether s/he wishes to be in the study.

If you kindly agree to participate in this study, please fill out the survey as accurately and completely as possible. Your response to this survey will serve as your consent of participation in this research.
Should you have any question about our research, please contact us or our research advisor at the following contacts.

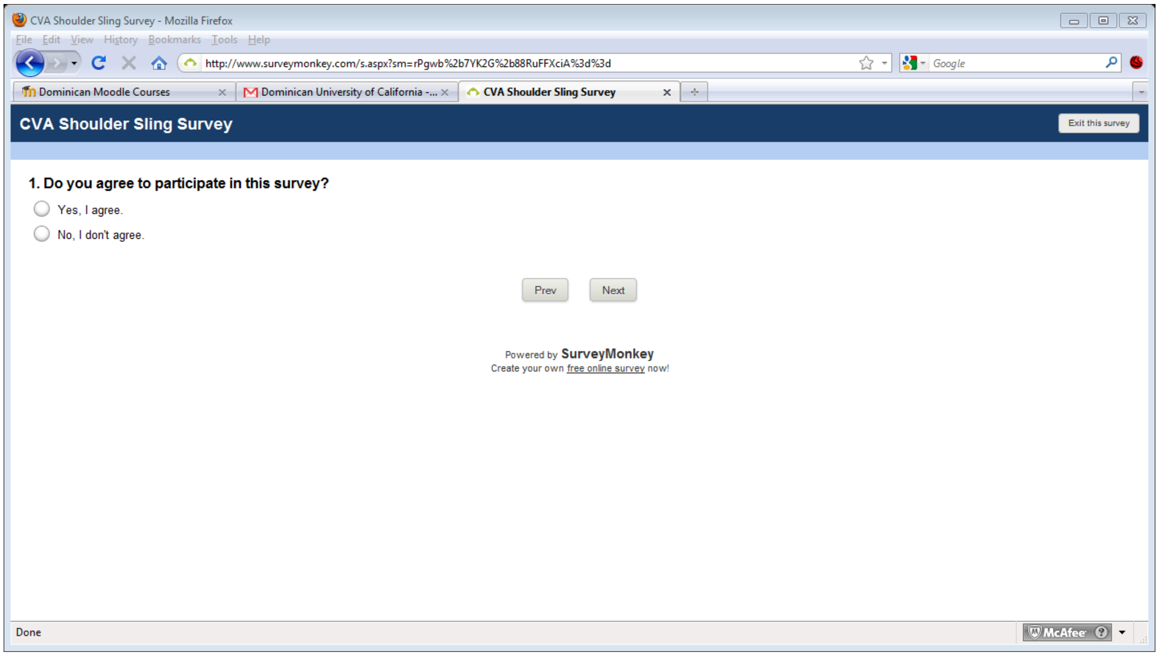
Naoko Murai, Occupational Therapy Student
Email: naoko.murai@students.dominican.edu

Simon Chi, Occupational Therapy Student
Email: simon.chi@students.dominican.edu

Dr. Kitsum Li, Assistant Professor, Department of Occupational Therapy
Email: kitsum.li@dominican.edu

Should you have any questions regarding protection of research participants, please contact the following.

The Dominican University of California, Institutional Review Board for the Protection of Human Subjects (IRBPHS),
Phone: (415)257-0168, Fax: (415)458-3755,
address; 50 Acacia Avenue, San Rafael, CA 95901.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No, I don't agree.
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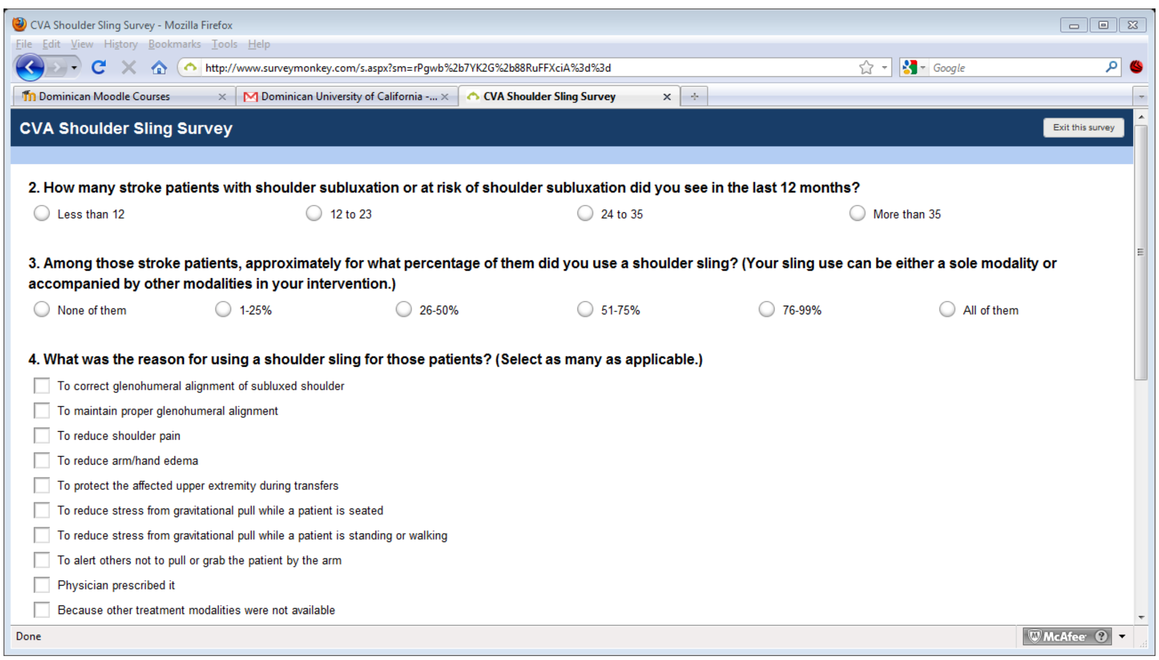
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2. How many stroke patients with shoulder subluxation or at risk of shoulder subluxation did you see in the last 12 months?
Less than 12
12 to 23
24 to 35
More than 35
3. Among those stroke patients, approximately for what percentage of them did you use a shoulder sling? (Your sling use can be either a sole modality or accompanied by other modalities in your intervention.)
None of them
1-25%
26-50%
51-75%
76-99%
All of them
4. What was the reason for using a shoulder sling for those patients? (Select as many as applicable.)
To correct glenohumeral alignment of subluxed shoulder
To maintain proper glenohumeral alignment
To reduce shoulder pain
To reduce arm/hand edema
To protect the affected upper extremity during transfers
To reduce stress from gravitational pull while a patient is seated
To reduce stress from gravitational pull while a patient is standing or walking
To alert others not to pull or grab the patient by the arm
Physician prescribed it
Because other treatment modalities were not available
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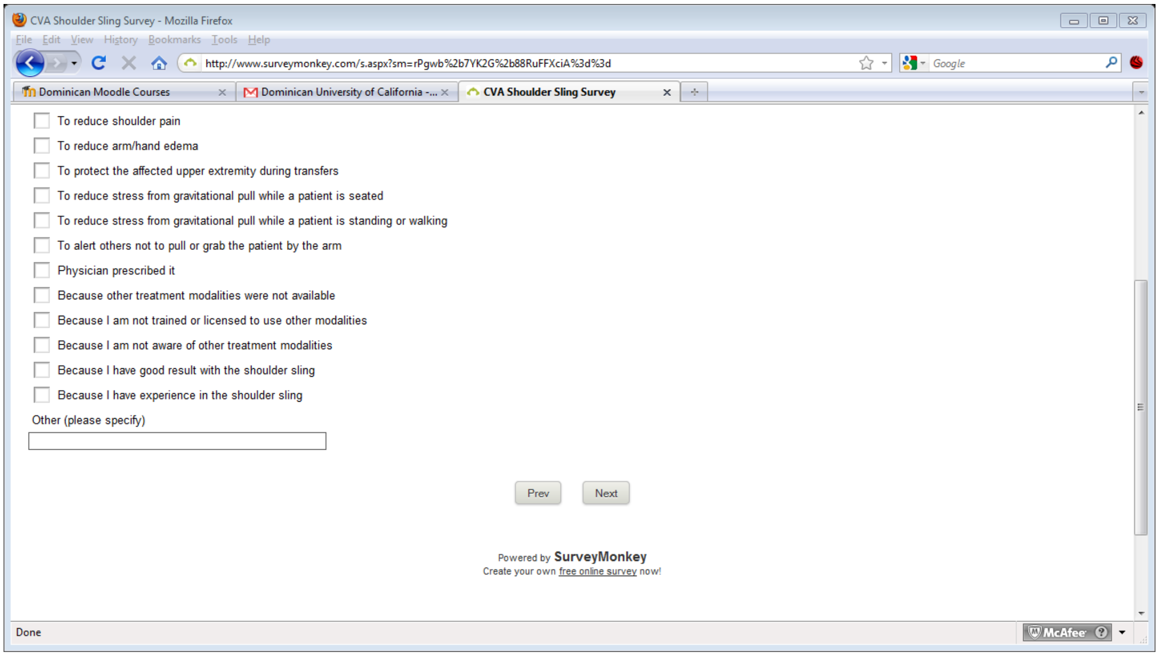

