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SIT TO STAND PROTOCOL IN LONG TERM CARE TO SUPPORT AND MAINTAIN STROKE RECOVERY

BY

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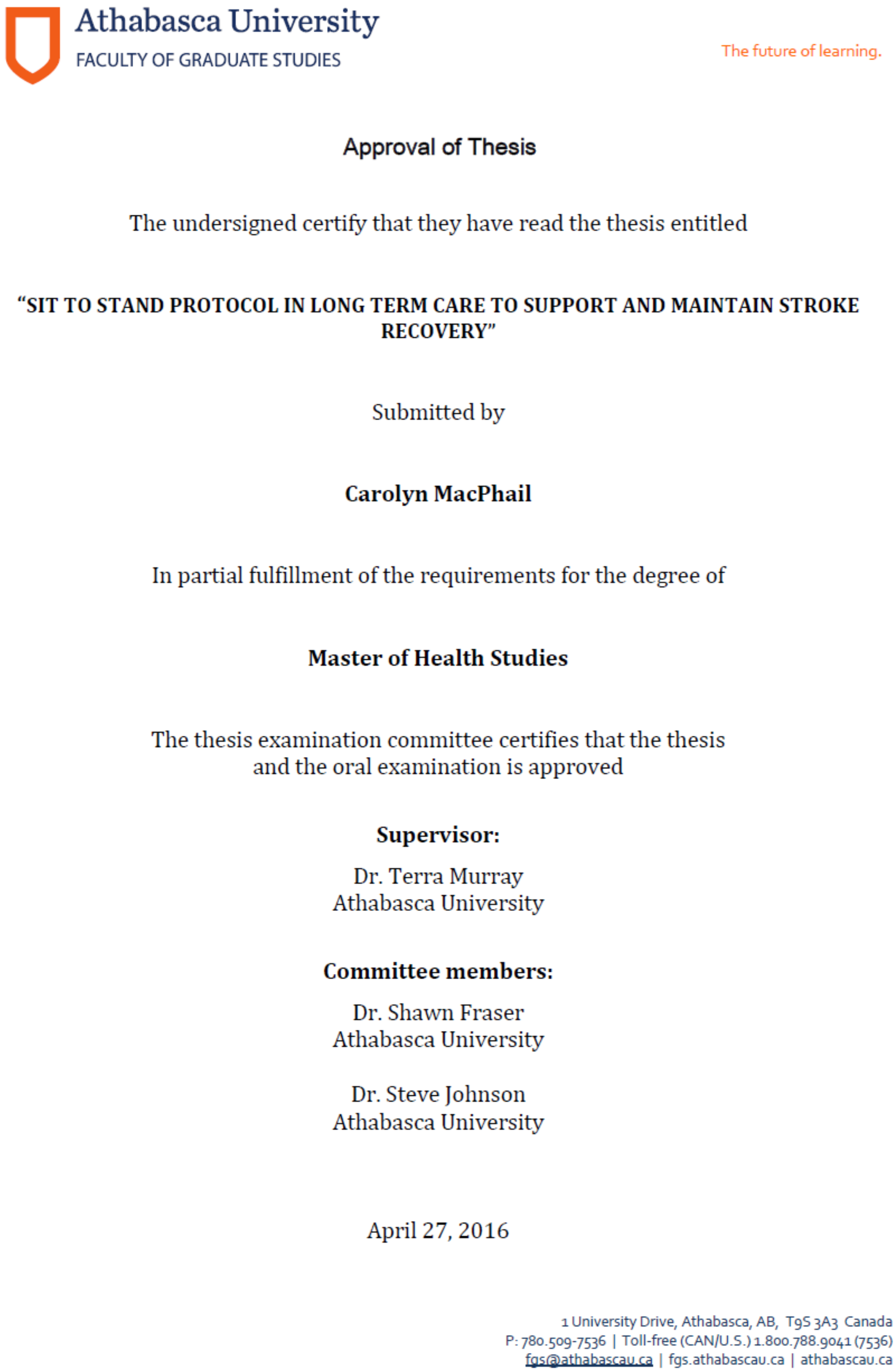

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In partial fulfillment of the requirements for the degree of

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Abstract

This study examined if practicing sit to stand (STS) with stroke survivors (12 women (*M* age = 78) and 14 men (*M* age = 77)) over 12 weeks, as part of daily clinical practice, would improve STS performance, have positive effects on functional independence and perceived quality of life. Results showed significant improvement of STS independence ($p < .001$) reflected in the improved score on the STS item of the Motor Assessment Scale and significant improvement in the length of time to perform STS ($p = .01$) reflected in the improved score on the Five Repetition STS Test. The STS intervention was not related to any improvement of functional independence ($p = .58$) as measured by the Barthel Activities of Daily Living Index or perceived quality of life ($p = .50$). Results of this study suggest repetitive practice of STS by usual caregivers may be beneficial at improving or maintaining STS performance.

Table of Contents

List of Tables

List of Figures

List of Abbreviations

BMI – Body Mass Index

FRSTST – Five Repetition Sit to Stand Test

ICF – International Classification of Functioning, Disability and Health

LTC – Long Term Care

MAS – Motor Assessment Scale

MoCa – Montreal Cognitive Assessment

STS – Sit to Stand

QoL – Quality of Life

CHAPTER I - Introduction

Stroke is a leading cause of adult disability in Canada (Lindsay et al., 2010; Public Health Agency of Canada [PHAC], 2009). Approximately 30,000 patients diagnosed with stroke are treated in Canadian hospitals each year and approximately 300,000 people in Canada are living with the effects of stroke (PHAC, 2009). Reports indicate that 40% of stroke survivors require assistance with activities of daily living and approximately 10% of stroke survivors require admission to long term care (Canadian Stroke Network [CSN], 2011; Stolee, Hillier, Webster, & O'Callaghan, 2006; Wade, 1992), where long term care (LTC) is defined as a place of permanent residence providing nursing supervision and care management (Forster et al., 2011; Ward, Drahota, Gal, Severs, & Dean, 2009). The risk of stroke increases with age and as baby boomers become seniors, the absolute number of strokes is expected to rise over the next 20 years (CSN, 2011; Langhorne, Bernhardt & Kwakkel, 2011; PHAC, 2009). This suggests there will be increased demands on the LTC system and rehabilitative services (de Carvalho Bastone & Filho, 2004; Forster et al., 2011; Freedman & Schoeni, 2006; Stolee et al., 2006). Despite early rehabilitation efforts, persons with stroke residing in LTC facilities often continue to face problems performing activities of daily living (Miller et al., 2010), and in order to support continued recovery, longer term rehabilitation strategies in LTC may be beneficial for residents.

CHAPTER II - Literature Review

Stroke Recovery Conceptual Framework

Stroke recovery is a multifaceted and complex process that can be understood in the context of the World Health Organization International Classification of Functioning, Disability and Health framework (ICF) (Kluding & Gajewski, 2009; Langhorne et al., 2011; Miller et al., 2010). The ICF framework supports understanding functioning and disability as a multidimensional and relativistic interaction not only as a consequence of a health condition, but also as determined by environmental and personal factors (Dahl, 2002). Components of the ICF are described according to the following dimensions: 1) *body functions and structure* where function is defined as the physiological and psychological functions of body systems and structure is defined as the anatomical parts of the body; 2) *activities* which describes the execution of a functional task or action; 3) *participation* which refers to an individual's involvement in a life situation (Sullivan et al., 2013), and 4) *contextual factors* including personal and environmental variables that influence how disability is experienced (Miller et al, 2010).

Recovery is an interplay between the pathophysiological processes directly related to the stroke, the impact this condition has on the individual and other contextual variables such as internal attributes (e.g. age) and environmental resources (Miller et al., 2010). Stroke impairments include loss of body functions and structures (e.g. hemiparesis, postural control and cognitive dysfunctions) which can contribute to limitations in activities such as dressing, bathing and walking (Miller et al., 2010). Rehabilitation is an important strategy aimed at helping individuals return to participation in activities they need and want to do (Carr & Shephard, 2011; Duncan et al., 2005; Forster et al., 2011;

Wade, 1992). The rehabilitation experience varies greatly depending on the individual's personal and environmental factors (Langhorne et al., 2011). There is no linear relationship among the ICF dimensions, for example, one cannot assume that mild body structure and function deficits will result in mild activity limitations or participation restriction or that a person with stroke with numerous facilitative personal and environmental supports will demonstrate few activity limitations (Dahl, 2002; Miller et al., 2010). A diagnosis does not provide information on how the person can perform tasks in their current environment, a person's life situation which is influenced by external factors such as physical assistance and support can increase function, participation and well-being (Paanalahti, Lundgren-Nilsson, Arndt & Sunnerhagen, 2013).

Contextual factors as related to stroke recovery.

Contextual factors include the unique personal and environmental variables of each person with stroke that influence his or her disability experience (Miller et al., 2010). Personal factors relate to the individual such as age, gender and co-morbidities which are not specifically classified in the ICF framework, however are recognized as part of the conceptual framework (Dahl, 2002). Internal attributes that compromise participation in rehabilitation, such as advanced age and high comorbidity, have been negatively associated with stroke recovery (Berlowitz, Hoenig, Cowper, Duncan, & Vogel, 2008; Langhammer, Lindmark & Stanghelee, 2007; Turhan, Atalay & Muderrisoglu, 2009). It has been suggested that men and women, due to differing physiological capacities, use different techniques in performing activities of daily living (Singh, Chin A Paw, Bosscher & van Mechelen, 2006). Singh et al. (2006) studied 226 persons living in LTC facilities and found men had significantly higher knee and elbow strength while women were more flexible. Motor coordination was associated with functional performance in both men and women (Singh et al., 2006). Although body weight has not been found to be a factor in performing independent sit to stand (STS), Bohannon (2007) suggests individuals with stroke who have low levels of knee extension force and excessive body weight may be more challenged in achieving independent STS. Depression is common post stroke and has also been associated with poorer functional recovery (Miller et al., 2010).

Environmental resources such as family/caregiver support and involvement in practicing activities outside of routine treatment hours has been positively linked to stroke survivor outcomes such as independence in activities of daily living (Duncan et al., 2005; Langhorne et al., 2011; Miller et al., 2010). LTC facility characteristics such as size and ownership model (public, private for profit, private not for profit) have been linked with quality of resident care and LTC performance outcomes (Berta, Laporte, Zarnett, Valdmanis & Anderson, 2006; Slaughter, Estabrooks, Jones & Wagg, 2011). Although research is conflicted, some research shows for profit facilities provide fewer types of services, maintain lower staff ratios, and realize higher rates of adverse outcomes than non profit facilities (Berta et al., 2006). Government owned facilities tend to be larger, rely more on regulated staff, have higher nursing staff ratios and tend to have residents requiring more complex care (Berta et al., 2006). Government facilities also tend to offer higher levels of therapy, however further investigation is needed to ensure levels are sufficient as intensity levels have been linked to improvements in cognition (Berta et al., 2006). Excessive bed rest may also contribute to declining fitness negatively impacting stroke recovery (Carr & Shephard, 2011). The major environmental factor addressed in this study is long term care staff physical assistance and support.

Spontaneous recovery versus re-learning.

The recovery process of stroke survivors is most likely a combination of spontaneous and learning-dependent processes including restitution, substitution, and compensation (Langhorne et al., 2011). Restitution refers to restoring the functionality of damaged neural tissue; substitution is the reorganization of partly spared neural pathways to relearn lost functions; and compensation refers to the improvement of the disparity between the impaired skills of a person with stroke and the demands of their environment (Langhorne et al., 2011). In general, studies have shown the strongest improvements in stroke recovery occur during the first 12 weeks post stroke (Janssen et al., 2010; Langhammer et al., 2007). Early stages of recovery within the first three months after stroke are thought to reflect resolution of edema and the contribution of spontaneous recovery (Janssen et al., 2010; Langhorne et al., 2011, Wade, 1992). Rehabilitation during this stage has a potential impact on reorganization of brain function and on recovery of motor abilities (Carr & Shepherd, 2011). In later stages of stroke recovery, further improvements are largely a result of re-learning and adaptation (Galvin, Cusack & Stokes, 2009; Wade, 1992). Initial rehabilitation management during the acute stage focuses on pathophysiological processes at the body structure and function level, where as the focus during the chronic phase tends to shift to improving performance of functional tasks at the activity level (Miller et al., 2010).

Despite early rehabilitation efforts, many individuals are left with physical deficits such as hemiparesis and decreased postural control that can lead to permanent disabilities and inability to complete basic activities of daily living independently (Green, Forster, Bogle & Young, 2002; Kwakkel, Kollen & Lindeman, 2004; Miller et al., 2010; Wade

1992). The ability to perform activities of daily living contributes to quality of life for older persons (Singh et al., 2006). In order to optimize stroke recovery, continued longer-term rehabilitation opportunities are needed for stroke survivors to improve and maintain physical functioning (Carr & Shephard, 2011).

Rehabilitation Process

Rehabilitation is accomplished by practicing activities tailored to improve targeted impairments (e.g. stretching a tight muscle) and/or practicing specific activities to achieve functional goals (e.g. walking) at a frequency and duration sufficient to achieve optimal recovery through learning-dependent processes (Carr & Shephard, 2011; Duncan et al., 2005; Forster et al., 2011; Wade, 1992). While there is little evidence to guide the precise amount of therapy needed to achieve optimal recovery (Langhorne et al., 2011; Miller et al., 2010), there is evidence that in general more rehabilitation results in better recovery and more is needed than is commonly available (Carr & Shephard, 2011; Duncan et al., 2005; Huijben-Schoenmakers, Gamel & Hafsteinsdottir, 2009; Krakauer, 2006; Miller et al., 2010; Teasell & Kalra, 2004). During the acute stage, observational studies have found that persons with stroke in hospitals and rehabilitation centre’s spend on average 20% of their day on therapeutic activities and more than 50% of their day resting in bed (Carr & Shepard, 2011; Huijben-Schoenmakers et al., 2009). It has been suggested that in traditional LTC facilities, therapy time is even lower given they are in the chronic phase of recovery and there is a lack of rehabilitation professionals available (Huijben-Schoenmakers et al., 2009; Langhammer et al., 2007; Stolee et al., 2006). Studies have shown that without adequate resources optimal stroke recovery may not be achieved and any benefits achieved during rehabilitation are difficult to sustain once rehabilitation is discontinued (Duncan et al., 2005; Galvin et al., 2009; Langhammer et al., 2007). Mobility of older adults often decline following admission to LTC which is thought to be related to sedentary behavior and limited mobility (Chen, 2010; Slaughter et al., 2015). Thus, there is a need for long term rehabilitation strategies to prevent deterioration in motor function and activities of daily living (Duncan et al., 2005; Ferrarello et al., 2011; Forster et al., 2011; Huijben-Schoenmakers et al., 2009).

There is a need to move away from reliance on the traditional one-to-one model of therapy to a model in which strategies are used to supplement individualized therapy sessions with other novel approaches aimed at increasing the “dose” of therapy and throughout the continuum of care (Carr & Shepherd, 2011; Ferrarello et al., 2011; Galvin et al., 2009). Approaches explored elsewhere include group interventions, as well as incorporating repetitive practice of simple tasks into daily routine functional activities (Carr & Shepherd, 2011; Ferrarello et al., 2011; Galvin et al., 2009). Generally, rehabilitation research with a demonstrated positive effect varies from 30 to 60 minutes per session, two to three times a week, over a period of three weeks to six months (Forster et al., 2011; Langhammer et al., 2007; Nitz & Josephson, 2011).

The design of therapeutic interventions is also important to achieve optimal stroke recovery (Teasell & Kalra, 2004; Miller et al., 2010). For example, therapeutic interventions need to be relevant to biomechanical needs, meaningful for daily life and designed based on clinical evidence (Carr & Shephard, 2011; Huijben-Schoenmakers et al., 2009; Outermans, van Peppen, Wittink, Takken, & Kwakkel, 2010). The majority of rehabilitation research to date has focused on the acute and subacute phases of recovery (usually during the first two to 14 weeks after stroke) with less attention given to rehabilitation in the chronic recovery phases (Carr & Shephard, 2011; Ferrarello et al., 2011; Gadidi, Katz-Leurer, Carmeli, & Bornstein, 2011; Langhammer et al., 2007; Miller et al., 2010; Stolee et al., 2006). The Canadian Best Practice Recommendations for Stroke Care reports that all patients discharged from hospital with residual disability and rehabilitation potential must have access to rehabilitation services appropriate to their needs (Lindsay et al., 2010). The majority of stroke survivors transferred to a LTC facility continue to need help with some basic care, thus continued management of these individuals is recommended (Miller et al., 2010). The primary goal of rehabilitating stroke survivors living in LTC is to contribute to a better quality of life by maintaining physical function (de Carvalho Bastone & Filho, 2004). Rehabilitation strategies in LTC impact functional long term stroke recovery (Huijben-Schoenmakers et al., 2009).

Evidence suggests that rehabilitation interventions for residents living in LTC is appropriate and worthwhile (de Carvalho Bastone & Filho, 2004; Ferrarello et al., 2011; Forster et al., 2011; Langhorne et al., 2011; Miller et al., 2010). Specifically, rehabilitation interventions in LTC contribute to delayed loss of functional independence, decreased depression and improved quality of life (de Carvalho Bastone & Filho, 2004; Forster et al., 2011; Vahakangas, Noro, & Bjorkgren., 2006). Previous studies have also demonstrated improvements in balance control, muscle strength, reaction time and gait velocity in LTC residents using rehabilitation techniques such as practicing standing up and sitting down, walking and climbing stairs (de Carvalho Bastone & Filho, 2004; Forster et al., 2011; Huijben-Schoenmakers et al., 2009; Nitz & Josephson, 2011; Vahakangas et al., 2006). A systemic review of rehabilitation for older people in LTC completed by Forster et al. (2011) concluded that there is evidence of successful interventions, however there is no clear indication of the optimum type of interventions in LTC. Interventions showing the most promise are those targeting task specific activities relevant to the impairments of stroke survivors (de Carvalho Bastone & Filho, 2004; Forster et al., 2011; Huijben-Schoenmakers et al., 2009; Langhorne et al., 2011; Miller et al., 2010; Rensink, Schuurmans, Lindeman & Hafsteinsdottir, 2009; Teasell & Kalra, 2004). Task specific interventions are designed to mirror daily activities with a clear functional objective integrated into routine care (de Carvalho Bastone & Filho, 2004; Langhorne et al., 2011). Task specific activities relevant to the LTC day-to-day context for stroke survivors includes exercises in sit to stand, reaching, balance and walking (Huijben-Schoenmakers et al., 2009; Rensink et al., 2009).

Sit to stand action.

Sit to stand (STS) is a task specific activity involving the transition from a seated position (a stable base of support) to a standing position (an unstable base of support) (Etnyre & Thomas, 2007). STS is a biomechanically demanding activity and challenges in achieving independent STS have been linked to decreased lower limb strength (Boukadida, Piotte, Dehail & Nadeau, 2015; Bohannon, 2007; Singh et al., 2006). A prerequisite for STS is the ability to sit independently (Di Monaco, Trucco, Di Monaco, Tappero, & Cavanna, 2010). The STS action requires postural control abilities and extensor strength in the lower extremities, which are often impaired in stroke survivors (Bohannon, 2007; Tung & Yang, 2010).