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- [ ] To reduce shoulder pain
- [ ] To reduce arm/hand edema
- [ ] To protect the affected upper extremity during transfers
- [ ] To reduce stress from gravitational pull while a patient is seated
- [ ] To reduce stress from gravitational pull while a patient is standing or walking
- [ ] To alert others not to pull or grab the patient by the arm
- [ ] Physician prescribed it
- [ ] Because other treatment modalities were not available
- [ ] Because I am not trained or licensed to use other modalities
- [ ] Because I am not aware of other treatment modalities
- [ ] Because I have good result with the shoulder sling
- [ ] Because I have experience in the shoulder sling

Other (please specify)

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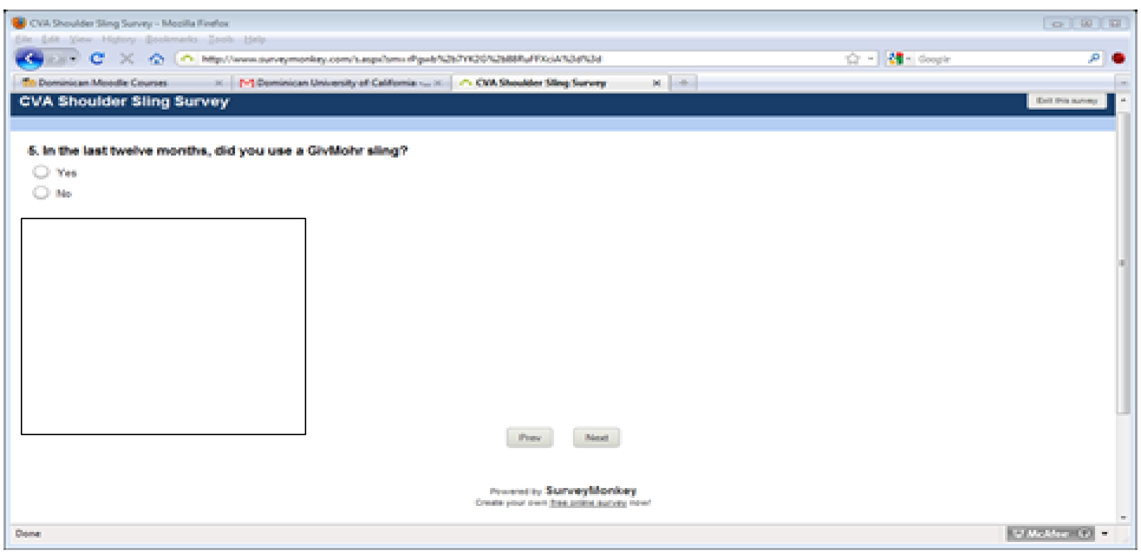