There is a tendency for stroke survivors to have decreased weight bearing through the hemiparetic leg impacting functional independence and increase risk of falls (Etnyre & Thomas, 2007; Janssen et al., 2010; Tung & Yang, 2010). The sit to stand task is needed for independent transfers and walking and is therefore an important rehabilitation objective for stroke survivors, their families and other caregivers (Barreca, Sigouin, Lambert, & Ansley, 2004; Bohannon, 2007; Britton, Harris, & Turton, 2008; Janssen et al., 2010; Tung & Yang, 2010). LTC residents are challenged with independent STS (Zabel, 2000) and when a resident loses the ability to stand up from a seated position, transferring the resident involves extra time and thus increased cost to the LTC care system (Slaughter et al., 2011).

There is compelling evidence that practice and repetition of STS is beneficial in improving independent STS, extensor muscle strength, standing balance, functional mobility and quality of life (Barreca et al., 2004; Bohannon, 2007; Britton et al., 2008; Dean & Shepherd, 1997; Janssen et al., 2010; Tung & Yang, 2010). It is also related to decreasing falls post stroke (Barreca et al., 2004; Bohannon, 2007; Britton et al., 2008; Dean & Shepherd, 1997; Janssen et al., 2010; Tung & Yang, 2010). Falls are a serious problem for LTC residents and fear of falling has been identified as a potential reason why residents decrease physical activities (Chen, 2010; Nitz & Josephson, 2011). Although many factors can affect falls risk, decreased lower extremity function combined with trunk instability increases fall risk in stroke survivors greater than the general population (Miller et al, 2010).

Outcomes Associated with STS Performance

A number of key functional outcome measures have previously been identified to assess STS performance including: level of independence in performing STS, speed or length of time to perform STS, symmetry of weight bearing comparing the hemiparetic and non hemiparetic legs, and the actual number of STS actions performed during daily life (Janssen et al., 2010).

Level of STS independence.

Level of independence with regard to being able to STS has been assessed a number of ways, from dichotomous assessments (Barreca et al., 2004; Bohannon, 2007; Janssen et al., 2010) to multiple item, Likert type scales (Carr, Shepherd, Nordholm, & Lynne, 1985). The multiple ways in which level of independence can be assessed with STS makes it challenging to compare results of different studies, as different approaches in specifying conditions defining what is independent versus dependent STS have been noted. For example, some research uses a simple dichotomous measure of STS independence as able (versus unable) to stand without assistance (Barreca et al., 2004; Bohannon, 2007; 2012; Janssen et al., 2010). In a study completed by Barreca et al. (2004), participants were able to achieve independent STS when they were able to perform two STS actions independently from a 16 inch surface without using their hands for two consecutive days. On the other hand, Bohannon (2007) defined independent STS as being able to stand from a standard armless chair without physical assistance of another individual, except for providing assistance to position the lower limbs if necessary. Bohannon (2007) allowed three attempts without the use of hands and if unsuccessful, allowed three attempts with the use of hands before classifying as unable to STS independently. Both approaches can be used to measure the change in the percentage of individuals who are able to gain independence in STS over time. However, given the approach used by Bohannon (2007) allows the use of hands, one would expect the success rate in achieving independent STS to be higher (Bohannon, 2012).

The motor assessment scale (MAS) developed by Carr et al. (1985) is also used in the literature to assess level of independence with STS (Carr et al., 1985; Janssen et al., 2010; Langhammer et al., 2007; Monger, Carr & Fowler, 2002). The MAS was specifically designed for use in the stroke population to assess progress of motor function across a variety of domains on a seven point rating scale (Carr et al., 1985; Langhammer et al., 2007; Monger et al., 2002). The STS item of the MAS ranges from 0 (unable to perform) to 6 (sitting to standing, with no stand by help, three times in 10 seconds) (Carr et al., 1985). Previous research has shown the MAS has high inter-reliability (r = .89 - .99), intra-reliability (r = .87 - .98) and high construct cross-sectional validity (r = .88 and r = .96) (Langhammer et al., 2007). The MAS is brief, easily administered, freely available, and requires no expensive equipment (Carr et al., 1985; Salter et al., 2012).

Previous research has used the MAS entire seven point scale to assess level of independence continuously (Monger et al., 2002) and also dichotomously, by collapsing response items into two categories, incapable of independent STS movement; and able to get standing, with help from therapist or by any method (Janssen et al., 2010; Langhammer et al., 2007). A potential advantage to assessing STS continuously is that it provides more discriminating indications to assess functional changes over time in STS ability (Carr et al., 1985). A potential disadvantage of the dichotomous approach is that it may be less sensitive to change over time than the scale with a broader range of scores.

Length of time to perform STS.

The time it takes participants to rise from a chair is often reported in research interested in evaluating improvements in STS performance before and after exercise programs (Forster et al., 2011; Ng, 2010), and as a predictor of fall risk (Janssen et al., 2010). There are several variations of timed STS tests, however the most commonly used measure with older adults is the “Five-Repetition STS Test” (FRSTST) (Bohannon, 2012; de Carvalho Bastone & Filho, 2004; Nitz & Josephson, 2011).

In the FRSTST participants are asked to stand up from a standard height chair and to sit down five times, as fast as safely possible without using their hands (Bohannon, 2012). Criterion validity of the FRSTST is supported by negative correlations (r = -.58) of FRSTST time with lower limb muscle strength in patients with chronic stroke (Mong, Teo & Ng, 2010). Ng (2010) also demonstrated a negative correlation (r = -.84) between FRSTST scores and Berg Balance Scale scores in chronic stroke, suggesting the FRSTST may be a proxy indicator of balance performance. Subjects with chronic stroke consistently take longer to complete the FRSTST than participants of a similar age group because of stroke-specific impairments such as lower limb muscle weakness and poor balance (Mong et al., 2010). A FRSTST duration greater than 15 seconds has been linked to greater deficits in instrumental activities of daily living and to greater risk of recurrent falls (Buatois et al., 2008; Whitney et al., 2005). Mong et al. (2010) reported excellent intra-rater reliability (intraclass correlation coefficient (ICC) = .970 - .976), inter-rater reliability (ICC = .999), and test-restest reliability (ICC = .994) for the FRSTST in their study involving chronic stroke participants. The FRSTST is easy to administer, requires little space, does not require any specialized equipment and has been previously used with LTC residents (de Carvalho Bastone & Filho, 2004; Nitz & Josephson, 2011). A prerequisite to using the FRSTST is the ability to rise from a chair without assistance or use of the upper limbs (Bohannon, 2012).

Other relevant timed measures include: the Timed Up and Go Test (TUG) (Forster et al., 2011; Nitz & Josephson, 2011), and the number of STS in 30 seconds (Slaughter et al., 2011, 2015). The TUG is an objective measure that assesses the ability to perform sequential motor tasks requiring participants to stand up from a chair, walk three meters, turn around, walk back to the chair and sit down (Salter et al., 2012). The TUG has proven reliability and validity when used with older adults (Nitz & Josephson, 2011; Salter et al., 2012). The TUG requires no specialized equipment and is quick and easy to administer (Salter et al., 2012). The TUG requires the ability to walk and therefore was not considered as a STS performance outcome measure for the purpose of this study.

The number of STS actions a resident is able to complete in 30 seconds (30 second STS test) is another timed option. Slaughter et al. (2011, 2015) chose the 30 second STS test to assess the response of a STS mobility intervention in a study of LTC residents with dementia, because they felt many residents may not be able to complete more than one STS and many residents must use their arms to stand. In the pilot study Slaughter et al. (2011) determined an increase of two STS completed in 30 seconds to be a meaningful change. A study involving stroke survivor’s who were discharged home from a rehabilitation unit, and identified as at risk of having a fall, also chose the 30 second test to assess leg strength following a tailored multifactorial falls prevention program (Batchelor, Hill, Mackintosh, Said, & Whitehead, 2012). In their study a statistically significant change in the 30 second STS test comparing pre and post intervention measures was achieved in both the intervention group and the control group. The researchers felt this was because the intervention was not sufficiently different to “usual care” (Batchelor et al., 2012). The 30 second STS test score has been validated against a measure of lower leg strength (correlations > .70) and comparing performance in different age and physical activity groups (Bohannon, 2012). Evidence of test-retest reliability has been demonstrated reporting an ICC of .84 for men and an ICC of .92 for women (Bohannon, 2012).

Other sophisticated methods of measuring rising speed, such as using an accelerometer system (Janssen et al., 2010) or extrapolating speed time using information received from force plates under the buttocks and feet (Britton et al., 2008; Monger et al., 2002) have also been reported in other research.

The Five Repetition Sit to Stand Test (FRSTST) was chosen to assess length of time to perform STS. Reasons for this choice include: the FRSTST is the most widely employed STS test with older adults, has been shown to be valid in the chronic stroke population, availability of normative values for comparison, and is easy to administer (Bohannon, 2012).

Weight bearing symmetry.

After a stroke, individuals with hemiparesis have a tendency to place more weight on their nonparetic leg while rising from a chair (Briere, Lauziere, Gravel, & Nadeau, 2010). Objective information about the weight distribution between each leg is best measured using special force sensors on a force platform (Briere et al., 2010; Britton et al., 2008, Langhorne et al., 2011, Monger et al., 2002). A major challenge to using this approach is the required equipment is expensive and therefore weight bearing symmetry was not assessed for the purpose of this study.

STS performance during daily life.

STS performance can also be assessed as a total of the daily number of STS actions performed (Bohannon et al., 2008; Janssen et al., 2010). This is used to reflect the participants execution of the STS task in his or her current environment (Janssen et al. 2010), and to determine the minimum number needed to improve STS function (Barecca et al., 2004). The number of STS actions performed each day has been measured using an accelerometer system (Britton et al., 2008; Janssen et al., 2010) or by manual methods including the use of a Sportline© hand held counter attached to participants wheelchairs (Barreca et al., 2004) or recording each STS performed in an exercise diary (Monger et al., 2002).

It has been suggested by Barreca et al. (2004) that a range from 11.0 to 13.5 daily STS repetitions are needed for stroke survivors in an inpatient rehabilitation unit to achieve independence in STS. Slaughter et al. (2011), as part of a pilot study, trained health care aides in LTC to prompt residents with dementia to repeatedly STS and found that over a one month period for every 12 occasions of STS repetitions performed, the odds of improving or maintaining performance with the 30 second STS test doubled. Nitz and Josephson (2011) in their study involving LTC residents, included two minutes of STS practice within a one hour exercise program two times a week for 12 weeks and found a statistically significant difference in the FRSTS test with a moderate effect size (.53) (Nitz & Josephson, 2011). Monger et al. (2002) demonstrated an improvement in the STS item of the Motor Assessment Scale by encouraging 30 repetitions (three sets of 10) of STS three times a week for three weeks in community dwelling participants at least one year post stroke. Similar findings to Monger et al. (2002) were seen in a study completed by Langhammer et al. (2007) involving stroke survivors in community and LTC settings who were followed for one year post hospital discharge. The 45 minute exercise program included three sets of 10 STS repetitions two to three times a week with a minimum of 20 hours of therapy every three months (Langhammer et al., 2007).

Additional benefits of STS in LTC.

There is evidence to suggest that continued practice of simple interventions such as STS on a daily basis can translate into other physical benefits (de Carvalho Bastone & Filho, 2004; Langhorne et al., 2011; Langhammer et al., 2007), including improvements in functional ability (e.g. walking speed) (de Carvhalo Bastone & Filho, 2004; Janssen et al., 2010; Monger et al., 2002). Functional ability refers to the capacity to independently perform primary daily life activities such as walking (Kluding & Gajewski, 2009; Miller et al., 2010). Level of functional ability is most commonly measured by the Barthel Activities of Daily Living Index (Green et al., 2002; Forster et al., 2011; Janssen et al., 2010; Langhammer et al.. 2007; Wade, 1992). The Barthel Index consists of 10 primary activities of daily living (ADL) items (feeding, bathing, grooming, dressing, bowels, bladder, toilet use, transfers, mobility and stairs) measured on a Likert scale ranging from 5 to 15 points (Langhammer et al., 2007). Inability to perform activities of daily living affects quality of life for LTC residents and increases the workload for LTC staff (Singh et al., 2006; Slaughter et al., 2011).

Quality of life is an important focus of clinical practice in LTC (Gerritsen, Steverink, Ooms, de Vet, & Ribbe, 2007). Quality of life refers to the subjective experience of the individual (Gerritsen et al., 2007). Prior research shows that preserving physical functioning including STS may positively impact quality of life for persons living in LTC

(Singh et al., 2006; Yoshioka, Nagano, Hay & Fukashiro, 2014). Gerritsen et al. (2007) suggests the reliability and validity of self report scales decrease with cognitively impaired residents, however self report scales provide interesting information on the experiences of residents and can be a valuable addition to observational data.

Rehabilitation in LTC

Rehabilitation services provided in LTC are generally a consultative service and considered insufficient to optimize stroke recovery (Ascent Strategy Group, 2008; Chen, 2010; Ferrarello et. al., 2011; Heart and Stroke Foundation of Prince Edward Island & Prince Edward Island Department of Health, 2006; Huijben-Schoenmakers et al., 2009**).** In LTC, rehabilitation is most likely provided by a physiotherapist, who typically conducts an assessment and develops a plan for facility staff to follow (Stolee et al., 2006). To optimize functional recovery post stroke, both stroke survivor and staff participation is essential to the rehabilitation process, adhering to therapy recommendations and the integration of task specific activities into daily routine care (Miller et al., 2010). There is evidence that LTC staff who integrate therapeutic activities as part of a resident’s daily routine have a positive effect on functional performance (Forster et al., 2011; Vahakangas et al., 2006). LTC staff are uniquely positioned to provide supervision of physical activities such as STS, and to facilitate practice of therapeutic activities developed by rehabilitation professionals (Miller et al., 2010). Despite this, few investigations have examined the effectiveness of techniques to encourage mobility, such as STS by usual caregivers in LTC (Slaughter et al., 2011).

STS is one of the most useful tasks in daily living. Practicing STS as part of LTC day to day clinical practice has the potential to optimize functional STS recovery of stroke survivors and reduce the rate of deterioration (Barreca et al., 2004; Vahakangas et al., 2006). While research has demonstrated that STS is an effective rehabilitation activity (Barreca et al., 2004; Bohannon, 2007; Britton et al., 2008; Dean & Shepherd, 1997; Slaughter et al., 2015; Tung & Yang, 2010), currently LTC staff do not generally support residents to practice STS in accordance to evidence based practice (Ascent Strategy Group, 2008; Stolee et al., 2006).

Stroke is a significant cause of disability, reduced independence and quality of life. Effective and efficient methods to optimize stroke recovery in stroke survivors living in LTC are needed. Therefore the purpose of this study was to examine if practice of STS supported by LTC staff, as part of daily clinical practice, would be beneficial in improving STS performance for stroke survivors living in LTC. Based on previous research, it was hypothesized, that practicing STS with stroke survivors residing in LTC would improve STS performance, have positive effects on functional independence and perceived quality of life.

CHAPTER III - Method

Participants

Recruitment.

Stroke survivors were recruited from nine public LTC facilities located in Prince Edward Island (PEI). To participate, residents had to meet the following criteria: permanent resident of a PEI public LTC facility; had no orthopedic or medical condition (such as unstable heart condition) preventing the resident from practicing STS repeatedly; able to sit independently; had the capacity to weight bear through their lower extremities; and medical clearance was provided by their physician. Exclusion criteria included residents with severe cognitive impairment that limited ability to understand and follow simple instructions. These criteria were set to limit participation to residents who had the capacity to practice STS repeatedly.

The principal investigator met with each nurse manager to discuss the recruitment process and review the eligibility criteria. The nurse manager or their delegate approached each potential participant to obtain verbal consent to pass their name along to the principal investigator. The principal investigator then met with potential participants who agreed to meet with the researcher, and the study was explained. A signed consent (Appendix A) was obtained from residents who agreed to participate. Eight of the 26 residents were deemed legally incompetent and a signed consent was obtained from the third party entrusted to make decisions on their behalf. A medical clearance letter (Appendix B) was given to each resident’s physician, requiring the physician to indicate that the participant was medically able to participate in the study. In two cases the physician did not recommend participation and the resident was advised and excluded from the study.

Setting.

In PEI there are 597 LTC beds within nine public LTC facilities ranging from 21 to 128 per site (Ascent Strategy Group, 2008; Health PEI, 2015). A review completed in August, 2011, estimated the total number of residents in public facilities across PEI who have experienced a previous stroke was 111. Forster et al. (2011), based on 19 studies included in a systemic review of rehabilitation for older people in long term care, calculated 48% of residents on average were eligible for intervention participation (e.g. interventions aimed at maintaining or improving physical function in a defined subgroup such as stroke patients). The mean number of eligible individuals who ultimately agreed to participate was 62% (Forster et al., 2011). Nitz and Josephson (2011) in a study investigating the effect of a balance training program developed for residents in LTC, reported 30% of residents were not eligible and of individuals eligible, 64% agreed to participate. Therefore, it was conservatively estimated that about 48% ($N = 53$) would be eligible for the study with potentially 62% ($N = 33$) residents agreeing to participate. The exact number of residents meeting the eligibility criteria is unknown, however a convenience sample of 52 residents were identified by nurse managers as meeting the eligibility criteria and who also provided verbal consent permitting the nurse manager to forward their name to the principal investigator. Of the 52 residents approached by the principal investigator 50% ($N = 26$) agreed to participate, which was less than expected. Reasons for this include, lack of interest and being unwell at time of recruitment. Another possible explanation is the target population was specific to residents who had a stroke as opposed to the general population of residents living in LTC.

Design and Procedure

This study used a prospective pretest posttest within group design to examine the effects of a STS intervention on stroke survivors living in LTC facilities in PEI. Ethics approval from the Athabasca University Research Ethics Board and from the Prince Edward Island Research Ethics Board was obtained prior to proceeding with this research study (Appendix C).

Baseline data collection.

Following medical clearance by the participant’s physician, the principal investigator (physiotherapist) completed the pre-intervention clinical assessments (STS item of the Motor Assessment Scale; Five Repetition STS Test; Barthel Activities of Daily Living Index and Quality of Life question) as well as the facility and participant characteristics (demographics, Charlson Comorbidity Index and Montreal Cognitive Assessment) with each participant. Recommended modifications to the STS protocol (such as starting seat height) were recorded on the residents STS practice sheet posted in their room. Staff were encouraged to practice STS within existing routines involving a variety of activities (e.g. toileting, transferring from bed, etc) and to gradually decrease the seat height to the level of 16 inches as participants demonstrated improved performance (such as increased speed and improved postural control). Although physiotherapists and occupational therapists providing services to the facility were invited to assist in ongoing monitoring and support to LTC staff as per usual care, only two residents were actively being followed by a physiotherapist during the study period.

LTC staff training.

Once all pre-intervention clinical assessments were completed within a facility, the principal investigator began training LTC staff, who were identified by their nurse manger, on the STS protocol. The training method was similar to the method described by Barreca et al. (2004) using written materials; actual practice and a supporting video. The principal investigator created a seven minute “You Tube” video describing the STS protocol, which was available to staff on their desktop and/or DVD for their review as needed. The purpose was to support LTC staff in consistently administering the standardized STS protocol.

Staff were provided an opportunity to practice the STS protocol demonstrating their understanding and were evaluated on their knowledge and ability using a posttest questionnaire. In addition a standardized checklist was used to evaluate each staff member’s observed ability to perform the STS movement according to the STS protocol (Barreca et al., 2004). Training took approximately 20 minutes per session and was done in groups of four or more whenever possible. Training schedules were flexible to ensure all staff were provided the opportunity to participate in a training session. In total 97 staff were trained ranging from 4 to 22 per site. The exact breakdown of staff positions is unknown, however it is estimated 80% were resident care workers, 18% licensed practical nurses and 2% registered nurses and others (e.g. recreation worker, physiotherapist).