CVA Shoulder Sling Survey

5. In the last twelve months, did you use a GivMohr sling?

- ( ) Yes
- ( ) No

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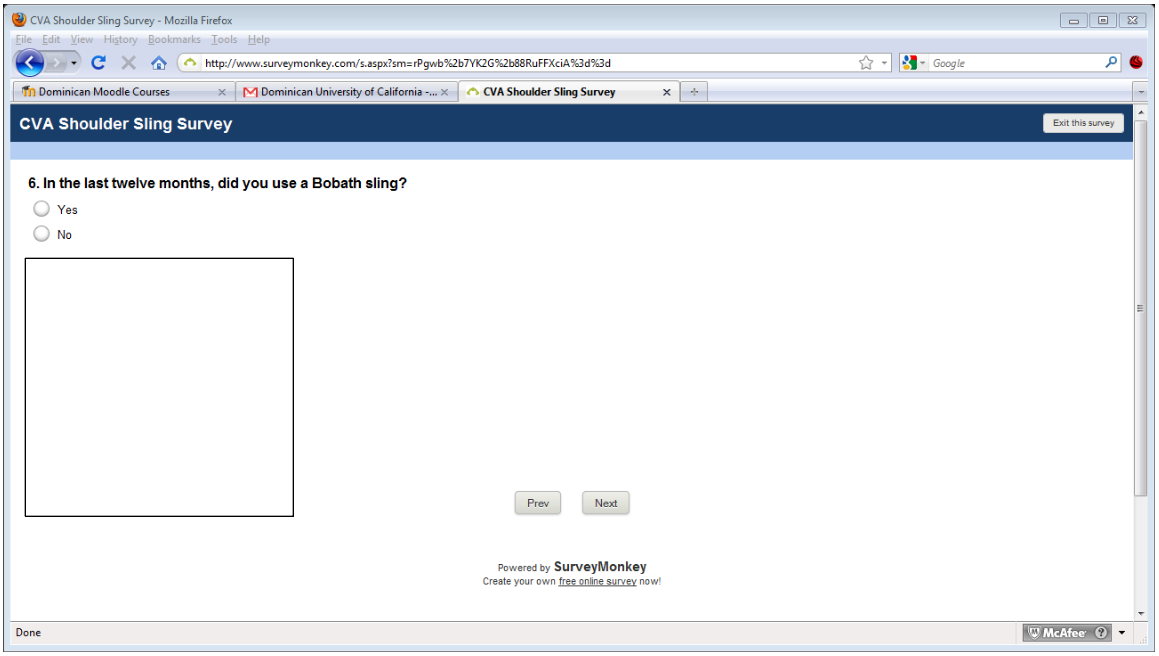
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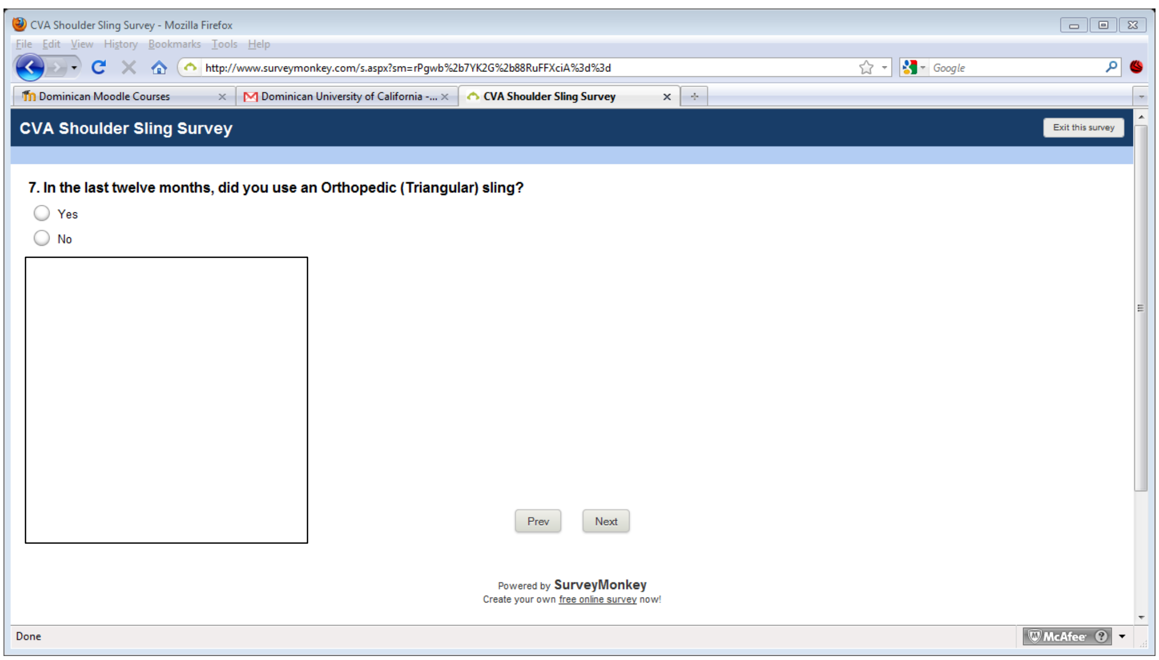
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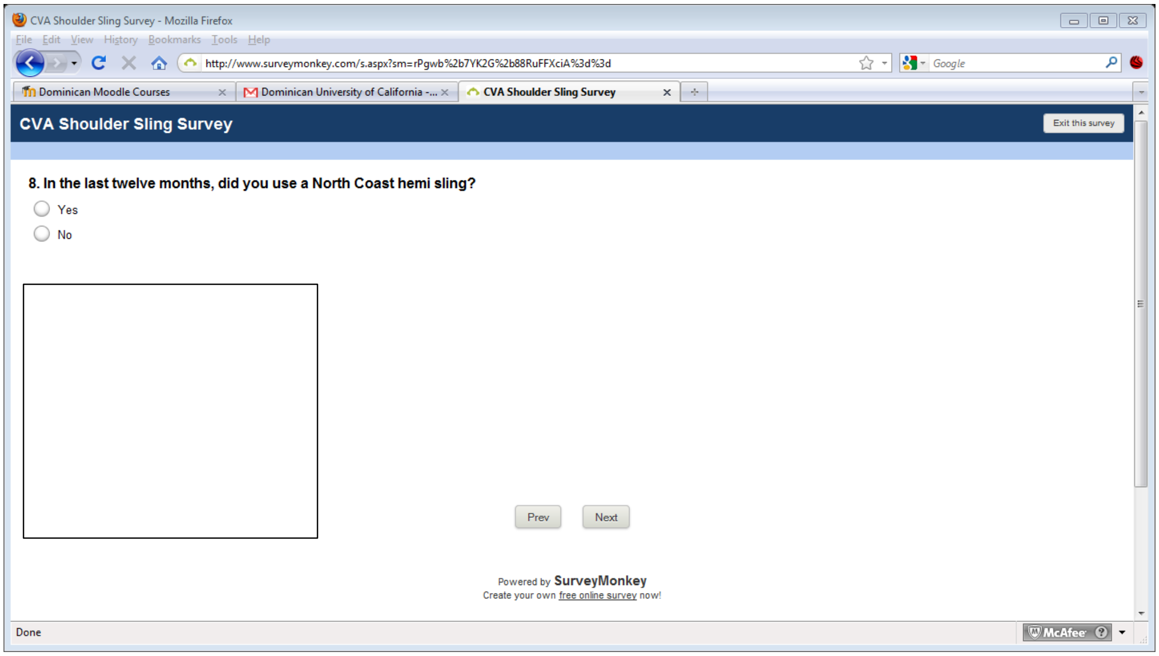
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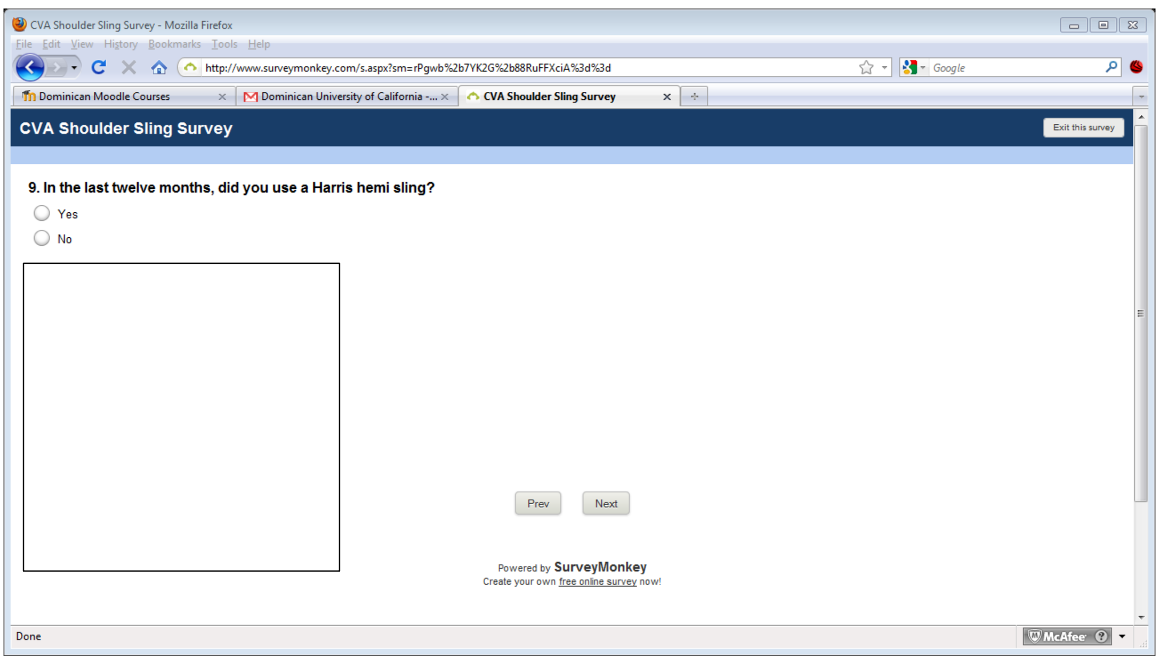
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9. In the last twelve months, did you use a Harris hemi sling?
Yes
No
Prev
Next
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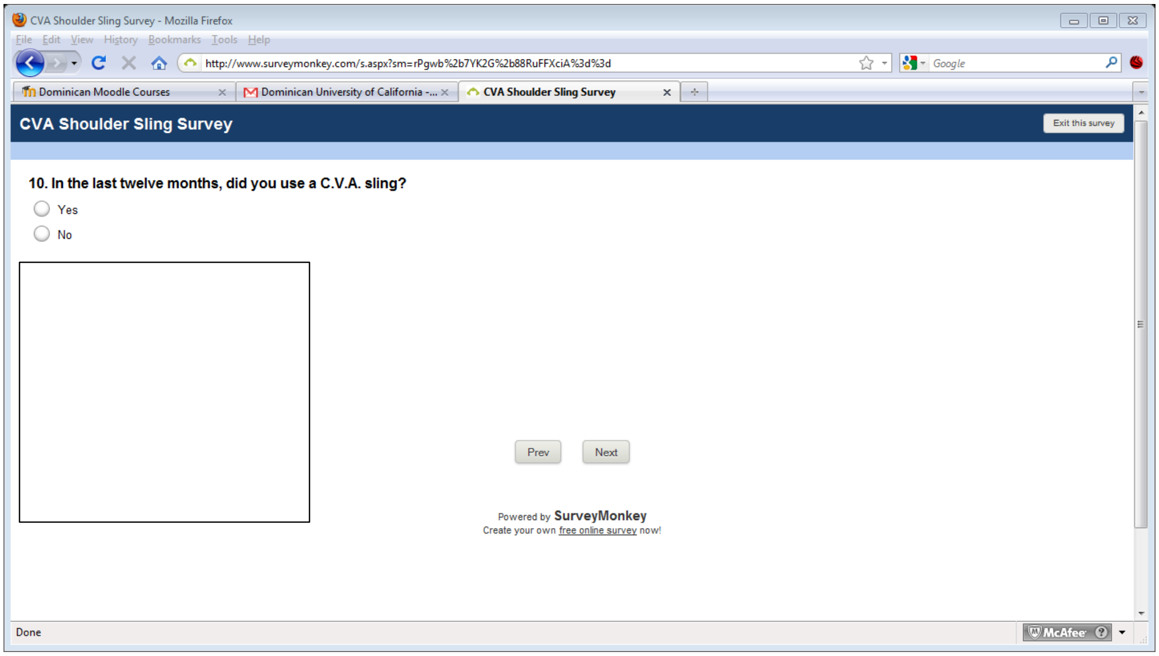
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10. In the last twelve months, did you use a C.V.A. sling?
Yes
No
Prev
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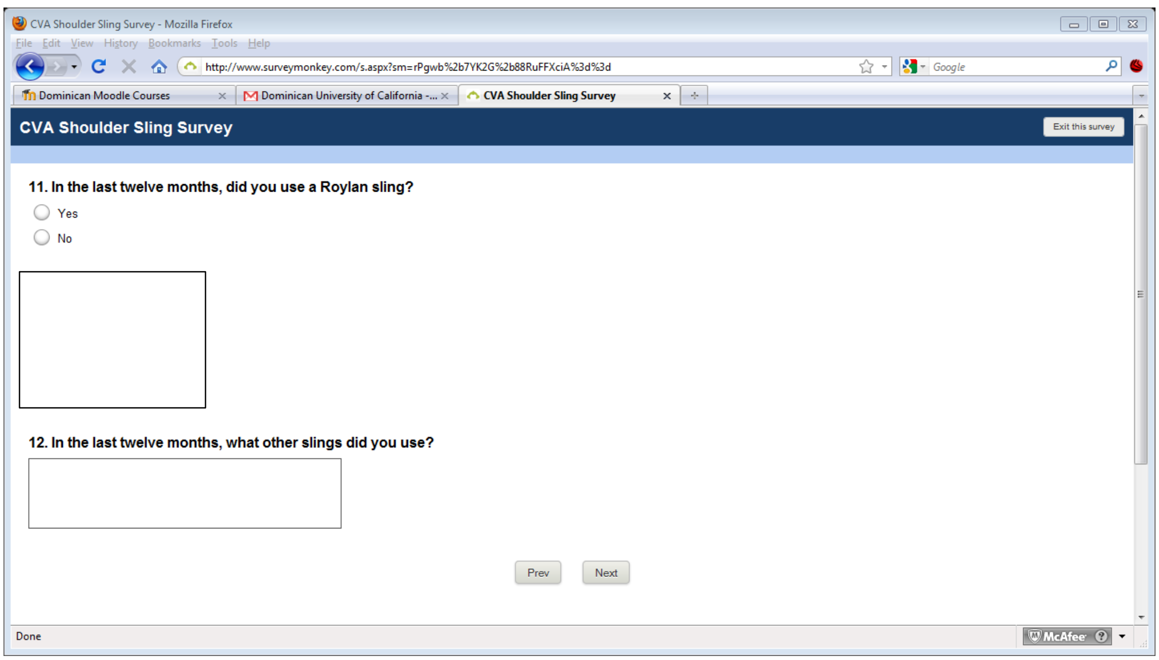
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11. In the last twelve months, did you use a Roylan sling?
Yes
No
12. In the last twelve months, what other slings did you use?
Prev
Next
Done
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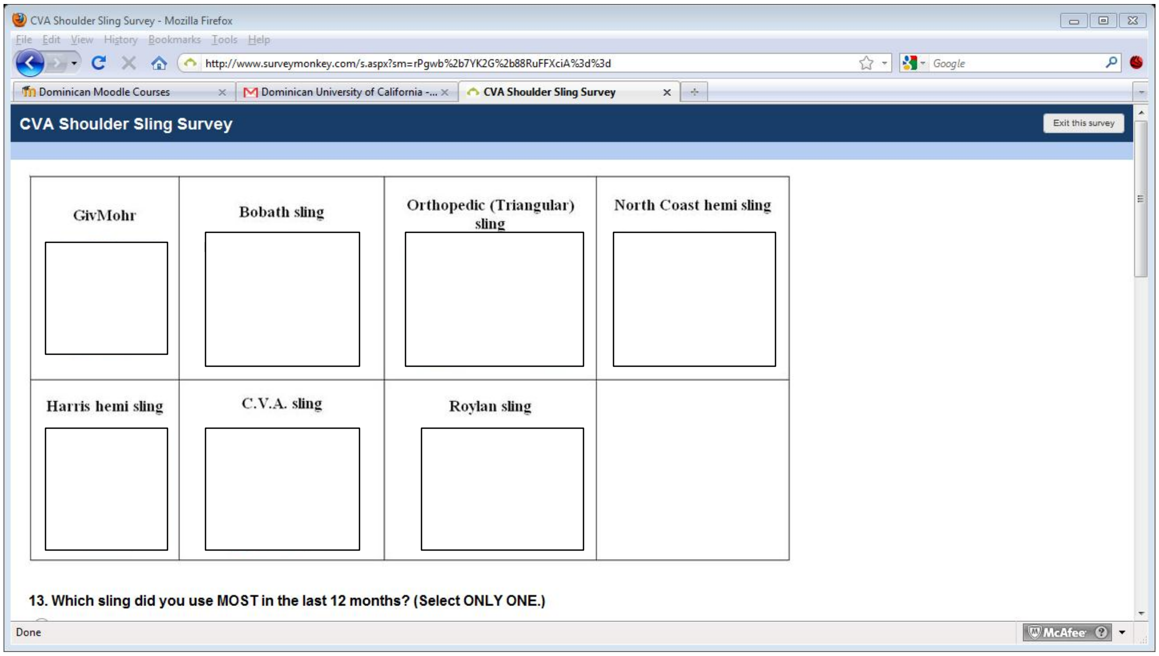