The length of delay between the pre clinical assessments and training was dependent on the number of residents participating in each facility and facility capacity to organize the training sessions. Length of time between clinical assessment and completion of LTC staff training ranged from 0 days to 119 days (*M* = 25 days; *Mdn* = 7 days). The twelve week intervention period began once all identified staff within a facility had been trained. The principal investigator visited each site once per week during the study period to provide support to staff and to monitor study fidelity.

Study procedure and timeline.

The study procedure and timeline is outlined in Figure 1. Baseline assessments of level of STS independence (STS item of the Motor Assessment Scale), length of time to perform STS (Five Repetition STS Test), functional independence (Barthel Activities of Daily Living Index) and perceived quality of life were done at week 0, or Baseline (Time 0). Staff was then trained on the STS intervention protocol in each facility. Following weeks 4 (Time 1) and 8 (Time 2), level of STS independence and length of time to perform STS were assessed. At the end of 12 weeks (Time 3) level of STS independence and length of time to complete STS were assessed along with functional independence and perceived quality of life (Figure 1). The implementation of the research study within each LTC facility was staggered to allow sufficient time to obtain participant informed consents, Baseline clinical assessments, LTC staff training and posttest clinical assessments. The entire study period took approximately ten months.

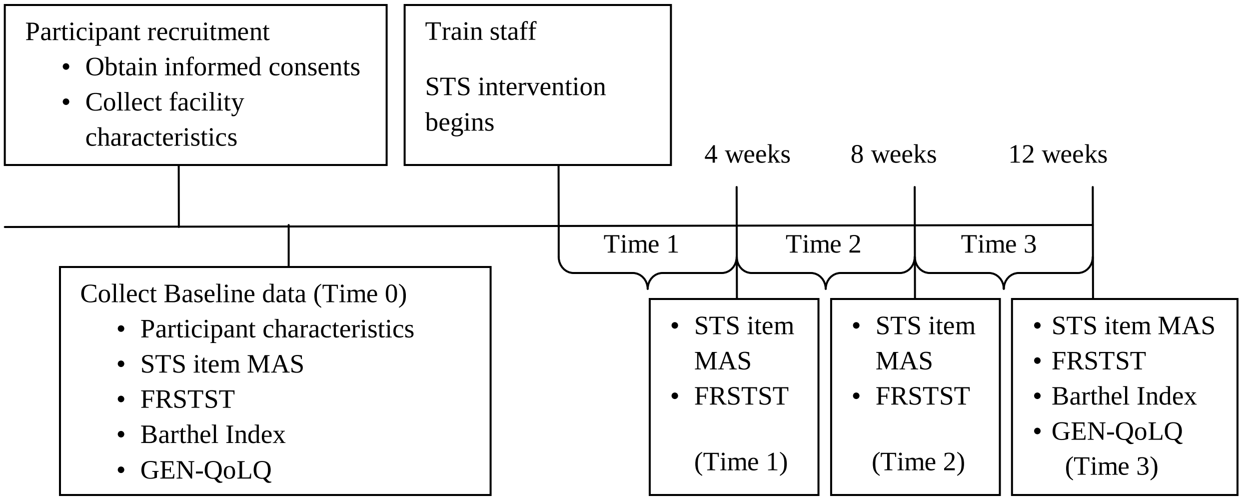

Figure 1. Study timeline and assessments. Sit to Stand Item Motor Assessment Scale (STS item MAS); Five Repetition Sit to Stand Test (FRSTST); Barthel Activities of Daily Living Index (Barthel Index); General Quality of Life question (GEN-QoLQ)

Intervention

Sit to stand protocol.

A Sit to Stand (STS) protocol (Appendix D) incorporating critical biomechanical features described by other researchers was developed to guide appropriate clinical practice strategies (Barreca et al., 2004; Bohannon, 2007; Monger et al., 2002; Tung & Yang, 2010). The critical biomechanical features as described by Etnyre and Thomas (2007) include: 1) initiation, 2) counter, 3) seat-off, 4) peak, 5) rebound, and 6) standing.

Using the features described by Etnyre and Thomas (2007) the STS movement began by asking participants to move their bottom forward in the chair (initiation), which involves slight vertical forces. This was followed by a reduction in vertical forces (counter) as participants prepared for seat off. During this preparation time participants were encouraged to interlock their fingers and place their arms out in front to facilitate symmetrical weight bearing through the lower extremities (Etnyre & Thomas, 2007). If the participant was unable to perform independent seat off in this position, or requested to use their hands, it was permissible for participants to place their hands on their knees, chair seat, armrests or other stable surface. Given the use of hands transfers some of the vertical forces from the lower extremities to the upper extremities, the use of hands was not encouraged; and in the event the use of hands was needed, bilateral use was encouraged when feasible to promote symmetrical weight bearing through the lower extremities (Etnyre & Thomas, 2007). Participants were asked to place their feet shoulder width apart, their toes under their knees and to sit up tall. Once they were ready, participants were asked to bend forward at the waist by moving their nose over their knees and to stand up (seat off). During seat off, vertical forces in the lower extremities peak, decrease (rebound) and then level out (standing). Physical assistance was provided when necessary. Participants used a self-selected natural speed.

Generally a seat height of 16 inches (the height of a regular toilet) was encouraged, however if the resident was unable to achieve independent seat off, a higher seat height that allowed independent seat off was permissible. Although the number of STS repetitions was dependent on the stroke survivor’s capacity to practice STS repeatedly and the intervention was incorporated within routine tasks, the proposed intervention frequency was to prompt stroke survivors to STS three to five times per occasion, four times per day, with a goal of at least 11 to 14 STS actions per day. The rehabilitation intervention was designed based on previous research and aimed at maximizing potential benefits while minimizing any potential harm such as falls and muscle or joint soreness.

Measures

Contextual variables.

Information on LTC facility characteristics (number of LTC beds, staff resident ratios and number of hours available for physiotherapy and occupational therapy services) was collected from the nurse manager, other senior level staff and from therapy staff. Participant characteristics (age, sex, type of stroke, side affected, height, and weight) and time since facility admission was collected from the residents chart. Body Mass Index (BMI) was calculated using weight (kg)/height (m)^2.

Comorbidity. Comorbodities are important predictors of stroke rehabilitation outcomes (Berlowitz et al., 2008). The Charlson Comorbidity Index (Liu, Domen & Chino, 1997; see Appendix E) was used to measure comorbidity level by taking into account both the number and severity of 19 pre-defined comorbid conditions. Higher scores represent worse conditions. The index is inexpensive, readily available, used widely and is accepted as a valid and reliable tool with stroke survivors (Liu et al., 1997).

Cognitive Impairment. The Montreal Cognitive Assessment (MoCA) is a screening instrument that was used to detect cognitive impairment (Nasreddine, 2010) (Appendix F). It is considered a valid and reliable tool for use in the stroke population (Aggarwal & Kean, 2010). The cognitive domains assessed include: attention and concentration, executive functions, memory, language, visuoconstructional skills, conceptual thinking, calculations, and orientation. Scoring is a point system on 12 items with a possible maximum total score of 30 points. A final total score below 26 is indicative of mild cognitive disability (Nasreddine, 2010). Time to administer was approximately 10 minutes.

Level of STS independence.

The STS item of the Motor Assessment Scale (MAS) (Carr et al., 1985) was used to assess functional independence in performing the STS activity as it was designed for the stroke population and provides a standardized approach to assess functional change over time. This is a single item scored from 0 to 6 with higher numbers representing higher level of STS independence (Langhammer et al., 2007). The rating scale is based on set criteria ranging from 0 (unable to perform) to 6 (sitting to standing, with no stand by help, three times in 10 seconds). See Appendix G for the complete scoring criteria. Langhammer et al. (2007) report high inter-reliability (r = .89 - .99), intra-reliability (r = .87 - .98) and high construct cross-sectional validity (r = .88 and r = .96) for the MAS. The MAS has been shown to be responsive to change over time during inpatient care after stroke with demonstrated effect size of 1.27 which is interpreted in accordance to Cohen’s Effect size as a large effect size (Scrivener, Schurr & Sherrington, 2014).

Length of time to perform STS.

The Five Repetition STS Test (FRSTST) is a widely used measure (Bohannon, 2012) to quantify STS performance and has been tested for the chronic stroke population (Mong et al., 2010). In the chronic stroke population negative correlations of FRSTST time with lower limb muscle strength (r = -.58) (Mong et al., 2010), as well negative correlations (r = -.84) with Berg Balance Scale scores (Ng, 2010) have been reported to support validity. Intra-rater reliability (intraclass correlation coefficient (ICC) = .970 - .976), inter-rater reliability (ICC = .999), and test-restest reliability (ICC = .994) for the FRSTST involving chronic stroke participants has also been reported (Mong et al., 2010). There is very little literature specifically addressing the responsiveness of the FRSTST (Bohannon, 2012).

Protocols for completing the FRSTST typically use armless chairs; prohibit the use of upper limbs and timing generally begins on the command “go” (Bohannon, 2012). The procedure recommended by Bohannon (2012) was used for this study; a standard seat height of 17 inches was aimed for and timing was ceased on landing after the fifth stand up (Bohannon, 2012). Although the aim was a seat height of 17 inches; various seating (such as wheelchairs, height adjustable beds and other available chairs such as dining room chairs) was used depending on the residents living environment. Even though the seat heights varied between residents, the seat height used at each time point was consistent for each resident. The detailed protocol for the FRSTST is described in Appendix H.

Number of STS actions practiced per protocol session.

LTC staff were asked to record after each STS prompted session the number of STS actions the resident was able to complete on an exercise log located in the residents room (exception was one unit maintained the log on the residents chart). The purpose was to report the proportion of participants who practiced at least 11 STS actions per day as per the protocol as well as the number of days STS practice was supervised over the 12 week intervention period.

Functional independence.

The Barthel Activities of Daily Living Index (Mahoney & Barthel, 1965) was used to assess functional independence. The principal investigator based on discussions with the resident, staff and through direct observation (when appropriate) completed the Barthel

Activities of Daily Living Index (Barthel Index) for each participant. The Barthel index consists of 10 primary activities of daily living items (feeding, bathing, grooming, dressing, bowels, bladder, toilet use, transfers, mobility and stairs) measured on a Likert scale (Langhammer et al., 2007). Two items are scored out of 5, six items are scored out of 10 and two are scored out of 15 resulting in a maximum summative score of 100 (Appendix I). Higher scores indicate a greater degree of functional independence (Collin, Wade, Davies, & Horne, 1988; Langhamer et al., 2007; Loewen, & Anderson, 1990). It has been estimated a score of 60 or below is indicative for need of institutional care (Langhammer et al., 2007). The Barthel Index has high inter-reliability (r = .70 - .88), intra-reliability (r = .84 and r = .98); and construct cross-sectional validity (r = .73 - .77) (Langahmmer et al., 2007). Responsiveness has been less frequently studied, however the Barthel Index has demonstrated ability to detect patient changes (including stroke patients) receiving inpatient rehabilitation (Dromerick, Edwards & Diringer, 2003; Eichhorn-Kissel, Dassen & Lohrmann, 2011; Hsueh, Lin, Jeng & Hsieh, 2002; van der Putten, Hobart, Freeman & Thompson, 1999). Responsiveness in the above studies were determined using an effect size calculation defined as the mean change score (discharge minus admission) divided by the standard deviation of admission scores. Effect sizes reported are as follows: 0.34 all patients and 1.14 for patients who changed (Eichhorn-Kissel et al., 2011); 0.95 (van der Putten et al., 1999); 1.20 (Hsueh et al., 2002) and 1.72 (Dromerick et al., 2003) which according to Cohen’s arbitrary criteria is interpreted as > 0.8 as large; 0.5-0.8 as moderate, and 0.2- 0.5 as small (Eichhorn-Kissel et al., 2011; Hsueh et al., 2002).

Quality of life.

Quality of life was assessed using the general quality of life question (GEN-QOLQ) described by Gerritsen et al., (2007), “Overall, how would you rate the quality of your life at the moment?”, as without the explicit time-limit residents may evaluate the whole of their past life (Gerritsen et al., 2007). The response scale consisted of five categories: 1 = *bad*, 2 = *moderate*, 3 = *good*, 4 = *very good* and 5 = *excellent*. These were presented in the form of a visual analog scale (Appendix J). A single item measure of quality of life is considered a valid measure and less burdening in the frail elderly population (Gerritsen et al., 2007), and is consistent with how quality of life is assessed in previous research (Singh et al., 2006). Measuring overall quality of life reliably and validly through self report may not be possible in nursing home residents with at least moderate cognitive impairment; nevertheless it can provide interesting information on the experience of residents and thus a valuable addition to observational data (Gerritsen et al., 2007).

Data Analyses

All analyses were conducted with the Statistical Package for Social Sciences (SPSS) version 23. An alpha level of .05 was used for all statistical tests. Descriptive statistic outputs for each variable were reviewed for both missing and unusual data. Data entry errors were corrected and no data was removed. Data was missing from 8% (n =2) of the sample for clinical measures at Time 1 (4 weeks), 15% (n =4) of the sample for clinical measures at Time 2 (8 weeks) and 4% (n =1) of the sample for clinical measures at Time 3 (12 weeks).

Data distributions for Five Repetition STS Test (FRSTST) at Time 0 (Baseline), Time 1 (4 weeks), Time 2 (8 weeks) and Time 3 (12 weeks) were reviewed for unusual shapes, as well the skewness and kurtosis statistics were examined for assumptions of normality. FRSTST at Time 1, Time 2 and Time 3 fell within acceptable skewness standards (*z* score of skewness less than 1.96), however FRSTST at Time 0 (Baseline) was positively skewed due to a large number of zero scores (unable to complete test).

Time since stroke event and time since LTC admission were positively skewed towards participants with shorter times. Outliers for time since LTC admission included two participants with 132 months, which were included in the analysis.

Data were also screened for outliers using stem and leaf display and box plots. No extreme values or data points fell outside the norm for clinical measures (Five Repetition STS Test, STS item of the Motor Assessment Scale and Barthel Index). One outlier was observed for the GEN-QoLQ measure at Baseline, which was included in the analysis. Non parametric inferential statistics were used; therefore this likely had little impact (Kinnear & Gray, 2010).

In order to examine if practicing STS would have a positive impact on level of STS independence, a Friedman’s test for ordinal data was used to test for differences between Time 0 (Baseline), Time 1 (4 weeks), Time 2 (8 weeks) and Time 3 (12 weeks) STS item of the Motor Assessment Scale (MAS) scores. The Friedman test is the non-parametric alternative to the one-factor ANOVA used with a repeated measures design (Kinnear & Gray, 2010; Morgan, Gliner & Harmon, 2006). A repeated measures ANOVA test can be used when the independent variable is distributed normally and the variances are similar for each condition (Morgan et al., 2006). A repeated measures ANOVA was conducted to examine if practicing STS influenced length of time to perform STS as measured by the Five Repetition STS Test at Time 0, Time 1, Time 2 and Time 3.

To examine any change in functional independence (measured by the Barthel Index) and perceived quality of life (General QOL Question), the Wilcoxon matched pairs signed ranks test was used to look at the difference between Baseline and 12 week median scores. The Wilcoxon matched pairs test is used for designs with one independent variable, with two levels, and the participants undergo both conditions (Morgan et al., 2006). In addition the dependent variable data are ordinal or assumptions of the t-test for paired samples is violated (Morgan et al., 2006).

CHAPTER IV – Results

Participants

Twenty-six stroke survivors residing in long term care were recruited to participate in the study, and complete follow up data for clinical measures at Time 3 (12 weeks) was available for *N* = 25 participants (see Figure 2). The sample included 12 women (*M* age = 78, *SD* = 11) and 14 men (*M* age = 77, *SD* = 9) who met the eligibility criteria and agreed to participate. One participant chose to discontinue within one week of starting the intervention. Each participant was a permanent resident with length of time since admission ranging from 1 month to 132 months. The average time since stroke event was 74 months and average time since LTC admission was 27 months. Participant stroke characteristics are presented in Table 1, and descriptive statistics for study variables are presented in Table 2. Out of the 26 participants, 81% (*n* =21) had an ischemic stroke, 12% (*n* =3) intracerebral hemorrhage (ICH), and 8% (*n* =2) subarachnoid hemorrhage (SAH). This is fairly representative of the general stroke population (PHAC, 2009). In addition 69% (*n* =18) were affected on the left side and 31% (*n* =8) the right side.

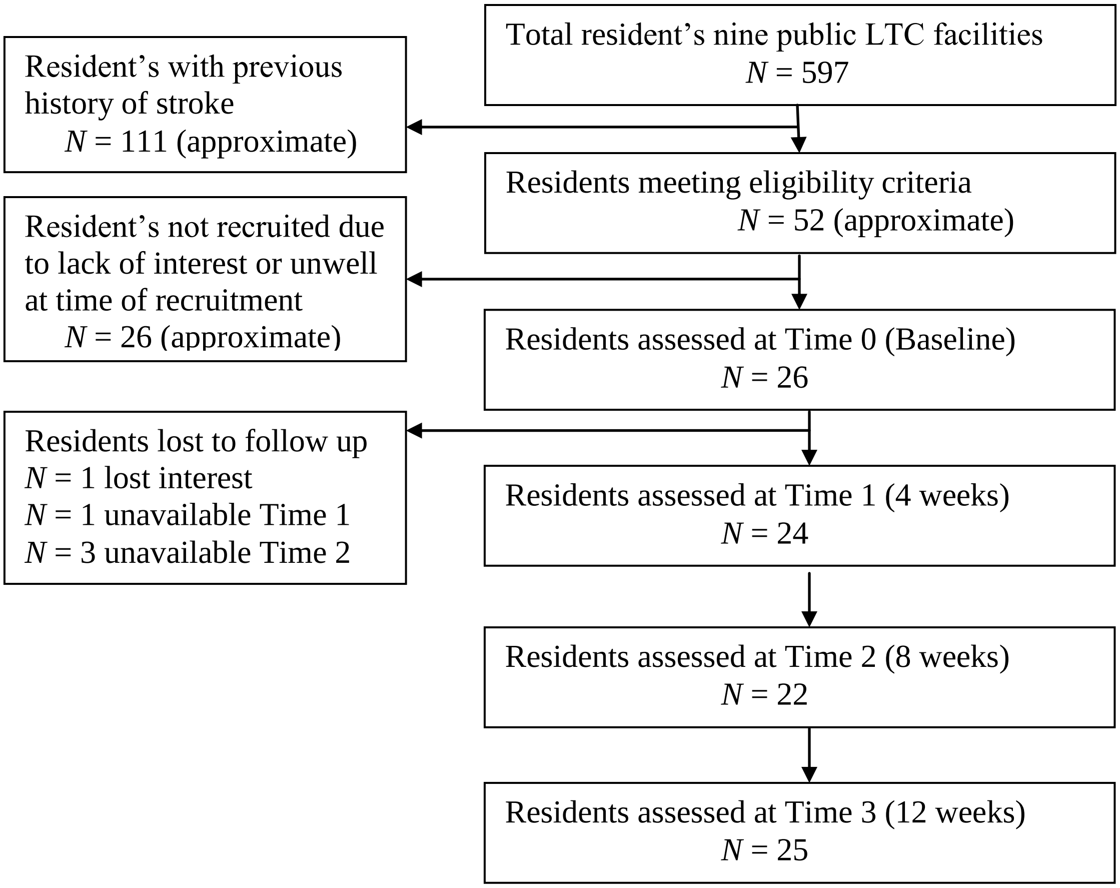

Figure 2. Flow of participants through the study. Approximate information was provided where confirmed information was not available.