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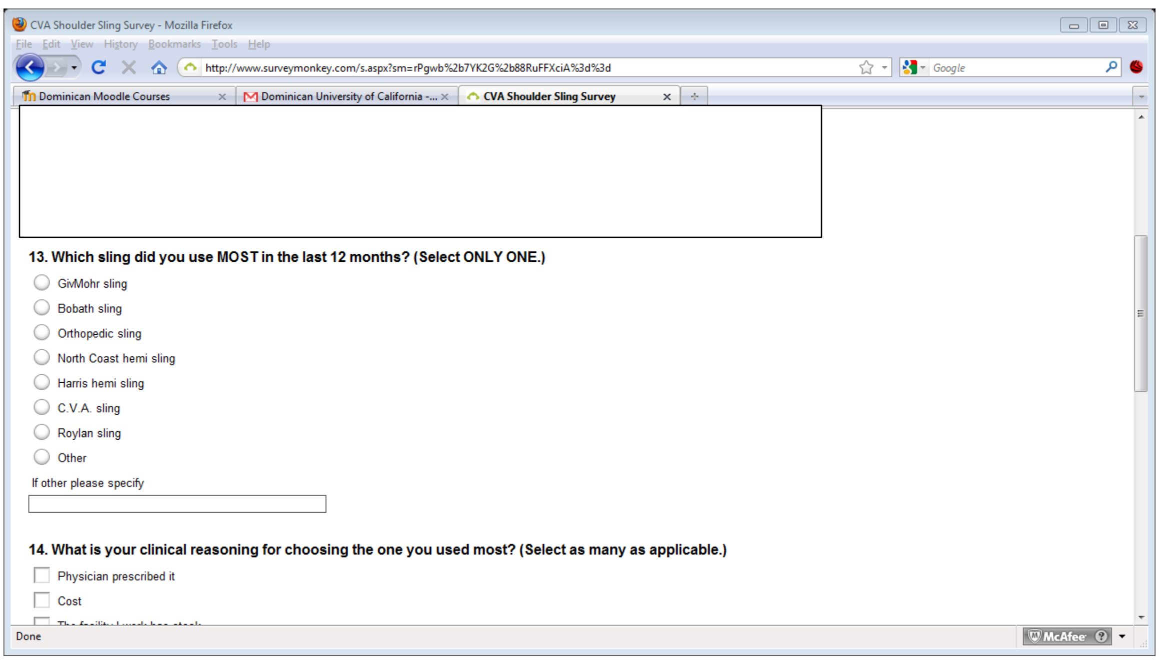
CVA Shoulder Sling Survey

GivMohr	Bobath sling	Orthopedic (Triangular) sling	North Coast hemi sling
Harris hemi sling	C.V.A. sling	Roylan sling	

13. Which sling did you use MOST in the last 12 months? (Select ONLY ONE.)



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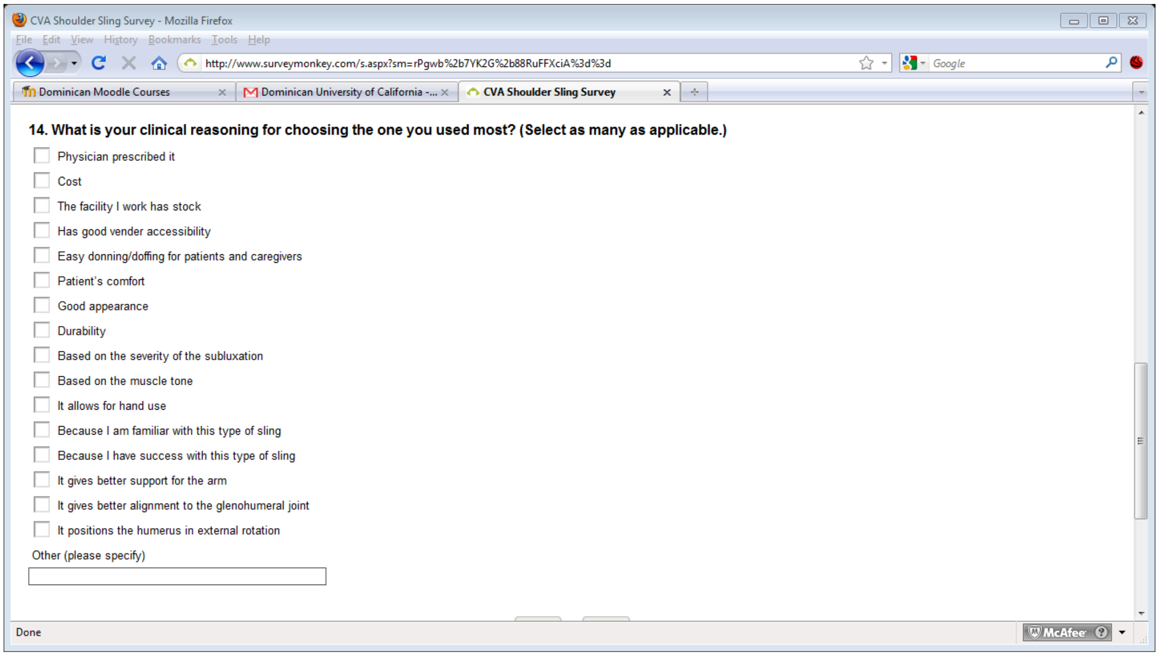
13. Which sling did you use MOST in the last 12 months? (Select ONLY ONE.)

- GivMohr sling
- Bobath sling
- Orthopedic sling
- North Coast hemi sling
- Harris hemi sling
- C.V.A. sling
- Roylan sling
- Other

If other please specify

14. What is your clinical reasoning for choosing the one you used most? (Select as many as applicable.)

- Physician prescribed it
- Cost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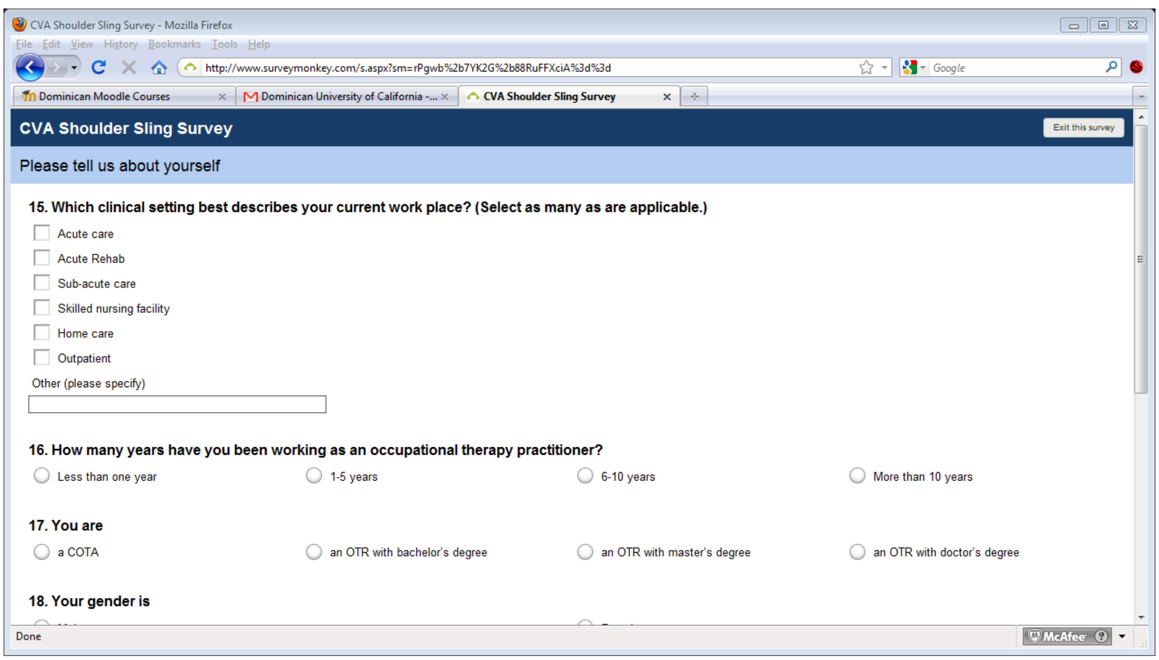
14. What is your clinical reasoning for choosing the one you used most? (Select as many as applicable.)