Table 1

Participant stroke characteristics

Variable	Male (*n* =14) *n* (%)	Female (*n* =12) *n* (%)	Total (*N* =26) *n* (%)
Stroke Type			
Ischemic	11 (78.6 %)	10 (83.3 %)	21 (80.8 %)
SAH	1 (7.1 %)	1 (8.3 %)	2 (7.7 %)
ICH	2 (14 .3 %)	1 (8.3 %)	3 (11. 5 %)
Side Affected			
Left	10 (71.4 %)	8 (66.7 %)	18 (69.2 %)
Right	4 (28.6 %)	4 (33.3 %)	8 (30.8 %)

Note. SAH = subarachnoid hemorrhage; ICH= intercerebral hemorrhage.

Table 2

Descriptive statistics for study variables

Variable	*N*	*Mean*	*SD*
Age (years)	26	77.62	9.73
Body Mass Index (kg/m^2)	26	25.88	4.04
Time Since Stroke Event (months)	26	74.35	68.50
Time Since LTC Admission (months)	26	26.96	33.96
Comobidity level	26	6.40	2.29
Cognitive Impairment	25	14.68	6.38
Rehab hrs/ resident	26	0.41	0.48
Daily STS (average number)	25	3.20	3.73
Supervised (average days)	25	21.20	17.25
Baseline Functional Independence	26	69.23	18.42
12 week Functional Independence	25	69.00	18.20
Baseline Quality of Life	26	3.40	1.17
12 week Quality of Life	25	3.32	0.99
Baseline STS Level of Independence	26	2.73	1.76
Time 1 STS Level of Independence	24	3.38	1.79
Time 2 STS Level of Independence	22	3.59	1.82
Time 3 STS Level of Independence	25	3.84	2.12
Baseline Time to Perform STS	8	22.81	4.76
Time 1 Time to Perform STS	12	26.33	8.84
Time 2 Time to Perform STS	12	22.50	5.96
Time 3 Time to Perform STS	13	18.87	4.30

Note. SD = standard deviation; Daily STS = number of daily sit to stands practiced; Supervised = number of days STS practice was supervised; Baseline = Time 0 (0 weeks); Time 1 = 4 weeks; Time 2 = 8 weeks; Time 3 = 12 weeks.

The standard staff resident ratio for all public LTC facilities was 3.9 hours per resident. The mean number of facility rehab hours per resident was 0.48. The mean number of daily STS practiced was three (range was 0.2 to 16). Only two participants (8%) reached the minimum target of 11 mean daily STS practiced at Time 1 and only one participant (4%) for Time 2 and Time 3. The mean number of days where STS practice was supervised was 21 out of 84 days (25%); range was 5 to 58 days.

Effect of Intervention on Level of STS Independence

In order to examine any differences in level of STS independence between Time 0 (Baseline), Time 1 (4 weeks), Time 2 (8 weeks) and Time 3 (12 weeks) a Friedman's test for ordinal data was used. Results of the analysis showed that the level of STS independence differed over time, $\chi^2(3) = 20.12$, $p < .001$. The Kendall's coefficient of concordance W is .32, which is a measure of effect size following a significant Friedman test result (Kinnear & Gray, 2010). Based on Cohen benchmarks, this is considered to be a moderate effect size (Kinnear & Gray). Follow up pairwise comparisons were conducted using a Wilcoxon signed ranks test, and a Bonferroni correction was applied to protect against Type 1 error rate (Kinnear & Gray, 2010). As Time 0 (Baseline) was considered the comparison object, Time 0 was compared with Times 1, 2 and 3. Therefore the Type 1 error rate was set at .05/3= .02. Results of the analysis showed that there were significant differences between Baseline and Times 1 ($Z = -2.51$, $p = .01$), 2 ($Z = -3.13$, $p < .01$), and 3 ($Z = -.24$, $p < .01$).

Effect of Intervention on Length of Time to Perform STS

Length of time to perform STS was indicated by the Five Repetition STS Test. However, not all participants were able to perform this test as they were unable to arise from a chair without using their upper extremities. At Time 0 (Baseline), 18 (69%) of residents were unable to perform the Five Repetition STS Test (FRSTST). At Time 1 (4 weeks) and Time 2 (8 weeks), 13 (52%) residents were unable to perform the FRSTST and at Time 3 (12 weeks) 12 (48%) residents were unable to perform the FRSTST. For those residents who completed the FRSTST ($N = 8$ Time 0, $N = 12$ Time 1, $N = 12$ Time 2 and $N = 13$ Time 3) , the mean time was 22.8 seconds at Time 0, 26.3 seconds at Time 1, 22.5 seconds at Time 2 and 18.9 seconds at Time 3; (Table 2). Participants unable to perform the FRSTST were given a score of zero. The mean and medium seat height was 19 inches (range was 16 inches to 22 inches).

Lower times to perform the FRSTST equal better scores, therefore to better reflect change over time for those participants with a zero time at Baseline; two different methods for analysis have been described by other studies. One method used by Duncan, Leddy, & Earhart (2011) converted zero time scores to a maximum score of 60 seconds. An alternative method described by Janssen et al. (2010), “for analysis, we used the inverse of duration (1/duration)” (p.764), was used for the purpose of this study. See Table 3 for the inversion of duration time scores.

Table 3

Inverse of Duration Five Repetition STS Test (FRSTST) Time Scores (Seconds)

Variable	*N*	*M*	*SD*
Inv Base FRSTST	21	.013	.023
Inv T1 FRSTS	21	.020	.024
Inv T2 FRSTS	21	.026	.027
Inv T3 FRSTS	21	.025	.031

Note. SD = standard deviation; Inv = Inverse of duration (1/duration), T1 = Time 1 (4 weeks); T2 = Time 2 (8 weeks); T3 = Time 3 (12 weeks).

In order to examine the effects of the intervention on length of time to complete STS over time, a Repeated Measures ANOVA was conducted. The inversion of duration scores from the Five Repetition STS Test were used as the independent variables, and time was used as the within participants factor (with 4 levels, Time 0 (Baseline), Time 1, Time 2 and Time 3). Mauchly's test indicated the assumption of sphericity had been violated, $\chi^2(5) = 12.06$, *p* = .034, therefore degrees of freedom were corrected using Greenhouse-Geisser estimates of sphericity (Kinnear & Gray, 2010). Results showed a significant effect of Five Repetition STS Test over time (*F*(3, 60) = 5.36; *p* = .01, eta^2 = .21). The effect size based on eta squared is interpreted as larger than typical (Kinnear & Gray, 2010). Follow up pairwise comparisons indicated that the differences between Time 0 and Time 2 (*M* Difference -0.012, *p* = .010); Time 0 and Time 3 (*M* Difference -.012, *p* = .011); and between Time 1 and Time 2 (*M* Difference -.005, *p* = .035) were significant. The differences between Time 0 and Time 1 (*M* Difference -.007, *p* = .056); Time 1 and Time 3 (*M* Difference -.005, *p* = .095); and between Time 2 and Time 3 (*M* Difference -.001, *p* = .836) were not significant.

Effect of Intervention on Functional Independence

A Wilcoxon matched pairs signed ranks test was used to examine the effects of the STS protocol on functional independence, as indicated by the Barthel Activities of Daily Living Index. Functional independence was assessed at Time 0 (Baseline) and at Time 3 (12 weeks). Results showed that no significant difference (*W* = 6.50, *p* = .58) between the median Time 0 Barthel Index score (*Mdn* = 70.00) and Time 3 Barthel Index (*Mdn* = 70.00). There was one negative difference (lower post functional independence), three positive differences (higher post functional independence) and 21 ties (no change in functional independence).

Effect of Intervention on Quality of Life (QoL)

A Wilcoxon matched pairs, signed ranks test was used to examine the effects of the intervention on quality of life, assessed at Time 0 (Baseline) and Time 3 (12 weeks).

Results showed no significant difference (*W* = 36.50, *p* = .50) between the median Baseline GEN-QoLQ score (*Mdn* = 4.00) and Time 3 GEN-QoLQ (*Mdn* = 3.00) score. There were eight negative differences (lower post QoL), five positive differences (higher post QoL) and 12 ties (no change in QoL).

CHAPTER V – Discussion

Stroke is a leading cause of adult disability (PHAC, 2009) and despite early rehabilitation efforts, many individuals are left with physical deficits such as hemiparesis and decreased postural control that can lead to permanent disabilities and inability to complete basic activities of daily living independently (Green et al., 2002; Kwakkel et al., 2004; Miller et al., 2010; Wade 1992). Approximately 10% of stroke survivors require admission to long term care (CSN, 2011; Stolee et al., 2006; Wade, 1992) and continued management of these individuals is recommended (Miller et al., 2010). This study set out to examine if practicing sit to stand with stroke survivors over a 12 week period, as part of LTC day to day clinical practice, would improve: 1) sit to stand level of independence; 2) length of time to perform sit to stand; 3) level of functional independence, and 4) perceived quality of life.

Overall, the findings of this study showed that a 12 week STS task specific intervention significantly improved level of STS independence and length of time to perform STS in chronic stroke patients living in LTC. This finding is consistent with our hypotheses as well as previous research that has examined STS (Barreca et al., 2004; Britton et al., 2008; Dean & Shepherd, 1997; Slaughter et al., 2015; Tung & Yang, 2010) but extends that research to include stroke survivors living in LTC facilities. However, the STS intervention was not related to any improvement in functional independence related to activities of daily living or perceived quality of life. This is contrary to our hypotheses and previous research, which has generally shown that improved ability to STS was related to improvement in activities of daily life (de Carvalho Bastone & Filho, 2004; Janssen et al., 2010) and to perceived quality of life (Barreca et al., 2004).

Effect of the Intervention on Level of STS Independence

It was hypothesized the STS intervention would have positive effects on level of STS independence. Level of STS independence refers to the amount of help needed to get from sitting to standing. This was measured using the STS item of the Motor Assessment Scale (MAS) ranging from 0 (unable to perform) to 6 (sitting to standing, with no stand by help, three times in 10 seconds) (Carr et al., 1985).

Results of the study showed that the STS intervention was successful in improving STS level of independence. The most improvement was observed at Time 3 (12 weeks). Significant functional improvement was reflected in the clinical improvement score of the STS item of the MAS. This is similar to previous research (Langhammer et al., 2007; Monger et al., 2002) which also found that extra practice of STS improved functional performance of STS in chronic stroke participants. Compared to these studies the level of STS independence achieved as measured by the STS item of the MAS was slightly lower in the current study. Given participants in the study by Monger et al. (2002) were younger stroke survivors living in the community and the level of functional independence (as reflected by the Barthel Activities of Daily Living Index) was higher in the study by Langhammer et al. (2007), it is reasonable to expect stroke survivors living in long term care to have comparably lower scores on the STS item of the Motor Assessment Scale.

Effect of the Intervention on Length of Time to Perform STS

It was hypothesized the STS intervention would have positive effects on length of time to perform STS. The time it takes participants to rise from a chair was measured using the Five Repetition STS Test (FRSTST). Participants were asked to stand up from a standard seat height and to sit down five times, as fast as safely possible without using their hands (Bohannon, 2012). Results of the study showed that the STS intervention was successful in decreasing the length of time to perform STS. Statistically significant improvement was reflected by the clinical improvement in the number of seconds to complete the FRSTST. The most improvement was observed at Time 3 (12 weeks). Although a standard seat height of 17 inches was aimed for, this was generally not achieved (median and mean height was 19 inches). This makes comparing the length of time to perform STS results with other studies challenging, however, given the seat height for each participant was consistent between time points, results are relevant for the purpose of examining the effects of the STS intervention.

The height of a seating surface can have a profound effect on whether a resident is able to rise successfully (Bohannon, 2012; Choi et al., 2013; Janssen et al., 2010; Yoshioka et al., 2014). Lower floor to seat distance puts persons of taller stature and persons with more impairment at a disadvantage (Whitney et al., 2005). Functionally it is important to determine whether someone can rise from a typical chair height (Whitney et al., 2005), however the current study was aimed at achieving a training effect, thus the seat height was adjusted to a height that enabled successful seat off. It has been suggested the minimum height for successful rising for elderly people (including nursing home residents) with chair rise difficulties appears to be 120% of lower limb length (Janssen et al., 2010). For example a lower limb length measurement of 17 inches would translate to a seat height of 20 inches.

Previous studies have noted persons post stroke are slower in performing STS tasks than age matched controls (Boukadida et al., 2015; Tung & Yang, 2010). FRSTST values reported in other research for chronic stroke include: 17.1 seconds (Kwong, Ng, Chung & Ng, 2014; Mong et al., 2010); and 17.9 seconds (Ng, 2010). In both studies, participants were community dwelling with a mean age of 60 years and the seat height was fixed at 17 inches. In the current study the mean FRSTST time at Time 3 (12 weeks) was 18.9 seconds for those participants who were able to complete the FRSTST (mean age 75). Although the mean seat height was greater than 17 inches, given this study looked at individuals living in LTC and that FRSTST times increase with age (Bohannon, 2012; Whitney et al., 2005), the mean responsive score of 18.9 seconds demonstrates this as a potential clinical relevant improvement for this population.

Nitz and Josephson (2011) investigated whether a balance strategy intervention (that included two minutes of practice standing up and sitting down) improved functional mobility as reflected by the FRSTST. Their intervention strategy involved small groups of 10 ambulatory residents who participated in one hour sessions held two times per week over 12 weeks. Compared to the current study, residents were older and of the 34 residents who completed the study, most were female. Similar to the current study, the Five Repetition STS Test was measured pre and post intervention and showed a significant improvement. FRSTST times for their population of residents (including four with a diagnosis of stroke) was 19.39 seconds pre intervention and 15.38 seconds post intervention. The chair height was not provided, however it is reasonable to assume a standard chair height of around 17 inches was used as per the FRSTST protocol. One explanation their participants took less time to complete the FRSTST is in order to be included in their study residents had to be able to ambulate with a walking aid and were therefore of higher functional mobility.

Effects of Intervention on Functional Independence

Functional independence refers to the capacity to independently perform activities of daily living such as feeding, bathing, dressing, transfers, mobility, etc. It was hypothesized that performing the STS protocol would lead to improvements in functional independence, as indicated by the Barthel Activities of Daily Living Index. However, contrary to the hypothesis and to previous research (Etnyre & Thomas, 2007; Janssen et al., 2010) which have reported improved ability to STS would enable participants to be more independent in activities of daily living, no statistical significant difference was shown for functional independence. Reasons that may account for this lack of a significant finding include a sample size too small to detect a change in functional independence; despite achieving improvements in STS performance, it did not necessarily guarantee greater physical mobility and freedom; or the Barthel Index may lack sufficient sensitivity to detect functional change in persons with stroke living in long term care. In other words the range of categories within the Barthel Index may be too broad to detect small functional changes in persons with stroke who have more functional limitations.

Previous studies (Buatois et al., 2008; Whitney et al., 2005) have indicated durations greater than 15 seconds to complete the Five Repetition STS Test (FRSTST) have been linked to greater deficits in instrumental activities of daily living. Although significant improvement in the length of time to complete the FRSTST was obtained, in general, overall achievements may not have been sufficient to have an impact on level of functional independence as measured by the Barthel Activities of Daily Living Index.

The mean number of daily STS practiced (*M* = 3) was less than the intended target (*M* = 11) and perhaps further intensity is needed to see a change in activities of daily living.

Another consideration is the Barthel Index indicates the need for assistance in care (Salter et al., 2012) and may lack sufficient sensitivity in detecting change over time in the chronic stroke population living in LTC. Sometimes improvement does not show up because the presence of another person may be required even though the resident does not require physical assistance (Mahoney & Barthel, 1965). Although the Barthel Index has demonstrated responsiveness in stroke patients during inpatient rehabilitation, this is at a time when participants are likely to have demonstrated changes in disability (Dromerick et al. 2003). Responsiveness is specific to the population being investigated and may be more sensitive to change in different settings over different time frames (Scrivener et al., 2014; Scrivener, Sherrington & Schurr, 2013).

Effects of Intervention on Quality of Life

Positive effects of exercise on perceived quality of life have been described by other studies (Barreca et al., 2004) where perceived quality of life refers to the subjective experience of the individual (Gerritsen et al., 2007). It was hypothesized that performing the STS protocol would lead to improvements in perceived quality of life, as indicated by the general quality of life question described by Gerritsen et al., (2007), “Overall, how would you rate the quality of your life at the moment?” However, despite achieving improved STS performance, no statistical significant association among STS and quality of life was found. Reasons that may account for the lack of significant finding include a sample size too small to detect a statistically significant change; insufficient intensity of STS practice to see a change; the measurement tool lacked sufficient range of possible scores to detect a change (Scrivener et al., 2014); or residents of LTC continue to face other challenges and improved STS performance did not have a significant impact on these. The ability to perform activities of daily living contributes to quality of life of older persons (Singh et al., 2006) and given a significant improvement in functional independence was not found, it may be one reason a statistical significant difference was not found.

Task Specific STS Intervention

A systemic review of rehabilitation for older people in LTC completed by Forster et al. (2011) concluded that there is evidence of successful interventions aimed at improving physical function such as strengthening exercises or functional walking programs, however there is no clear indication of the optimum type of interventions in LTC. Nonetheless, interventions showing the most promise are those targeting task specific activities relevant to the impairments of stroke survivors (de Carvalho Bastone & Filho, 2004; Forster et al., 2011; Huijben-Schoenmakers et al., 2009; Langhorne et al., 2011; Miller et al., 2010; Rensink et al., 2009; Teasell & Kalra, 2004), such as STS. STS is the process of standing from sitting and is a biomechanically demanding task specific activity (Etnyre & Thomas, 2007). LTC residents are challenged with independent STS (Zabel, 2000) and when a resident loses the ability to stand up from a seated position, functional independence in mobility such as transfers and walking is impacted (Janssen et al., 2010; Slaughter et al., 2015).

The results of this study are consistent with the growing evidence that task specific training involving the STS movement is an effective strategy to improve and maintain STS functional performance (Barecca et al., 2004; Britton et al., 2008; Langhammer et al., 2007; Monger et al., 2002; Nitz & Josephson, 2011; Slaughter et al. 2015; Tung & Yang, 2010). A recent study by Slaughter et al. (2015) assessed the effect of the STS activity on the mobility, functional and health related quality of life of nursing home residents with dementia. Similar to the current study, they used health care aides to prompt residents to sit to stand four times a day during routine day to day activities. Although their target population was not specific to stroke, was older and of higher functional mobility at baseline (able to transfer independently or with a one person assist) the results of our study with their research adds support to the concept of a simple mobility intervention integrated into daily routines of health care aides can help slow the decline in mobility and function in activities of daily living of long term care residents. Compared with residents receiving usual care, those who completed the STS activity over six months demonstrated less decline in functional independence and a statistical significant improvement in length of time to complete one STS. Given their intervention was longer and their target population was of higher functional mobility, may be one explanation the current study did not find a positive effect on functional independence and perceived quality of life.

A randomized, controlled, crossover study by Ouslander et al. (2005) conducted in four Veteran Affairs nursing homes also used a similar intervention design, however they used trained research assistants to prompt residents to sit to stand three times a day as part of a Functional Incidental Training (FIT) program. Participants in their study were of similar age, however they had less comorbidities and would have had greater STS independence at baseline given the inclusion criteria indicated they needed two or fewer people for transfers. They observed a significant effect of the FIT intervention on STS performance (reflected by time for first STS, number of STS in 30 seconds and maximum number of STS completed per trial) and of interest, deterioration was observed in outcome measures in the crossover group reinforcing the need for an ongoing intervention to maintain effects.

A number of previous studies have examined the effect of a STS intervention targeting stroke survivors (Barreca et al., 2004; Britton et al., 2008; Dean, Richards & Malouin, 2000; Langhammer et al., 2007; Outermans et al., 2010; Tung & Yang, 2010), however no other study was found specific to stroke survivors living in long term care. Previous study locations include inpatient rehabilitation units and community settings. Intervention designs varied, however all studies examined involved participation in group exercise sessions that included practicing sit to stand. The number of sessions ranged from 5 days to 37 days over a range of 1 week to 1 year (mainly 4 and 12 weeks). Sample size of intervention groups ranged from 12 to 35 participants, and the majority of participants were male. In general, stroke survivors were younger and tended to be more mobile as inclusion criteria requirements included the ability to sit to stand independently and in some studies the ability to walk was a requirement. Although the methodology and outcome measures of interest varied, results of these studies strongly support the concept of consistent repetitive practice of STS with stroke survivors to improve STS performance. Group exercise classes are one way to increase the frequency and intensity of STS practice and the benefits of this approach have been demonstrated, however the current study supports growing evidence (Ouslander et al., 2005; Slaughter et al., 2011, 2015) for an alternative approach incorporating repetitive practice of STS within daily routine functional activities of stroke survivors living in long term care.

Although the task specific STS intervention has been shown to be a promising strategy, both the current study and the study completed by Slaughter et al. (2015) experienced challenges in implementing the STS activity by health care aides and sustaining adherence over time. Slaughter et al. (2015) explains some of the reasons for this challenge, including the involvement of a primary workforce of unregulated health care aides who are task driven (as opposed to driven by care goals) and with an emphasis on getting tasks done quickly.

Despite the implementation challenges and the lower than intended daily number of STS actions practiced, training LTC staff to regularly prompt residents to practice STS appears to be a promising approach. There may be several explanations as to why we saw a significant improvement in STS performance, even with relatively poor practice of the STS protocol. One explanation may be that although staff and participants were asked to record on the daily record sheet the number of STS practiced each day; this may not have been consistently done, therefore underestimating the total number of repetitions completed. Another possibility is that even minimal practicing of the STS protocol has beneficial effects in terms of improved STS independence and time required to perform the STS activity in this population. Previous research has shown that two occasions of STS activity daily can maintain, and in some cases modestly improve, resident mobility (Slaughter et al., 2011). These findings suggest training staff on practicing STS using evidence based therapeutic principles and providing stroke survivors increased opportunity to practice STS with consistent verbal feedback was beneficial for participants. Functional activity is related to the interaction between a person’s health condition and that individual’s contextual factors (environmental and personal factors) as described by the International Classification of Functioning, Disability and Health (ICF) framework (Paanalahti et al., 2013). The findings of this study support the concept that improving environmental physical assistance and support to practice a task specific activity can have a positive impact on the execution of that activity.

Limitations

A number of potential limitations should be noted including the small number of participants and the lack of a control group. The small convenience sample may not be representative of all stroke survivors living in LTC. In addition, a small sample size can decrease power, which may be one reason the STS intervention was not related to any improvement of functional independence in activities of daily living or perceived quality of life. In the absence of a control group it is possible that other unexplained extraneous variables (such as a resident having a bad day when measured at Baseline or another unknown exercise program was simultaneously introduced during the study period) may contribute to the results of this study. This was offset somewhat by the fact study participants came from nine different public LTC facilities and primary outcome measures were repeated at 4 weeks, 8 weeks and 12 weeks providing a degree of assurance changes were not caused by other environment events. A further limitation may be the less than intended number of daily STS practiced. It is possible that increased daily repetitions may have resulted in further improvement in STS independence and length of time to perform STS, which in turn may have contributed to significant changes in functional independence and perceived quality of life. In addition, although the Barthel Activities of Daily Living Index measurement tool has demonstrated responsiveness in stroke patients during inpatient rehabilitation, there may be a more responsive tool to detect changes in functional independence for persons with stroke living in long term care.

Other limitations of this study include the lack of longer term follow up to assess any sustained effectiveness of positive results and no standardized approach for seat height as part of the length of time to perform sit to stand measurement. Although this study supports the feasibility of incorporating STS practice within routine day to day activities, challenges with sustainability have been noted. Further research is required to examine implementation strategies that may contribute to maintaining the effects of the intervention over the long term (Slaughter et al., 2015).

The seating surface most relevant to the current environment of each resident was used for the intervention. This was appropriate for achieving a training effect; however for the purpose of examining length of time to perform STS and contributing to normative data for this population, a standardized approach such as using 120% of lower limb length would have allowed for easier comparison with other studies.

Strengths

In spite of the limitations, this study has several conceptual and methodological strengths. First, subjectivity was minimized as the principle investigator was the only person who administered the standardized measurement tools; secondly, the primary outcome measures chosen for this study have demonstrated high intra-rater reliability and construct validity in the stroke population; thirdly, the study examines participants from all nine public LTC facilities; and fourthly, the design and method used was low cost, specific and clinically relevant, and took place within a real world setting where the intervention is meant to be performed in.

CHAPTER VI – Conclusion

Stroke is a leading cause of disability and longer term rehabilitation strategies are needed to improve and maintain physical function. The majority of rehabilitation research to date has focused on the acute and subacute phases of recovery with less attention to the chronic recovery phase. While there is evidence that interventions in long term care are appropriate and worthwhile, there is no clear indication of the optimum type of interventions. Effective and efficient methods to optimize stroke recovery for persons with stroke living in long term care are needed.

The ability to perform sit to stand independently and safely is a fundamental prerequisite for mobility and functional independence. Persons following stroke are particularly challenged to perform sit to stand due to residual impairments such as hemiparesis and postural control. There are a number and complexity of factors as described by the World Health Organization International Classification of Functioning, Disability and Health (ICF) framework that may affect stroke survivor outcomes. Although all components of the ICF framework are important and any one may interact with another, the major focus of rehabilitation in later stages of stroke recovery is improving functional tasks at the activity level. This study focused on the actual performance of the sit to stand task by creating an environment of support aimed at influencing post stroke recovery. Long term care staff play a key role in incorporating long term rehabilitation strategies to optimize functioning at the activity level and delay functional decline.

The positive results of this study support the growing evidence that consistent repetitive practice using a standardized STS protocol may be beneficial at improving or slowing down the decline of STS performance in stroke survivors living in long term care. One of the challenges in maintaining and/or improving STS performance is sustainable long term rehabilitation strategies. If the findings in this study are typical of other LTC facilities then there is clearly a need to increase opportunities for residents to practice STS. Training usual caregivers in LTC to practice STS as part of day to day clinical practice is a low cost intervention requiring minimal training. LTC staff are uniquely positioned to enhance the quality of STS practice by providing verbal feedback and as well to prompt residents to practice STS at a frequency or “dosage” sufficient to achieve a clinically important response. Despite the challenges of implementing the sit to stand protocol, results of this study support the need to integrate consistent practice of sit to stand as a standard of care for stroke survivors living in long term care. Suggestions for future research include the use of a control group, further work to determine a target number of STS actions per day needed to maintain STS performance with stroke survivors living in LTC and effective implementation strategies to ensure practicing STS in accordance to evidence based clinical practice is embedded within daily routine.

References

Aggarwal, A., & Kean, E. (2010). Comparison of the Folstein Mini Mental State Examination (MMSE) to the Montréal Cognitive Assessment (MoCA) as a cognitive screening tool in an inpatient rehabilitation setting. *Neuroscience and Medicine, 1*(2), 39-42. doi:10.4236/nm.2010.12006

Ascent Strategy Group. (2008). *Final report: Trends, projections and recommended approaches to delivery of long-term care in the province of Prince Edward Island 2007-2017*. Retrieved from http://www.gov.pe.ca/publications/getpublication.php3?number=1472

Barreca, S., Sigouin, C.S., Lambert, C., & Ansley, B. (2004). Effects of extra training on the ability of stroke survivors to perform an independent sit-to-stand: A randomized controlled trial. *Journal of Geriatric Physical Therapy, 27*(2), 59-68. Retrieved from http://0-proquest.umi.com.aupac.lib.athabascau.ca/pqdweb?did=975421811&sid=1&Fmt=1&clientId=12302&RQT=309&VName=PQD

Batchelor, F.A., Hill, K.D., Mackintosh, S.F., Said, C.M., & Whitehead, C.H. (2012). Effects of a multifactorial falls prevention program for people with stroke returning to home after rehabilitation: A randomized control trial. *Archives of Physical Medicine and Rehabilitation, 93*(9), 1648-1655. doi:10.1016/j.apmr.2012.03.031

Berlowitz, D.R., Hoenig, H., Cowper, D.C., Duncan, P.W., & Vofel, W.B. (2008). Impact of comorbidities on stroke rehabilitation outcomes: Does the method matter? *Archives of Physical Medicine and Rehabilitation, 89*(10), 1903-1906.

doi:10.1016/j.apmr.2008.03.024

Berta, W., Laporte, A., Zarnett, D., Valdmanis, V., & Anderson, G. (2006). A pan-Canadian perspective on institutional long-term care. *Health Policy, 79*(2), 175-194. doi:10.1016/j.healthpol.2005.12.006

Bohannon, R.W. (2007). Knee extension strength and body weight determine sit-to-stand independence after stroke. *Physiotherapy Theory and Practice, 23*(5), 291-297. doi:10.1080/09593980701209428

Bohannon, R.W. (2012). Measurement of sit-to-stand among older adults. *Topics in Geriatric Rehabilitation, 28*(1), 11-16. doi:10.1097/TGR.0b013e31823415fa

Bohannon, R.W., Barreca, S.R., Shove, M.E., Lambert, C., Masters, L.M., & Sigouin, C.S. (2008). Documentation of daily sit-to-stands performed by community-dewelling adults. *Physiotherapy Theory and Practice, 24*(6), 437-442. doi:10.1080/09593980802511813

Boukadida, A., Piotte, F., Dehail, P. & Nadeau, S. (2015). Determinants of sit to stand tasks in individuals with hemiparesis post stroke: A review. *Annuals of Physical and Rehabilitation Medicine, 58*(3), 167-172. doi: 10.1016/j.rehab.2015.04.007

Briere, A., Lauziere, S., Gravel, D., & Nadeau, S. (2010). Perception of weight bearing distribution during sit to stand tasks in hemiparetic and healthy individuals. *Stroke, 41*(8), 1704-1708. doi:10.1161/STROKEAHA.110.589473

Britton, E., Harris, N., & Turton, A. (2008). An exploratory randomized controlled trial of assisted practice for improving sit-to stand in stroke patients in the hospital setting. *Clinical Rehabilitation, 22*(5), 458-468. doi:10.1177/0269215507084644

Buatois, S., Miljkovic, D., Manckoundia, P., Gueguen, R., Miget, P., Vancon, G., …

Benetos, A. (2008). Five Times Sit to Stand Test is a predictor of recurrent falls in healthy community living subjects aged 65 and older. *Journal of the American Geriatrics Society, 56*(8), 1575-1577. doi:10.1111/j.1532-5415.2008.01777.x

Canadian Stroke Network. (2011). *The quality of stroke care in Canada*. Retrieved from http://www.strokebestpractices.ca/wp-content/uploads/2011/06/QoSC-EN.pdf

Carr, J., & Shepherd, R. (1994). *Motor Assessment Scale for stroke: Amended version*. Retrieved from http://www.rehabmeasures.org/PDF%20Library/Motor%20Assessment%20Scale%20Testing%20Form.pdf

Carr, J.H., & Shepherd, R.B. (2011). Enhancing physical activity and brain reorganization after stroke. *Neurology Research International, 2011*, article ID 515938, 1-7. doi:10.1155/2011/515938

Carr, J.H., Shepherd, R.B., Nordholm, L., & Lynne, D. (1985). Investigation of a new motor assessment scale for stroke patients. *Physical Therapy, 65*(2), 175-180. Retrieved from http://ptjournal.apta.org/content/65/2/175.long

Chen, Y. (2010). Perceived barriers to physical activity among older adults residing in long term care institutions. *Journal of Clinical Nursing, 19*(3/4), 432-439. doi:10.1111/j.1365-2702.2009.02990.x

Choi, Y., Her, J.G., Ko, J., Ko, D.H., Whoo, J., O'Sullivan, & D., Kim, H. (2013). Effects of chair height and foot position on chronic stroke sit to walk movement. *Journal of Physical Therapy Science, 25*(4), 431-435. doi:10.1589/jpts.25.431

Collin, C., Wade, D.T., Davies, S., & Horne, V. (1988). The Barthel ADL index: A reliability study. *International Disability Study, 10*(2), 61-63. doi:10.3109/09638288809164103

Dahl, T.H. (2002). International Classification of Functioning, Disability and Health: An introduction and discussion of its potential impact on rehabilitation services and research. *Journal of Rehabilitation Medicine, 34*(5), 201-204. doi:10.1080/165019702760279170

de Carvalho Bastone, A., & Filho, W.J., (2004). Effect of an exercise program on functional performance of institutionalized elderly. *Journal of Rehabilitation Research and Development, 41*(5), 659-668. doi:10.1682/JRRD.2003.01.0014

Dean, C.M., & Shepherd, R.B. (1997). Task-related training improves performance of seated reaching tasks after stroke: A randomized controlled trial. *Stroke, 28*(4), 722-728. doi:10.1161/01.STR.28.4.722

Dean, C.M., Richards, C.L., & Malouin, F. (2000). Task-related circuit training improves performance of locomotor tasks in chronic stroke: A randomized, controlled pilot trial. *Archives of Physical Medicine and Rehabilitation, 81*(4), 409 – 417. doi.org/10.1053/mr.2000.3839

Di Monaco, M., Trucco, M., Di Monaco, R., Tappero, R., & Cavanna, A. (2010). The relationship between initial trunk control or postural balance and inpatient rehabilitation outcome after stroke: A prospective comparative study. *Clinical Rehabilitation, 24*(6), 543-554. doi:10.1177/0269215509353265

Dromerick, A.W., Edwards, D.F., & Diringer, M.N. (2003). Sensitivity to changes in disability after stroke: A comparison of four scales useful in clinical trials.

Journal of Rehabilitation Research and Development, 40(1), 1-8. Retrieved from http://www.rehab.research.va.gov/jour/03/40/1/page1.html

Duncan, P.W., Zorowitz, R., Bates. B., Choi, J.Y., Glasberg, J.J., Graham, G.D., … Reker, D. (2005). Management of adult stroke rehabiliation care: A clinical practice guideline. *Stroke, 36e*, e100-e143. doi:10.1161/01.STR.0000180861.54180.FF

Duncan, R.P., Leddy, A.L., & Earhart, G.M. (2011). Five Times Sit to Stand Test performance in Parkinson's disease. *Archives of Physical Medicine and Rehabilitation, 92*(9), 1431-1436. doi:10.1016/j.apmr.2011.04.008

Eichhorn-Kissel, J., Dassen, T. & Lohrmann, C. (2011). Comparison of the responsiveness of the Care Dependency Scale for rehabilitation and the Barthel Index. *Clinical Rehabilitation, 25*(8), 760-767. doi: 10.1177/0269215510397558

Etnyre, B., & Thomas, D.Q. (2007). Event standardization of sit-to-stand movements. *Physical Therapy, 87*(12), 1651-1668. doi:10.2522/ptj.20060378

Ferrarello, F., Baccini, M., Rinaldi, L.A., Cavallini, M.C., Mossello, E., Masotti, G., … Di Bari, M. (2011). Efficacy of physiotherapy interventions late after stroke: A meta-analysis. *Journal of Neurology, Neurosurgery and Psychiatry, 82*(2), 136-143. doi:10.1136/jnnp.2009.196428

Forster, A., Lambley, R., Hardy, J., Young, J., Smith, J., Green, J., & Burns, E. (2011). Rehabilitation for older people in long term care (review). *Cochrane Database of Systemic Reviews* (Issue 1. Art. No.: CD004294). doi:10.1002/14651858.CD004294.pub2

Freedman, V.A., & Schoeni, R.F., (2006). Disability, long term care, and rehabilitation: Emerging questions and data needs. Retrieved from: http://www.nia.nih.gov/NR/rdonlyres/AF0997F6-0C16-4A76-96C0-D3780F00E6D4/4373/FreedmanandSchoeni.pdf

Gadidi, V., Katz-Leurer, M., Carmeli, E., & Bornstein, N. (2011). Long-term outcome poststroke: Predictors of activity limitation and participation restriction. *Archives of Physical Medicine and Rehabilitation, 92*(11), 1802-1808. doi:10.1016j.apmr.2011.06.014

Galvin, R., Cusack, T., & Stokes, E. (2009). To what extent are family members and friends involved in physiotherapy and the delivery of exercises to people with stroke? *Disability and Rehabilitation, 31*(11), 898-905. doi:10.1080/09638280802356369

Gerritsen, D.L., Steverink, N., Ooms, M.E., de Vet, H.C.W., & Ribbe, M.W. (2007). Measurement of overall quality of life in nursing homes through self report: The role of cognitive impairment. *Quality of Life Research, 16*(16). doi:10.1007/s11136-007-9203-7

Green, J., Forster, A., Bogle, S., & Young, J. (2002). Physiotherapy for patients with mobility problems more than 1 year after stroke: A randomized controlled trial. *The Lancet, 359*(9302), 199-203. Retrieved from http://0-search.ebscohost.com.aupac.lib.athabascau.ca/login.aspx?direct=true&AuthType=url,ip,uid&db=a9h&AN=5890630&site=ehost-live

Heart and Stroke Foundation of Prince Edward Island, & Prince Edward Island Department of Health. (2006). *Changing systems: Improving lives: PEI Integrated Stroke Strategy*. Retrieved from www.healthpei.ca/stroke

Health PEI. (2015). *Long-term care*. Retrieved from http://www.healthpei.ca/longtermcare

Hsueh, I.P., Lin, J.H., Jeng, J.S., Hsieh, C.L. (2002). Comparison of the psychometric characteristics of the Functional Independence Measure, 5 item Barthel Index, and 10 item Barthel Index in patients with stroke. *Journal of Neurology, Neurosurgery and Psychiatry, 73*(2), 188-190. Retrieved from http://0-search.proquest.com.aupac.lib.athabascau.ca/docview/195734118?accountid=8408

Huijben-Schoenmakers, M., Gamel, C., & Hafsteinsdottir, T.B. (2009). Filling up the hours: How do stroke patients on a rehabilitation nursing home spend the day? *Clinical Rehabilitation, 23*(12), 1145-1150. doi:10.1177/0269215509341526

Janssen, W., Bussmann, J., Selles, R., Koudstaal, P., Ribbers. G., & Stam, H. (2010). Recovery of the sit to stand movement after stroke: A longitudinal cohort study. *Neurorehabilitation and Neural Repair, 28*(8), 763-769. doi:10.1177/1545968310363584

Kinnear, P.R, & Gray, C.D. (2010). *IBM SPSS statistics made simple*. New York, New York: Taylor & Francis.