- Physician prescribed it
- Cost
- The facility I work has stock
- Has good vender accessibility
- Easy donning/doffing for patients and caregivers
- Patient's comfort
- Good appearance
- Durability
- Based on the severity of the subluxation
- Based on the muscle tone
- It allows for hand use
- Because I am familiar with this type of sling
- Because I have success with this type of sling
- It gives better support for the arm
- It gives better alignment to the glenohumeral joint
- It positions the humerus in external rotation

Other (please specify)

Done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CVA Shoulder Sling Survey

Exit this survey

Please tell us about yourself

15. Which clinical setting best describes your current work place? (Select as many as are applicable.)

- Acute care
- Acute Rehab
- Sub-acute care
- Skilled nursing facility
- Home care
- Outpatient

Other (please specify)

16. How many years have you been working as an occupational therapy practitioner?

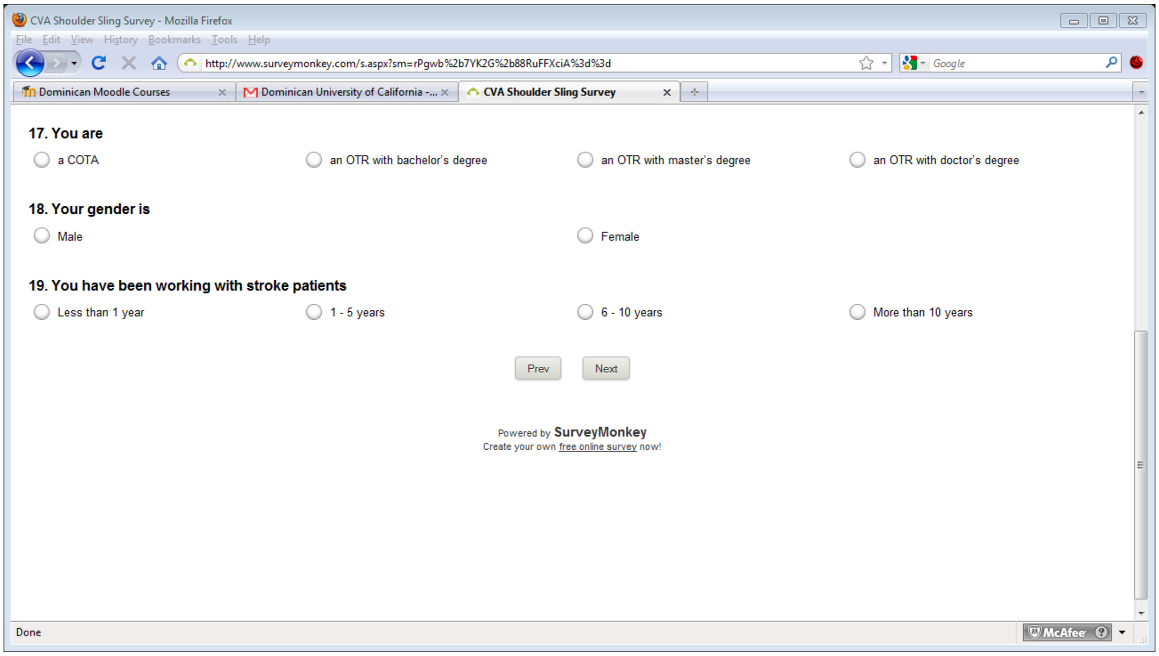
- Less than one year
- 1-5 years
- 6-10 years
- More than 10 years

17. You are

- a COTA
- an OTR with bachelor's degree
- an OTR with master's degree
- an OTR with doctor's degree

18. Your gender is

Done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17. You are
a COTA
an OTR with bachelor's degree
an OTR with master's degree
an OTR with doctor's degree
18. Your gender is
Male
Female
19. You have been working with stroke patients
Less than 1 year
1 - 5 years
6 - 10 years
More than 10 years
Prev
Next
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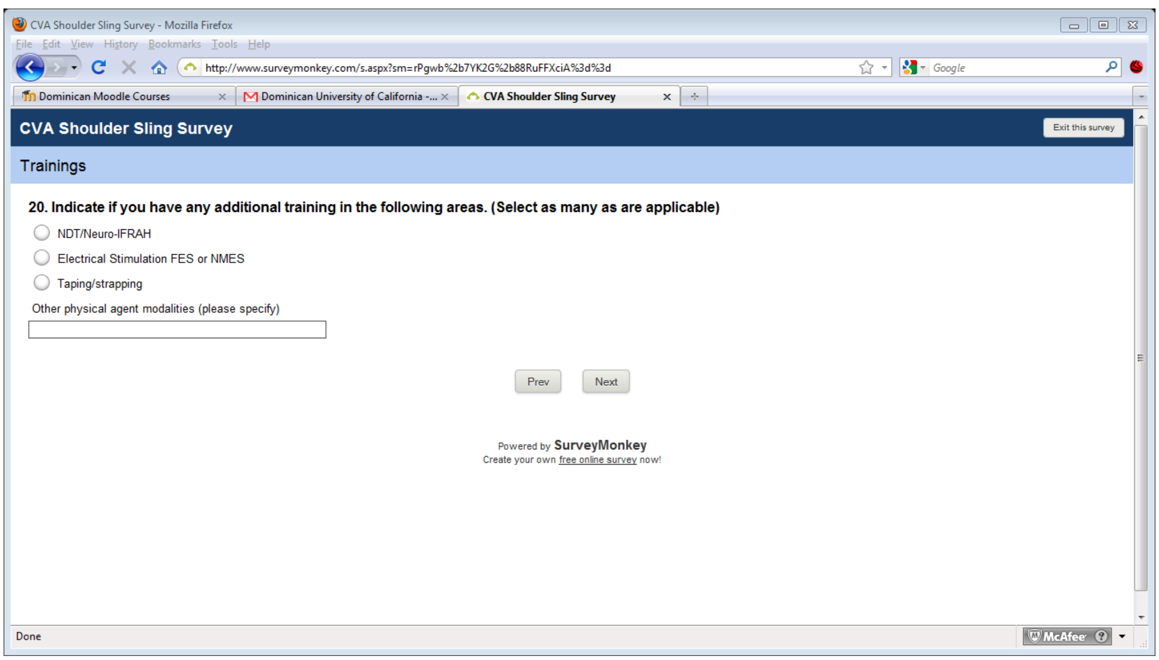
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Exit this survey
Trainings
20. Indicate if you have any additional training in the following areas. (Select as many as are applicable)
NDT/Neuro-IFRAH
Electrical Stimulation FES or NMES
Taping/strapping
Other physical agent modalities (please specify)
Prev
Next
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Appendix C

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Request for CVA Sling Survey Result Information

I would like to receive the results of the above survey at the following contact.