Kluding, P., & Gajewski, B. (2009). Lower-extremity strength differences predict activity limitations in people with chronic stroke. *Physical Therapy, 89*(1), 73-81. doi:10.2522/ptj.20070234

Krakauer, J.W. (2006). Motor learning: its relevance to stroke recovery and neurorehabilitation. *Current Opinion in Neurology, 19*(1), 84-90. Retrieved from http://www.jsmf.org/meetings/2008/may/Krakauer_COIN(2006).pdf

Kwakkel, G., Kollen, B., & Lindeman, E., (2004). Understanding the pattern of functional recovery after stroke: Facts and theories. *Restorative Neurology and Neuroscience, 22*(3-5), 281-299. Retrieved from http://0-search.ebscohost.com.aupac.lib.athabascau.ca/login.aspx?direct=true&AuthType=url,ip,uid&db=a9h&AN=14797323&site=ehost-live

Kwung, P., Ng, S., Chung, R., & Ng, G. (2014). Foot placement and arm position affect the five times sit to stand test time of individuals with chronic stroke. *BioMed Research International*, Article ID 636530. doi:10.1155/2014/636530

Langhammer, B., Lindmark, B., & Stanghelee, J.K. (2007). Stroke patients and long term training: Is it worthwhile? A randomized comparison of two different training strategies after rehabilitation. *Clinical Rehabilitation, 21*(6), 495-510. doi:10.1177/0269215507075297

Langhorne, P., Bernhardt, J., & Kwakkel, G., (2011). Stroke care 2: Stroke rehabilitation. *The Lancet, 377*(9778), 1693-1702. Retrieved from: http://0-proquest.umi.com.aupac.lib.athabascau.ca/pqdweb?did=2349541631&sid=1&Fmt=2&clientId=12302&RQT=309&VName=PQD

Lindsay, M. P., Gubitz, G., Bayley, M., Hill, M.D., Davies-Schinkel, C., Singh, S., & Phillips, S. (2010). *Canadian best practice recommendations for stroke care (updated 2010).* Retrieved from http://strokebestpractices.ca/wp-content/uploads/2010/12/2010_BP_ENG.pdf

Liu, M., Domen, K., & Chino, N. (1997). Comorbidity measures for stroke outcome research: A preliminary study. *Archives of Physical Medicine and Rehabilitation, 78*(2), 66-172. doi:10.1016/S0003-9993(97)90259-8

Loewen, S.C., & Anderson, B.A. (1990). Predictors of stroke outcome using objective measurement scales. *Stroke, 21*(1), 78-81. doi:10.1161/01.STR.21.1.78

Mahoney, F.L., Barthel, D.W. (1965). Functional evaluation: The Barthel Index. *Maryland State Medical Journal, 14*(2), 56-61. Retrieved from www.strokecenter.org/wp-content/uploads/2011/08/barthel_reprint.pdf

Miller, E.L., Murray, L., Richards, L., Zorowitz, R.D., Bakas, T., Clark, P., & Billinger, S.A. (2010). Comprehensive overview of nursing and interdisciplinary rehabilitation care of the stroke patient: A scientific statement from the American Heart Association. *Stroke, 41*(10), 2402-2448. doi:10.1161/STR.0b013e3181e7512b

Mong, Y., Teo, T.W., & Ng, S.S. (2010). 5-Repetition Sit to Stand Test in subjects with chronic stroke: Reliability and validity. *Archives of Physical Medicine and Rehabilitation, 91*(3), 407-413. doi:10.1016/j.apmr.2009.10.030

Monger, C., Carr, J.H., & Fowler, V. (2002). Evaluation of a home based exercise and training programme to improve sit to stand in patients with chronic stroke. *Clinical Rehabilitation, 16*(4), 361-367. doi:10.1191/0269215502cr506oa

Morgan, G.A, Gliner, J.A., & Harmon, R.J. (2006). *Understanding and evaluating research in applied and clinical settings*. Mahwah, New Jersey: Lawrence Erlbaum Associates, Inc.

Nasreddine, Z. (2010). *Montreal Cognitive Assessment*. Retrieved from http://www.mocatest.org/pdf_files/instructions/MoCA-Instructions-English_2010.pdf

Ng, S.S.M. (2010). Balance ability, not muscle strength and exercise endurance, determines the performance of hemiparetic subjects on the timed-sit-to-stand test. *American Journal of Physical Medicine and Rehabilitation, 89*(6), 497-504. doi:10.1097/PHM.0b013e3181d3e90a

Nitz, J.C., & Josephson, D.L. (2011). Enhancing functional balance and mobility among older people living in long term care facilities. *Geriatric Nursing, 32*(2), 106-113. doi:10.1016/j.gerinurse.2010.11.004

Ouslander, J.G., Griffiths, P.C., McConnell, E., Riolo, L.R., Kutner, M., & Schnelle, J. (2005). Functional incidental training: A randomized, controlled, crossover trial in Veterans Affairs nursing homes. *Journal of American Geriatrics Society, 53*(7), 1091 – 1100. doi: 10.1111/j.1532-5415.2005.53359.x

Outermans, J., van Peppen, R.P.S., Wittink, H., Takken, T., & Kwakkel, G. (2010). Effects of a high-intensity task-oriented training on gait performance early after stroke: A pilot study. *Clinical Rehabilitation, 24*(11), 979-987. doi:10.1177/0269215509360647

Paanalahti, M., Lundgren-Nilsson, A., Arndt, A., & Sunnerhagen, K.S. (2013). Applying the comprehensive International Classification of Functioning, Disability and Health core sets for stroke framework to stroke survivors living in the community. *Journal of Rehabilitation Medicine, 45*(4), 331-340. doi: 10.2340/16501977-1110

Public Health Agency of Canada. (2009). *Tracking heart disease and stroke in Canada* (Cat: HP32-3/2009E). Retrieved from http://www.phac-aspc.gc.ca/publicat/2009/cvd-avc/pdf/cvd-avs-2009-eng.pdf

Rensink, M., Schuurmans, M., Lindeman, E., & Hafsteinsdottir, T. (2009). Task-oriented training in rehabilitation after stroke: systematic review. *Journal of Advanced Nursing, 65*(4), 737-754. doi: 10.1111/j.1365-2648.2008.04925.x. Epub 2009 Feb 9

Salter, K., Jutai, J., Zettler, L., Moses, M., McClure, J.A., Mays, R., Foley, N., & Teasell, R. (2012). *Outcome measures in stroke rehabilitation*. http://www.ebrsr.com/uploads/Chapter-21-outcome-assessment-SREBR-15_1.pdf

Scrivener, K., Schurr, K., & Sherrington, C. (2014). Responsiveness of the Ten-metre Walk Test, Step Test and Motor Assessment Scale in inpatient care after stroke. *BioMed Central Neurology, 14:129.* doi: 10.1186/1471-2377-14-129

Scrivener, K., Sherrington, C., & Schurr, K. (2013). A systematic review of the responsiveness of lower limb physical performance measures in inpatient care after stroke. *BioMed Central Neurology, 13:4.* doi:10.1186/1471-2377-13-4

Singh, A.S., Chin A Paw, M.J., Bosscher, R.J. & van Mechelen, W. (2006). Cross-sectional relationship between physical fitness components and functional performance in older persons living in long-term care facilities. *Biomedcentral Geriatrics, 6*(4), 1471-2318. doi:10.1186/1471-2318-6-4

Slaughter, S.E., Estabrooks, C.A., Jones, C.A. & Wagg, A.S. (2011). Mobility of vulnerable elders (MOVE): Study protocols to evaluate the implementation and outcomes of a mobility intervention in long term care facilities. *BioMed Central Geriatrics, 11*(Dec 16), 84- 94. doi:10.1186/1471-2318-11-84

Slaughter, S.E., Wagg, A.S., Jones, C.A., Schopflocher, D., Ickert, C., Bamptom, E., … Estabrooks, C.A. (2015). Mobility of vulnerable elders study: Effect of the sit-to-stand activity on mobility, function, and quality of life. *Journal of the American Medical Directors Association, 16*(2), 138-143. doi: 10.1016/j.jamda.2014.07.020

Stolee, P., Hillier, L.M., Webster, F., & O'Callaghan, C. (2006). Stroke care in long-term care facilities in Southwestern Ontario. *Topics in Stroke Rehabilitation*, *13*(4), 97-108. doi:10.1310/tsr1304-97

Sullivan, J.E., Crowner, B.E., Kluding, P.M., Nichols, D., Rose, D.K., Yoshida, R., & Zipp, G.P. (2013). Outcome measures for individuals with stroke: Process and recommendation from the American Physical Therapy Association Neurology Section Task Force. *Physical Therapy, 93*(10), 1383-1396. doi:10.2522/ptj.20120492

Teasell, R.W., & Kalra, L. (2004). Advances in stroke 2003: What's new in stroke rehabilitation. *Stroke,35*(2), 383-385. doi:10.1161/01.STR.0000115937.94104.76

Tung, F., & Yang, Y. (2010). Balance outcomes after additional sit-to-stand training in subjects with stroke: A randomized controlled trial. *Clinical Rehabilitation*, *24*(6), 533-542. doi:10.1177/0269215509360751

Turhan, N., Atalay, A., & Muderrisoglu, H. (2009). Predictors of functional outcome in first-ever ischemic stroke: A special interest to ischemic subtypes, comorbidity and age. *Neurorehabilitation, 24*(4), 321-326. doi:10.3233NRE-2009-0485

Vahakangas, P., Noro, A, & Bjorkgren, M. (2006). Provision of rehabilitation nursing in long term care facilities. *Issues and Innovations in Nursing Practice, 55*(1), 29-35. doi:10.1111/j.1365-2648.2006.03885.x

van der Putten, J.J.M.F., Hobart, J.C., Freeman, J.A., & Thompson, A.J. (1999). Measuring change in disability after inpatient rehabilitation: Comparison of the responsiveness of the Barthel Index and the Functional Independence Measure. *Journal of Neurology, Neurosurgery and Psychiatry, 66*(4), 480-484. Retrieved from http://0-search.proquest.com.aupac.lib.athabascau.ca/docview/195702988?accountid=8408

Wade, D.T. (1992). Stroke: Rehabilitation and long term care. *Lancet, 339*(8796), 791-794. Retrieved from http://0-search.ebscohost.com.aupac.lib.athabascau.ca/login.aspx?direct=true&AuthType=url,ip,uid&db=a9h&AN=9204207004&site=ehost-live

Ward, D., Drahota, A., Gal, D., Severs, M., & Dean, T.P., (2009). Care home versus hospital and own home environments for rehabilitation of older people. *Cochrane Database of Systematic Reviews* (Issue 4. Art. No.: CD003164). doi: 1002/14651858.CD003 164.pub2

Whitney, S.L., Wrisley, D.M., Marchetti, G.F., Gee, M. A., Redfern, M.S., & Furman, J.M. (2005). Clinical measurement of sit to stand performance in people with balance disorders: Validity of data for the Five Times Sit to Stand Test. *Physical Therapy, 85*(10), 1034-1045. Retrieved from http://0-

search.ebscohost.com.aupac.lib.athabascau.ca/login.aspx?direct=true&AuthType=url,ip,uid&db=a9h&AN=18819851&site=ehost-live

Yoshioka, S., Nagano, A., Hay, D., & Fukashiro, S. (2014). Peak hip and knee movements during a sit-to-stand movement are invariant to the change of seat height within the range of low to normal seat height. *BioMedical Engineering Online*, *13*(1), 27. doi: 10.1186/1475-925X-13-27

Zabel, R. (2000). Special feature: Reliability of selected performance measures in older adults residing in long-term care. *Topics of Geriatric Rehabilitation*, *15*(4), 61-67. Retrieved from http://0-search.ebscohost.com.aupac.lib.athabascau.ca/login.aspx?direct=true&AuthType=url,ip,uid&db=rzh&AN=2001005031&site=ehost-live

Appendix A

INFORMATION LETTER AND CONSENT FORM

Title of Study

Sit to Stand Protocol in Long Term Care to Optimize Stroke Recovery

Principal Investigator

Carolyn MacPhail
Graduate Student, Athabasca University
Chronic Disease Prevention and Management Manager
Health PEI
152 St. Peter's Road
PO Box 2000
Charlottetown, PE C1A 7N8
Phone: (902) 368-6721
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Email: clmacphail@gov.pe.ca

Research Committee

Supervisor: Dr. Terra Murray
Athabasca University
1 University Drive
Athabasca, AB T9S 3A3
Phone: 1-866-379-1127
Email: tmurray@athabascau.ca

Dr. Shawn Fraser, Athabasca University
Dr. Steven Johnson, Athabasca University

Introduction

You are invited to join a research study that will be submitted to Athabasca University as part of a Masters Degree requirement. This letter describes the research study to help you decide if you want to be part of the study. Taking part in this study is voluntary. We are asking you to be part of this study as you are a stroke survivor living in a long term care facility. This study is 12 weeks long.

Why is this study being done?

Sit to stand is the act of standing up from a seated position to a standing position. The sit to stand movement is important for your independence. For example, it may help you when moving from a bed to wheelchair, to and from a toilet, or to go from sitting to walking. It may also help prevent falls. The sit to stand exercise in this study is designed to help strengthen your legs and to improve balance. This study is being done to find out if practicing sit to stand with long term care staff will help your ability with sit to stand.

Currently, you may have a physiotherapist come to visit you to assist with exercises, including practicing the sit to stand movement as part of therapy. This study will not interfere with usual care. This study is intended to provide opportunity for extra sit to stand practice.

Why am I being asked to join this study?

You are being asked to join this study because you had a stroke and you live in a long term care facility. This study is taking place in public long term care facilities in Prince Edward Island (PEI). Your long term care Administrator has signed a letter of support for this research study. The principal investigator is not receiving any payment to complete this study.

What happens in this study?

If you choose to take part in this study, a letter will be sent to your physician asking if there are any medical reasons you should not take part in this study. You will be advised if your physician recommends you should not take part. If this happens you will not be able to participate in the study.

If you decide to take part in the study, the principal investigator will collect personal information (for example, your age, height, body weight) and medical information (for example, date of stroke, type of stroke, information about other illnesses you may have) from your medical chart, long term care staff and yourself. This information will be used to describe the people who took part in the study.

The principal investigator, who is a physiotherapist, will assess your sit to stand ability. You will be asked to take part in an assessment of sit to stand on four occasions. Each time will take about 15 to 20 minutes each time. To assess sit to stand ability, you will be asked to sit to stand to see if you can sit to stand without using your hands. If you can sit to stand without using your hands you will be asked to sit to stand five times and the principal investigator will record the time it takes you. The first assessment will take place before long term care staff begin practicing sit to stand with you. Sit to stand ability will be assessed again after 4, 8 and 12 weeks of practice. You will also be asked some questions to measure how your stroke has impacted your life during the first assessment and again during the last assessment (12 weeks).

You will be asked by long term care staff to practice sit to stand 4 times a day. If possible, you will be encouraged to try practicing the sit to stand movement without using your hands to help put more weight through your legs. To ensure you are safe practicing this way, staff will help you. Each time you practice, staff will ask you to do between 3 and 5 sit to stand movements. This should take no more than 1 or 2 minutes each session.

Who can participate in the study?

You may participate in the study if,

- You had a stroke.
- Your permanent residence is a long term care facility.
- You can sit without assistance.
- You can put weight through your legs.

You will not be able to take part in the study if,

- You have other medical conditions that prevent you from practicing sit to stand repeatedly (e.g. up to five times in a row).
- Your doctor recommends you should not participate in practicing repeated sit to stands.
- You are unable to follow the instructions.

Who will be conducting the research?

During the study, you will be in contact with the principal investigator, Carolyn MacPhail who will collect your personal and medical information. Carolyn is a physiotherapist who will conduct all study assessments.

What are the possible risks, side effects, and/or inconveniences?

Your participation in the study is expected to increase your opportunity to practice the sit to stand movement. The sit to stand exercise is designed to encourage you to use your leg muscles. If you are not used to this type of movement you may experience some muscle and/or joint pain. This is a normal response to new physical activity. However, if this occurs, you can tell your nurse, physician and/or the principal investigator, Carolyn MacPhail. If your pain is severe and/or persists you will be directed to a qualified professional for appropriate medical care.

If you currently need help with transfers (e.g. going from bed to a wheelchair), there may be an increased risk for falling if you try to transfer on your own before having sufficient balance control. Make certain your nurse or physiotherapist tells you it is safe for you to do transfers without help.

What are the possible benefits?

You may benefit from the opportunity to practice sit to stands. These benefits may include increased muscle strength in your legs, improved balance control, easier transfers such as from bed to chair, less falls and an overall feeling of well being.

What are my rights as a participant?

You can choose whether or not to take part in this study, you can change your mind at anytime if you want to leave the study, and the care given to you will not be affected (now or in the future) if you decide not to take part or if you choose not to answer certain questions.

If you choose to leave the study after providing written consent, you can do so by contacting the principal investigator, your nurse or other care staff who will inform the principal investigator you wish to stop your participation. If you decide to leave the study, the information about you that was collected before you left the study will still be used, unless you ask to have all your information withdrawn from the study. No new information will be collected.

In no way does signing this consent form affect your legal rights nor does it relieve the principal investigator, sponsors or involved institutions from their legal and professional responsibilities.

What about my right to privacy?

All information collected during this study, including your personal health information, will be kept confidential and will not be shared with anyone outside the study unless required by law. Furthermore, your name will not appear in any report or article published as a result of this study. Any information about you will have a special code and will not show any information that directly identifies you.

The information that is collected for the study will be kept in a locked filing cabinet in a locked office by the principal investigator for five years. After this period, all documents will be destroyed by physically shredding the paper documents. The existence of the research will be listed in an abstract posted online at the Athabasca University Library's Digital Thesis and Project Room; and the final research paper will be publicly available. Information about the results of this study will be shared with your long term care facility staff and with you.

Will it cost me anything?

There are no costs to you to take part in this study. You will not be paid to participate.

Who do I contact if I have questions or problems?

If you have any general questions about the study, please call the principal investigator Carolyn MacPhail at 902-368-6721.

This study has been reviewed by the PEI Research Ethics Board and by the Athabasca University Research Ethics Board. If you have any questions about your rights as a research participant, contact Jennifer Bradley, PEI Research Ethics Coordinator at 902-569-0576. This individual is not involved with the research project in any way and calling her will not affect your participation in the study. Should you have any comments or concerns regarding your treatment as a participant in this study, please contact the Office of Research Ethics at 780-675-6718 or by e-mail to rebsec@athabascau.ca

Consent Signature Page

Title of Study

Sit to Stand Protocol in Long Term Care to Optimize Stroke Recovery

Principal Investigator: Carolyn MacPhail Phone: (902) 368-6721

By signing this form, I agree that: Yes No

- The study has been explained to me. ___ / ___
- All my questions were answered. ___ / ___
- Possible harm and discomforts and possible benefits of of this study have been explained to me. ___ / ___
- I understand that I have the right not to participate and the right to stop at any time. ___ / ___
- I understand that I may refuse to participate without consequence. ___ / ___
- I have a choice of not answering any specific questions. ___ / ___
- I am free now, and in the future, to ask any questions about the study. ___ / ___
- I have been told that my personal information will be kept confidential. ___ / ___
- I understand that no information that would identify me will be released or printed without asking me first. ___ / ___
- I understand that I will receive a signed copy of this consent form. ___ / ___

I have read and understood the information contained in this form, and agree to take part in the study, on the understanding that I may choose not to anwer certain questions, and I may withdraw during the data collection period.

Participant's Name (Please Print) Participant's Signature Date

Signature of Substitute Decision Maker (if indicated) ______________________

I confirm that I have explained the nature and purpose of the study.

Principal Investigator Name Principal Investigator Signature Date

Appendix B

Medical Clearance Letter

Title of Study: Sit to Stand Protocol in Long Term Care to Optimize Stroke Recovery

Principal Investigator
Carolyn MacPhail, BSc Physiotherapy
Graduate Student, Athabasca University
Chronic Disease Prevention and Management Manager
Health PEI, Community Health
152 St. Peter's Road, PO Box 2000
Charlottetown, PE C1A 7N8

Phone: (902) 368-6721
Fax: (902) 368-6936
Email: clmacphail@gov.pe.ca

Dear Dr. ________________________

______________________ a resident of _______________________ has volunteered to participate in a study titled "Sit to Stand Protocol in Long Term Care to Optimize Stroke Recovery" (see attached participant information letter and consent form which explains the study in detail). The purpose of the study is to determine if practicing sit to stand (STS) with stroke survivors residing in long term care will improve STS performance, have positive effects on functional independence and perceived quality of life. STS is a biomechanically demanding activity requiring postural control abilities and extensor strength in the lower extremities, which are often impaired in stroke survivors. There is compelling evidence that practice and repetition of STS is beneficial in improving independent STS, extensor muscle strength, standing balance, functional mobility and quality of life. It is also related to decreasing falls post stroke. Despite this, few investigations have examined the effectiveness of practicing STS by usual caregivers in long term care.