My e-mail ____

or

My mailing address

Name: ____

Address: ____

____

____

Appendix D

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Invitation to CVA Shoulder Sling Survey

Dear Occupational Therapy Practitioners,

We cordially invite you to participate in our survey-based research on the use of shoulder slings for stroke patients with shoulder subluxation. This research is our master thesis at Dominican University of California. The purpose of this research is to identify the clinical reasoning that OT practitioners apply when they use a shoulder sling and select a sling type for the patients in stroke rehabilitation. The research literature indicates that shoulder slings are commonly used in post-stroke rehabilitation. However, investigation on the clinical reasoning for the sling use is rare. We believe that your participation in this research will contribute for a better understanding of the clinical contexts that guide occupational therapy practitioners in evidence based practice.

Your survey response will be completely anonymous. The survey contains some demographic questions. However, there is no question that asks for your personal identity. It will take approximately 5 to 10 minutes to fill out the questionnaire. If you wish to receive the results of this research upon its completion, please contact us (see contact information below) or fill out the separate form, Request for CVA Sling Survey Result Information.

There is no potential risk or direct benefit to you in filling out our survey, except knowing that you are helping us in our research interests and contributing to the body of knowledge in occupational therapy practices. There will be no costs, except your time, or reimbursement to you as a consequence of participating in this survey. Participation in research is voluntary. You are free to decline this invitation or withdraw from it at any point.

If you kindly agree to participate in this study, please fill out the attached CVA Shoulder Sling Survey as accurately and completely as possible. Your response to this survey will serves as your consent of participation in this research.

Should you have any question about our research, please contact us or our research advisor at the following contacts.

Naoko Murai
Occupational Therapy Student
Email: naoko.murai@students.dominican.edu

Simon Chi
Occupational Therapy Student
Email: simon.chi@students.dominican.edu

Dr. Kitsum Li
Assistant Professor
Department of Occupational Therapy
Email: kitsum.li@dominican.edu

Should you have any question regarding protection of research participants, please contact the Dominican University of California, Institutional Review Board for the Protection of Human Subjects (IRBPHS), phone: (415)257-0168, fax: (415)458-3755, address 50 Acacia Avenue, San Rafael, CA 95901.

Sincerely yours,

Naoko Murai
Occupational Therapy Student
Dominican University of California
50 Acacia Avenue, San Rafael, CA 94901

Simon Chi
Occupational Therapy Student
Dominican University of California
50 Acacia Avenue, San Rafael, CA 94901

Appendix E

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Dominican University of California
Research Participant's Bill of Rights

Every person who is asked to be in a research study has the following rights:

1. To be told what the study is trying to find out;
2. To be told what will happen in the study and whether any of the procedures, drugs or devices are different from what would be used in standard practice;
3. To be told about important risks, side effects or discomforts of the things that will happen to her/him;
4. To be told if s/he can expect any benefit from participating and, if so, what the benefits might be;
5. To be told that other choices s/he has and how they may be better or worse that being in the study;
6. To be allowed to ask any questions concerning the study both before agreeing to be involved and during the course of the study;
7. To be told what sort of medical treatment is available if any complications arise;
8. To refuse to participate at all before or after the study is started without any adverse effects. If such a decision is made, it will not affect his/her rights to receive the care or privileges expected if s/he were not in the study;
9. To receive a copy of the signed and dated consent form;
10. To be free of pressure when considering whether s/he wishes to be in the study.

If you have questions about the research, you may contact us at the following.

Naoko Murai naoko.murai@students.dominican.edu

Simon Chi simon.chi@students.dominican.edu

If you have further questions, you may contact our research advisor, Dr. Kitsum Li, Assistant Professor, Department of Occupational Therapy at (415)458-3753 or the Dominican University of California Institutional Review Board for the Protection of Human Subjects (IRBPHS), which is concerned with protection of volunteers in research projects. You may reach the IRBPHS Office by calling (415) 257-1389 and leaving a voicemail message, or fax at (415) 257-0165, or by writing to IRBPHS, Office of Associate Vice President for Academic Affairs, Dominican University of California, 50 Acacia Avenue, San Rafael, CA 94901

Appendix F

Occupational therapy practitioners,

Do you work with stroke patients in your practice? We invite you to participate in our online survey regarding the use of shoulder slings for stroke patients with shoulder subluxation. This research is our master thesis at the Dominican University of California. The purpose of this research is to identify the clinical reasoning that OT practitioners apply when they use a shoulder sling, and in the selection of a sling type for patients in stroke rehabilitation.

Your survey response will be completely anonymous. If your practice includes stroke rehabilitation, please consider taking a few moments of your time to complete our survey by clicking the link below. The survey will take 5 to 10 minutes to complete. Your participation in this research will contribute to a better understanding of the clinical context that guide occupational therapy practitioners in evidence based practice.

Here is the link to our online survey.

http://www.surveymonkey.com/s/BBT8XC5

If you have any question, please feel free to contact us.

Simon Chi
simon.chi@students.dominican.edu

Naoko Murai
naoko.murai@students.dominican.edu

Appendix G

OTAC's 2012 Spring Symposium

March 31 - April 1, 2012

Click here to download the registration brochure.

Click here to register online.

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Call 714-520-5005 or click here to reserve today!

Discount Disneyland Tickets! Discount not available once you arrive at the resort.

Disney's Paradise Pier® Hotel, Anaheim, CA

Occupational therapy practitioners,

This is a reminder to participate in our CVA Shoulder Sling Online Survey sent on January 30, 2012. This survey is our master thesis at Dominican University of California.

If you work with patients recovering from stroke and haven't taken this survey yet, please consider taking a few moments to complete our survey by clicking the link below. The survey is anonymous, and it will take only 5 to 10 minutes to complete. Your participation will contribute to a better understanding of the clinical context that guide occupational therapy practitioners in evidence based practice. Deadline to take the survey is April 1, 2012.

Here is the link to our online survey.

http://www.surveymonkey.com/s/BBT8XC5

If you have any question, please feel free to contact us.

Simon Chi
simon.chi@students.dominican.edu

Naoko Murai
naoko.murai@students.dominican.edu