A STS protocol incorporating critical biomechanical features has been developed to increase vertical forces through the lower extremities and to promote symmetrical weight bearing. Given the use of hands decreases the forces in the legs, the use of hands will only be used as necessary. Generally a seat height of 16 inches (the height of a regular toilet) will be encouraged. The principal investigator will train and monitor long term care staff to consistently administer the standardized STS protocol. The goal will be to practice three to five STS actions per session four times per day with a minimum target of 11 to 14 STS actions per day. Physical assistance may be provided when necessary.

Physiotherapists and Occupational Therapists providing services to the facility will be invited to assist in ongoing monitoring and support to long term care staff as per usual care.

Title of Study: Sit to Stand Protocol in Long Term Care to Optimize Stroke Recovery

Physician's Recommendations

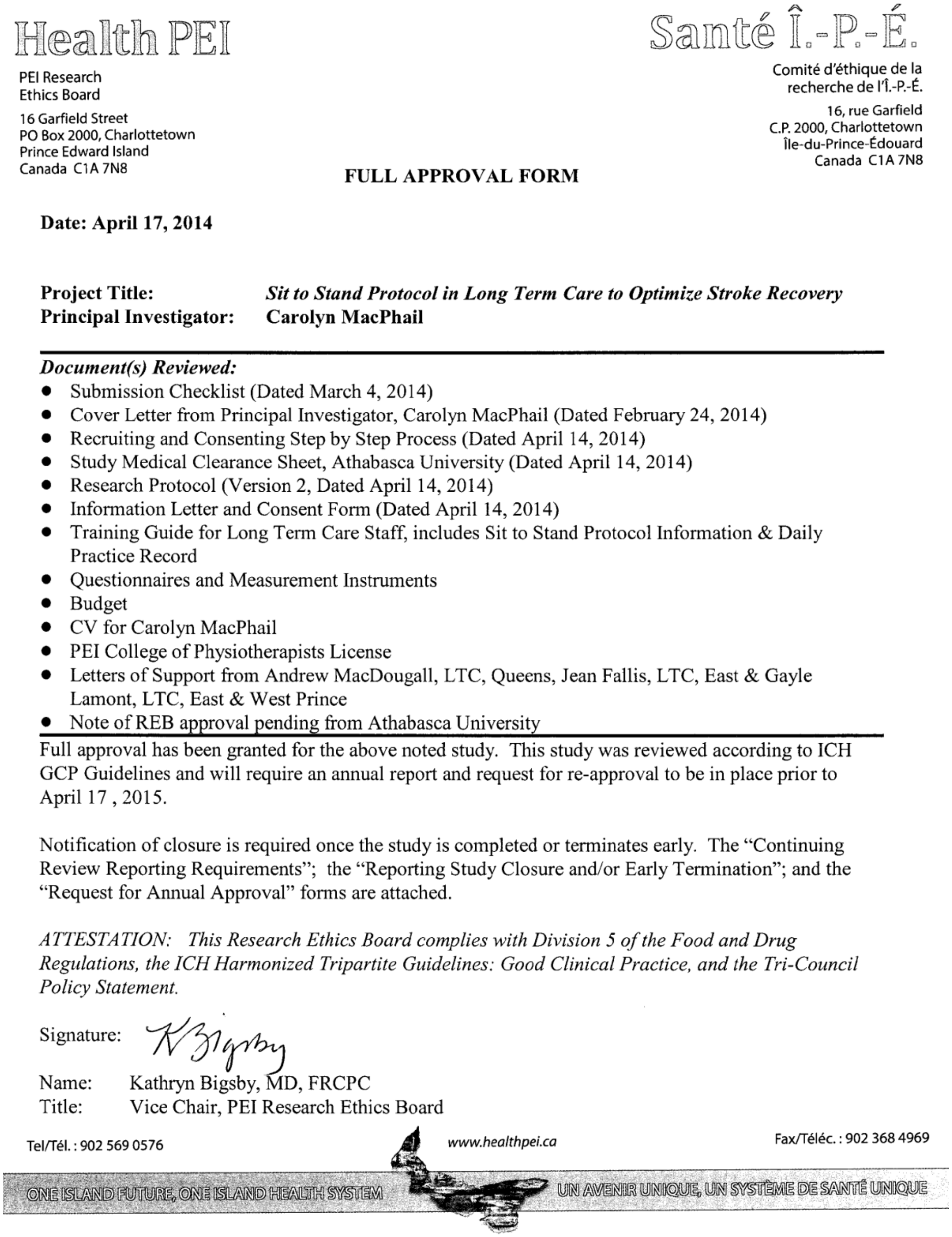
Please check the following recommendation for ___________________________ resident of _________________________ regarding participation in the sit to stand protocol and explain if necessary.

	I am not aware of any contraindications toward participation in the sit to stand protocol.
	I recommend the resident **not** participate in the sit to stand protocol because:
Physician’s signature:	Date:
Phone:	Fax:
Address:	

Any costs associated with the completion of this form will be paid by the principal investigator (Carolyn MacPhail).

Appendix C

Ethics Approval



Health PEI

PEI Research
Ethics Board

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PO Box 2000, Charlottetown
Prince Edward Island
Canada C1A 7N8

Santé Î.-P.-É.

Comité d'éthique de la
recherche de l'Î.-P.-É.

16, rue Garfield
C.P. 2000, Charlottetown
Île-du-Prince-Édouard
Canada C1A 7N8

FULL APPROVAL FORM

Date: April 17, 2014

Project Title: ***Sit to Stand Protocol in Long Term Care to Optimize Stroke Recovery***
Principal Investigator: **Carolyn MacPhail**

Document(s) Reviewed:

- Submission Checklist (Dated March 4, 2014)
- Cover Letter from Principal Investigator, Carolyn MacPhail (Dated February 24, 2014)
- Recruiting and Consenting Step by Step Process (Dated April 14, 2014)
- Study Medical Clearance Sheet, Athabasca University (Dated April 14, 2014)
- Research Protocol (Version 2, Dated April 14, 2014)
- Information Letter and Consent Form (Dated April 14, 2014)
- Training Guide for Long Term Care Staff, includes Sit to Stand Protocol Information & Daily Practice Record
- Questionnaires and Measurement Instruments
- Budget
- CV for Carolyn MacPhail
- PEI College of Physiotherapists License
- Letters of Support from Andrew MacDougall, LTC, Queens, Jean Fallis, LTC, East & Gayle Lamont, LTC, East & West Prince
- Note of REB approval pending from Athabasca University

Full approval has been granted for the above noted study. This study was reviewed according to ICH GCP Guidelines and will require an annual report and request for re-approval to be in place prior to April 17 , 2015.

Notification of closure is required once the study is completed or terminates early. The "Continuing Review Reporting Requirements"; the "Reporting Study Closure and/or Early Termination"; and the "Request for Annual Approval" forms are attached.

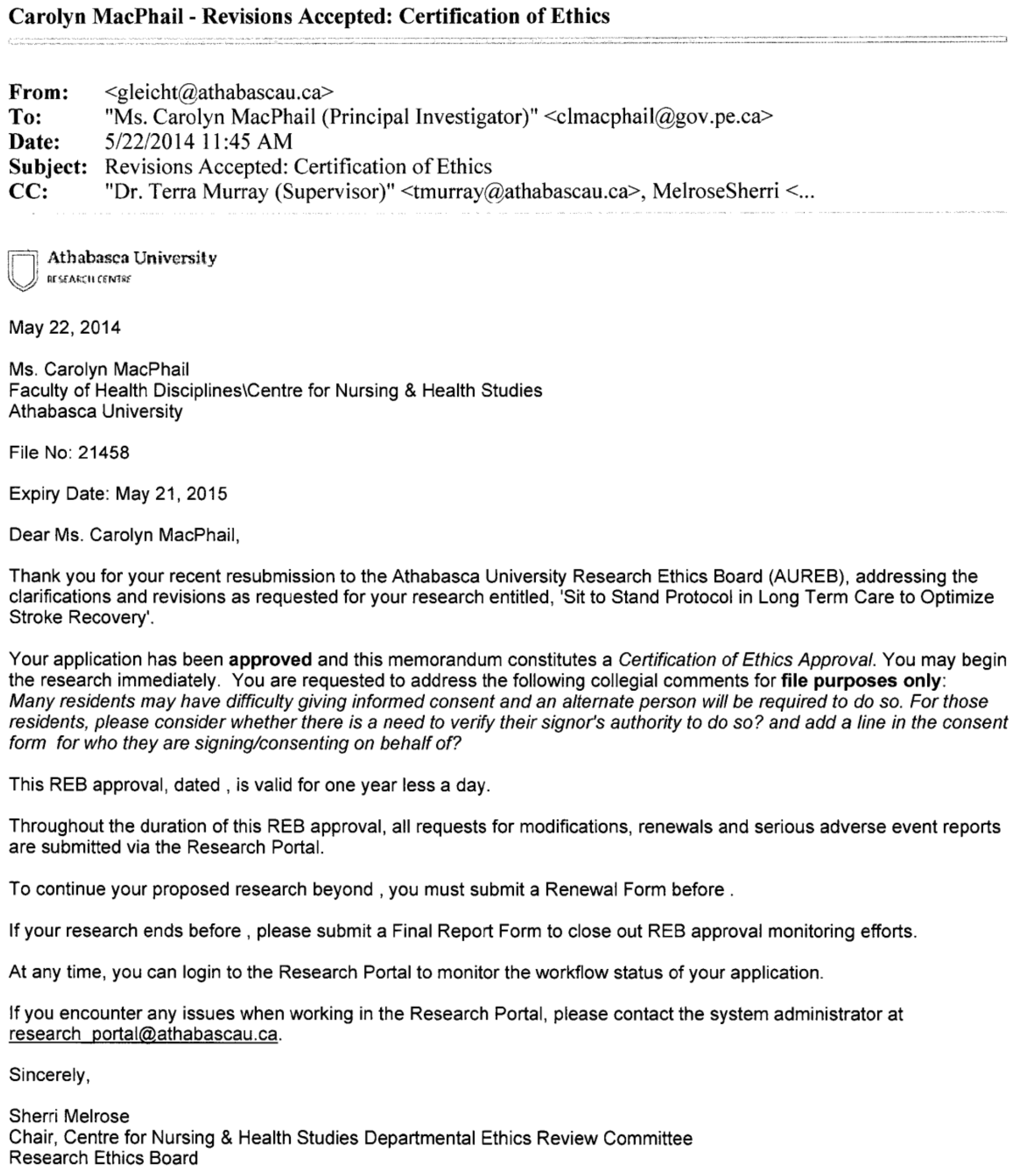
ATTESTATION: This Research Ethics Board complies with Division 5 of the Food and Drug Regulations, the ICH Harmonized Tripartite Guidelines: Good Clinical Practice, and the Tri-Council Policy Statement.

Signature: K Bigsby

Name: Kathryn Bigsby, MD, FRCPC
Title: Vice Chair, PEI Research Ethics Board

Tel/Tél. : 902 569 0576 www.healthpei.ca Fax/Téléc. : 902 368 4969

ONE ISLAND FUTURE, ONE ISLAND HEALTH SYSTEM UN AVENIR UNIQUE, UN SYSTÈME DE SANTÉ UNIQUE



Carolyn MacPhail - Revisions Accepted: Certification of Ethics

From: <gleicht@athabascau.ca>
To: "Ms. Carolyn MacPhail (Principal Investigator)" <clmacphail@gov.pe.ca>
Date: 5/22/2014 11:45 AM
Subject: Revisions Accepted: Certification of Ethics
CC: "Dr. Terra Murray (Supervisor)" <tmurray@athabascau.ca>, MelroseSherri <...

Athabasca University
RESEARCH CENTRE

May 22, 2014

Ms. Carolyn MacPhail
Faculty of Health Disciplines\Centre for Nursing & Health Studies
Athabasca University

File No: 21458

Expiry Date: May 21, 2015

Dear Ms. Carolyn MacPhail,

Thank you for your recent resubmission to the Athabasca University Research Ethics Board (AUREB), addressing the clarifications and revisions as requested for your research entitled, 'Sit to Stand Protocol in Long Term Care to Optimize Stroke Recovery'.

Your application has been **approved** and this memorandum constitutes a *Certification of Ethics Approval.* You may begin the research immediately. You are requested to address the following collegial comments for **file purposes only**:
Many residents may have difficulty giving informed consent and an alternate person will be required to do so. For those residents, please consider whether there is a need to verify their signor's authority to do so? and add a line in the consent form for who they are signing/consenting on behalf of?

This REB approval, dated , is valid for one year less a day.

Throughout the duration of this REB approval, all requests for modifications, renewals and serious adverse event reports are submitted via the Research Portal.

To continue your proposed research beyond , you must submit a Renewal Form before .

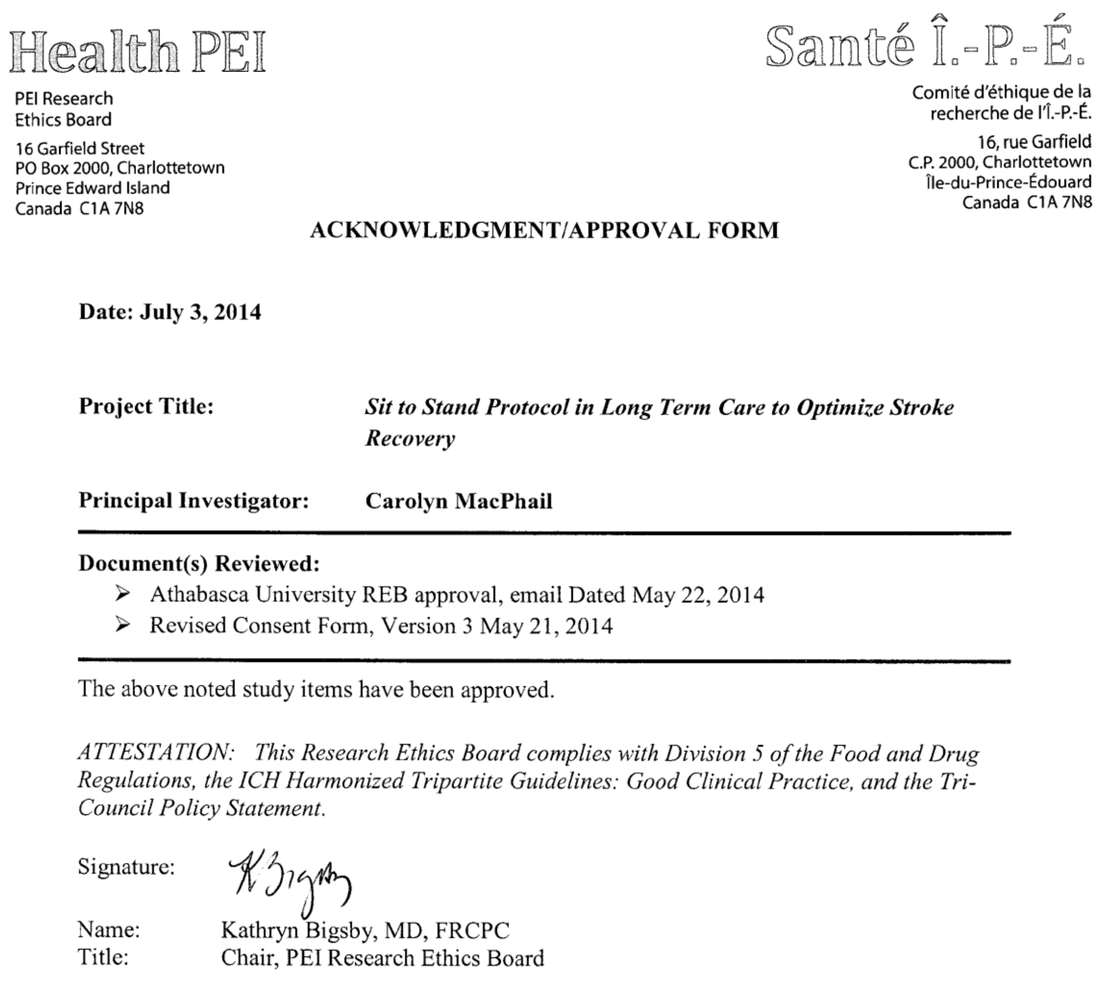
If your research ends before , please submit a Final Report Form to close out REB approval monitoring efforts.

At any time, you can login to the Research Portal to monitor the workflow status of your application.

If you encounter any issues when working in the Research Portal, please contact the system administrator at research_portal@athabascau.ca.

Sincerely,

Sherri Melrose
Chair, Centre for Nursing & Health Studies Departmental Ethics Review Committee
Research Ethics Board



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ACKNOWLEDGMENT/APPROVAL FORM

Date: July 3, 2014

Project Title: ***Sit to Stand Protocol in Long Term Care to Optimize Stroke Recovery***

Principal Investigator: **Carolyn MacPhail**

Document(s) Reviewed:

- Athabasca University REB approval, email Dated May 22, 2014
- Revised Consent Form, Version 3 May 21, 2014

The above noted study items have been approved.

ATTESTATION: This Research Ethics Board complies with Division 5 of the Food and Drug Regulations, the ICH Harmonized Tripartite Guidelines: Good Clinical Practice, and the Tri-Council Policy Statement.

Signature:

Name: Kathryn Bigsby, MD, FRCPC
Title: Chair, PEI Research Ethics Board

Appendix D

Sit to Stand Protocol[1]

Purpose: Repeated practice of sit to stand (STS) is beneficial in improving muscle strength in lower extremities, standing balance, functional independence in STS, quality of life and in decreasing falls.

Indications: Residents who are able to sit independently and are able to weight bear through their lower extremities.

Precautions: Residents with a lower leg amputation, residents who are medically unstable, residents requiring a lot of assistance, residents who have severe cognitive deficits and have difficulty following commands, and residents who are agitated.

Procedure: Prepare the area: check area for tripping hazards in the event the resident decides to walk, position wheelchair if preparing for a transfer. Ensure resident is wearing appropriate non slip footwear. Practice from different seating surfaces. Generally a seat height of 16 inches (the height of a regular toilet) is encouraged. Using hands decreases the forces in the legs, therefore use hands only as necessary. If hands are used, then use of both hands is encouraged (when feasible) to facilitate equal weight bearing through both legs. Encourage independence whenever possible. Minimize verbal cues and gestures as resident improves in STS performance.

Checklist	Verbal Instructions
• Brakes on	"Put your brakes on"
• Footrests out of the way	"Push your footrests back"
• Participant moves bottom forward in chair	"Scoot your bottom forward"
• Feet shoulder width apart	"Feet apart"
• Toes under knees	"Toes under knees"
• Interlock fingers	"Interlock your hands"
• Arms out in front	"Arms out in front"
• Sit tall in the chair	"Sit up tall"
• Nose over knees and stand up in a timely manner	"Nose over your knees and stand up"

Frequency: Goal is to practice three to five STS actions per session four times per day with a minimum of 11 to 14 STS actions per day. Physical assistance may be provided when necessary. Residents are to use a self-selected natural speed.

[1] Adapted from: Barreca, S., Sigouin, C.S., Lambert, C., & Ansley, B. (2004). Effects of extra training on the ability of stroke survivors to perform an independent sit-to-stand: A randomized controlled trial. *Journal of Geriatric Physical Therapy, 27*(2), 59-68.

Appendix E

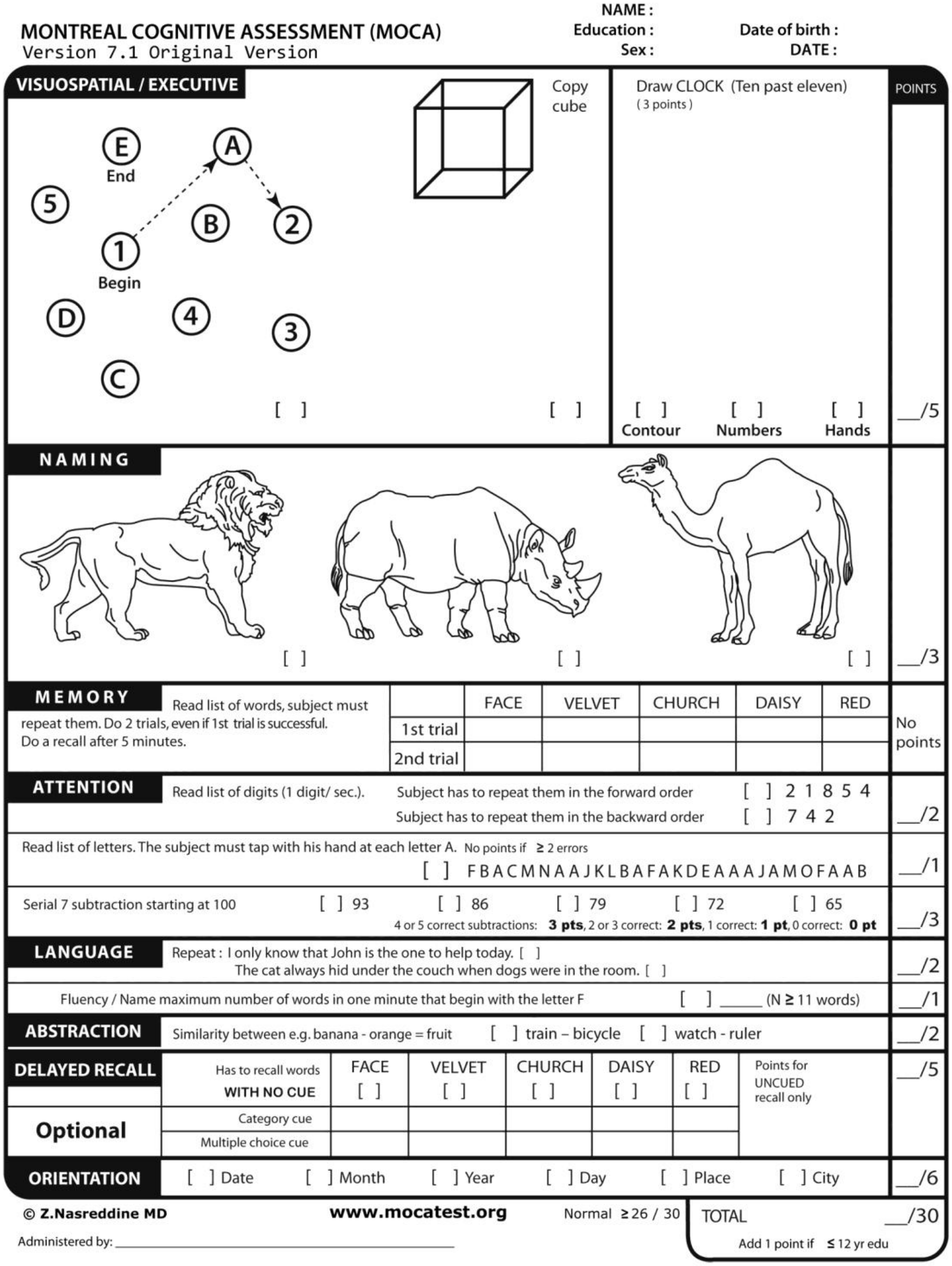
Charlson Comorbidity Index (Liu, Domen, & Chino, 1997)

Score	Condition
1	Myocardial infraction (history, not ECG changes only)
	Congestive heart failure
	Peripheral vascular disease (includes aortic aneurysm ≥ 6cm)
	Cerebrovascular disease: CVA with mild or no residual or TIA
	Dementia
	Chronic pulmonary disease
	Connective tissue disease
	Peptic ulcer disease
	Mild liver disease (without portal hypertension, includes chronic hepatitis)
	Diabetes without end-organ damage (excludes diet-controlled alone)
2	Hemiplegia
	Moderate or severe renal disease
	Diabetes with end-organ damage (retinopathy, neuropathy, nephropathy, or brittle diabetes)
	Tumor without metastases (exclude if >5 y from diagnosis)
	Leukemia (acute or chronic)
	Lymphoma
3	Moderate or severe liver disease
6	Metastatic solid tumor
	AIDS (not just HIV positive)

NOTE. For each decade > 40 years of age, a score of 1 is added to the above score. Abbreviations: ECG, electrocardiogram; CVA, cerebrovascular accident; TIA, transient ischemic attack; AIDS, acquired immunodeficiency syndrome; HIV, human immunodeficiency virus.

Appendix F

Montreal Cognitive Assessment (MoCA) (Nasreddine, 2010)



MONTREAL COGNITIVE ASSESSMENT (MOCA)
Version 7.1 Original Version

NAME :
Education : **Date of birth :**
Sex : **DATE :**

VISUOSPATIAL / EXECUTIVE

[ ]

Copy cube [ ]

Draw CLOCK (Ten past eleven) (3 points)

[ ] **Contour** [ ] **Numbers** [ ] **Hands**

POINTS: ___/5

NAMING

[ ] [ ] [ ] ___/3

MEMORY Read list of words, subject must repeat them. Do 2 trials, even if 1st trial is successful. Do a recall after 5 minutes.

	FACE	VELVET	CHURCH	DAISY	RED	
1st trial						No points
2nd trial						

ATTENTION Read list of digits (1 digit/ sec.).

Subject has to repeat them in the forward order [ ] 2 1 8 5 4

Subject has to repeat them in the backward order [ ] 7 4 2 ___/2

Read list of letters. The subject must tap with his hand at each letter A. No points if ≥ 2 errors

[ ] F B A C M N A A J K L B A F A K D E A A A J A M O F A A B ___/1

Serial 7 subtraction starting at 100 [ ] 93 [ ] 86 [ ] 79 [ ] 72 [ ] 65

4 or 5 correct subtractions: **3 pts**, 2 or 3 correct: **2 pts**, 1 correct: **1 pt**, 0 correct: **0 pt** ___/3

LANGUAGE Repeat : I only know that John is the one to help today. [ ]
The cat always hid under the couch when dogs were in the room. [ ] ___/2

Fluency / Name maximum number of words in one minute that begin with the letter F [ ] _____ (N ≥ 11 words) ___/1

ABSTRACTION Similarity between e.g. banana - orange = fruit [ ] train – bicycle [ ] watch - ruler ___/2

DELAYED RECALL	Has to recall words **WITH NO CUE**	FACE [ ]	VELVET [ ]	CHURCH [ ]	DAISY [ ]	RED [ ]	Points for UNCUED recall only	___/5
Optional	Category cue							
	Multiple choice cue							

ORIENTATION [ ] Date [ ] Month [ ] Year [ ] Day [ ] Place [ ] City ___/6

© Z.Nasreddine MD **www.mocatest.org** Normal ≥26 / 30 TOTAL ___/30

Add 1 point if ≤ 12 yr edu

Administered by: ____________________

Administration and Scoring Instructions MoCA (Nasreddine, 2010)

1. Alternating Trail Making:

Administration: The examiner instructs the subject: *"Please draw a line, going from a number to a letter in ascending order. Begin here* [point to (1)] *and draw a line from 1 then to A then to 2 and so on. End here* [point to (E)]."

Scoring: Allocate one point if the subject successfully draws the following pattern: 1 −A- 2- B- 3- C- 4- D- 5- E, without drawing any lines that cross. Any error that is not immediately self-corrected earns a score of 0.

2. Visuoconstructional Skills (Cube):

Administration: The examiner gives the following instructions, pointing to the cube: *"Copy this drawing as accurately as you can, in the space below".*

Scoring: One point is allocated for a correctly executed drawing.

- Drawing must be three-dimensional
- All lines are drawn
- No line is added
- Lines are relatively parallel and their length is similar (rectangular prisms are accepted)

A point is not assigned if any of the above-criteria are not met.

3. Visuoconstructional Skills (Clock):

Administration: Indicate the right third of the space and give the following instructions: *"Draw a clock. Put in all the numbers and set the time to 10 after 11".*

Scoring: One point is allocated for each of the following three criteria:

- Contour (1 pt.): the clock face must be a circle with only minor distortion acceptable (e.g., slight imperfection on closing the circle);
- Numbers (1 pt.): all clock numbers must be present with no additional numbers; numbers must be in the correct order and placed in the approximate quadrants on the clock face; Roman numerals are acceptable; numbers can be placed outside the circle contour;
- Hands (1 pt.): there must be two hands jointly indicating the correct time; the hour hand must be clearly shorter than the minute hand; hands must be centered within the clock face with their junction close to the clock centre.

A point is not assigned for a given element if any of the above-criteria are not met.

4. Naming:

Administration: Beginning on the left, point to each figure and say: *"Tell me the name of this animal".*

Scoring: One point each is given for the following responses: (1) lion (2) rhinoceros or rhino (3) camel or dromedary.

5. Memory:

Administration: The examiner reads a list of five words at a rate of one per second, giving the following instructions: *"This is a memory test. I am going to read a list of words that you will have to remember now and later on.Listen carefully. When I am through, tell me as many words as you can remember. It doesn't matter in what order you say them".* Mark a check in the allocated space for each word the subject produces on this first trial. When the subject indicates that (s)he has finished (has recalled all words), or can recall no more words, read the list a second time with the following instructions: "*I am going to read the same list for a second time. Try to remember and tell me as many words as you can, including words you said the first time."* Put a check in the allocated space for each word the subject recalls after the second trial. At the end of the second trial, inform the subject that (s)he will be asked to recall these words again by saying, "*I will ask you to recall those words again at the end of the test.*"

Scoring: No points are given for Trials One and Two.

6. Attention:

Forward Digit Span: Administration: Give the following instruction: "*I am going to say some numbers and when I am through, repeat them to me exactly as I said them".* Read the five number sequence at a rate of one digit per second.

Backward Digit Span: Administration: Give the following instruction: "*Now I am going to say some more numbers, but when I am through you must repeat them to me in the backwards order."* Read the three number sequence at a rate of one digit per second.

Scoring: Allocate one point for each sequence correctly repeated, (*N.B.:* the correct response for the backwards trial is 2-4-7).

Vigilance: Administration: The examiner reads the list of letters at a rate of one per second, after giving the following instruction: "*I am going to read a sequence of letters. Every time I say the letter A, tap your hand once. If I say a different letter, do not tap your hand".*

Scoring: Give one point if there is zero to one errors (an error is a tap on a wrong letter or a failure to tap on letter A).

Serial 7s: Administration: The examiner gives the following instruction: "*Now, I will ask you to count by subtracting seven from 100, and then, keep subtracting seven from your answer until I tell you to stop."* Give this instruction twice if necessary.

Scoring: This item is scored out of 3 points. Give no (0) points for no correct subtractions, 1 point for one correction subtraction, 2 points for two-to-three correct subtractions, and 3 points if the participant successfully makes four or five correct subtractions. Count each correct subtraction of 7 beginning at 100. Each subtraction is evaluated independently; that is, if the participant responds with an incorrect number but continues to correctly subtract 7 from it, give a point for each correct subtraction. For example, a participant may respond "92 – 85 – 78 – 71 – 64" where the "92" is incorrect, but all subsequent numbers are subtracted correctly. This is one error and the item would be given a score of 3.

7. Sentence repetition:

Administration: The examiner gives the following instructions: "*I am going to read you a sentence. Repeat it after me, exactly as I say it* [pause]*: I only know that John is the one to help today.*" Following the response, say: "*Now I am going to read you another sentence. Repeat it after me, exactly as I say it* [pause]*: The cat always hid under the couch when dogs were in the room."*

Scoring: Allocate 1 point for each sentence correctly repeated. Repetition must be exact. Be alert for errors that are omissions (e.g., omitting "only", "always") and substitutions/additions (e.g., "John is the one who helped today;" substituting "hides" for "hid", altering plurals, etc.).

8. Verbal fluency:

Administration: The examiner gives the following instruction: "*Tell me as many words as you can think of that begin with a certain letter of the alphabet that I will tell you in a moment. You can say any kind of word you want, except for proper nouns (like Bob or Boston), numbers, or words that begin with the same sound but have a different suffix, for example, love, lover, loving. I will tell you to stop after one minute. Are you ready?* [Pause] *Now, tell me as many words as you can think of that* *begin with the letter F.* [time for 60 sec]. *Stop."*

Scoring: Allocate one point if the subject generates 11 words or more in 60 sec. Record the subject's response in the bottom or side margins.

9. Abstraction:
Administration: The examiner asks the subject to explain what each pair of words has in common, starting with the example: "*Tell me how an orange and a banana are alike"*. If the subject answers in a concrete manner, then say only one additional time: "*Tell me another way in which those items are alike"*. If the subject does not give the appropriate response (*fruit*), say, "*Yes, and they are also both fruit.*" Do not give any additional instructions or clarification. After the practice trial, say: "*Now, tell me how a train and a bicycle are alike".* Following the response, administer the second trial, saying: "*Now tell me how a ruler and a watch are alike".* Do not give any additional instructions or prompts.

Scoring: Only the last two item pairs are scored. Give 1 point to each item pair correctly answered. The following responses are acceptable:

Train-bicycle = means of transportation, means of travelling, you take trips in both;
Ruler-watch = measuring instruments, used to measure.

The following responses are not acceptable: Train-bicycle = they have wheels; Ruler-watch = they have numbers.

10. Delayed recall:
Administration: The examiner gives the following instruction: "*I read some words to you earlier, which I asked you to remember. Tell me as many of those words as you can remember.* Make a check mark (√) for each of the words correctly recalled spontaneously without any cues, in the allocated space.

Scoring: Allocate 1 point for each word recalled freely without any cues.

11. Orientation:
Administration: The examiner gives the following instructions: "*Tell me the date today"*. If the subject does not give a complete answer, then prompt accordingly by saying: *"Tell me the [year, month, exact date, and day of the week]."* Then say: *"Now, tell me the name of this place, and which city it is in."*

Scoring: Give one point for each item correctly answered. The subject must tell the exact date and the exact place (name of hospital, clinic, office). No points are allocated if subject makes an error of one day for the day and date.

TOTAL SCORE: Sum all subscores listed on the right-hand side. Add one point for an individual who has 12 years or fewer of formal education, for a possible maximum of 30 points. A final total score of 26 and above is considered normal.

Appendix G

Sit to Stand Item of the Motor Assessment Scale (Carr & Shepherd, 1994)

Scoring Criteria

1. Gets to standing with help from therapist. (Any method).
2. Gets to standing with stand-by help. (Weight unevenly distributed, uses hands for support.)
3. Gets to standing. (Do not allow uneven weight distribution or help from hands.)
4. Gets to standing and stand for five seconds with hips and knees extended. (Do not allow uneven weight distribution.)
5. Sitting to standing to sitting with no stand-by help. (Do not allow uneven weight distribution. Full extension of hips and knees.)
6. Sitting to standing to sitting with no stand-by help three times in 10 seconds. (Do not allow uneven weight distribution.)

General rules for administering

1. The test should preferably be carried out in a quiet private area.
2. The test should be carried out when resident is maximally alert.
3. Resident should be dressed in suitable day clothes.
4. Scoring is recorded on a scale of zero to six.
5. Stand-by help means that the therapist stands by and may steady the resident but must not actively assist.
6. Since the scale is designed to score best performance, the therapist should give general encouragement but should not give specific feedback on whether response is correct or incorrect.
7. Instructions should be repeated and demonstrations given to resident if necessary.
8. The resident should be informed when being timed.

Participants are provided three trials and the best performance observed is recorded

Appendix H

The Five Repetition Sit to Stand Test (Bohannon, 2012)

Prerequisite

Participant must be able to rise independently without the use of hands from a chair. If a participant is unable to rise independently their score is zero.

Method

Use a slightly padded straight back chair that is about 17” high. Stabilize the chair, preferably against a wall. Ask participant to come forward in the chair seat until the feet are flat on the floor. Ask the participant to fold the upper limbs across the chest if possible.

Instructions

Test trial instructions.

> “Stand up all the way and sit down once without using the upper limbs”. If able to complete the maneuver without the upper limbs or physical assistance continue with testing.

Test instructions.

> “Stand up all the way and sit down landing firmly, as fast as possible, five times without using the arms”. Guard the patient as necessary.

Measurement

Begin timing on the command “go” and cease timing on landing after the fifth stand up. Abort the test and start over again if the patient fails to stand up all the way or sit down firmly.

Appendix I

The Barthel Activities of Daily Living Index (Mahoney & Barthel, 1965)

Patient Name: ___________________ **Rater:** ___________________ **Date:** ___/___	
Activity	**Score**
Feeding 0 = unable 5 = needs help cutting, spreading butter, etc., or requires modified diet 10 = independent	0 5 10
Bathing 0 = dependent 5 = independent (or in shower)	0 5
Grooming 0 = needs to help with personal care 5 = independent face/hair/teeth/shaving (implements provided)	0 5
Dressing 0 = dependent 5 = needs help but can do about half unaided 10 = independent (including buttons, zips, laces, etc.)	0 5 10
Bowels 0 = incontinent (or needs to be given enemas) 5 = occasional accident 10 = continent	0 5 10
Bladder 0 = incontinent, or catheterized and unable to manage alone 5 = occasional accident 10 = continent	0 5 10
Toilet Use 0 = dependent 5 = needs some help, but can do something alone 10 = independent (on and off, dressing, wiping)	0 5 10
Transfers (bed to chair and back) 0 = unable, no sitting balance 5 = major help (one or two people, physical), can sit 10 = minor help (verbal or physical) 15 = independent	0 5 10 15
Mobility (on level surfaces) 0 = immobile or < 50 yards 5 = wheelchair independent, including corners, > 50 yards 10 = walks with help of one person (verbal or physical) > 50 yards 15 = independent (but may use any aid; for example, stick) > 50 yards	0 5 10 15
Stairs 0 = unable 5 = needs help (verbal, physical, carrying aid) 10 = independent	0 5 10
TOTAL (0 - 100)	________

The Barthel Activities of Daily Living Index (Mahoney & Barthel, 1965)

Guidelines

1. The index should be used as a record of what a patient does, not as a record of what a patient could do.
2. The main aim is to establish degree of independence from any help, physical or verbal, however minor and for whatever reason.
3. The need for supervision renders the patient not independent.
4. A patient's performance should be established using the best available evidence. Asking the patient, friends/relatives and nurses are the usual sources, but direct observation and common sense are also important. However direct testing is not needed.
5. Usually the patient's performance over the preceding 24-48 hours is important, but occasionally longer periods will be relevant.
6. Middle categories imply that the patient supplies over 50 per cent of the effort.
7. Use of aids to be independent is allowed.

Appendix J

Quality of Life Visual Analog Scale (Gerritsen, Steverink, Ooms, de Vit, & Ribbe, 2007)

“Overall, how would you rate the quality of your life at the moment?”

Bad Moderate Good Very Good Excellent

1 = *Bad*

2 = *Moderate*

3 = *Good*

4 = *Very Good*

5 = *Excellent*