1-1-2013

Usefulness of the MMS and S5 for Assessing Medication Management Capacity for Clients Post-Stroke

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Capstone Project

Usefulness of the MMS and S5 for Assessing Medication Management Capacity for Clients Post-Stroke

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August 2013
Abstract

Occupational therapists need a means to efficiently and accurately screen a client’s medication management capacity, especially for clients post-stroke. Most therapists are not aware of, nor do they utilize specific assessments for medication management capacity, partly due to lack of thorough assessments. The purpose of this study was to compare the scores of the ManageMed Screen (MMS), the Screening for Self-Medication Safety Post Stroke (S5), and the Montreal Assessment of Cognition (MoCA) on a population of rehabilitation clients post-stroke to evaluate consistency of scores and determine their usefulness in clinical practice. All screens were designed for use in occupational therapy; the MMS was validated for the general adult population, the S5 for clients post-stroke, and the MoCA is a cognitive screen used with adult clients with a variety of diagnoses including stroke. The MoCA was used to explore the potential relationship between cognition and medication management capacity. Study participants included five clients post-stroke and three occupational therapists. Clients were screened by the occupational therapists with the MMS, S5, and MoCA, and clinicians also participated in a focus group to assess their perceived usefulness of the screens. Results demonstrated that the MMS was consistent with the S5 in identifying the clients who performed the poorest. The MoCA has no consistent relationship with either the MMS or S5. Additionally, through a focus group, clinicians deemed both the MMS and S5 as useful, but felt the MMS was a more useful screen for their clinical practice in regards to efficient and practical use with clients post-stroke in a rehabilitation setting.
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Introduction

This capstone paper presents combined findings from quantitative and qualitative studies conducted to determine the usefulness of two fairly new medication management screens in occupational therapy practice. The first few sections of this paper provide a background to the topic, a literature review highlighting key factors of cognition, stroke medication and issues pertinent to medication management capacity post-stroke. Medication management capacity screens and a statement of the problem for this capstone follows. The research study is then presented in the methodology section outlining the design, participants, instrumentation and procedure. Results and discussion ensue with a conclusion on the usefulness (e.g. accuracy, efficiency and practicality) of the medication management capacity screens. This paper ends with the implications for occupational therapy practice and suggestions for future research.

Background

The capacity for medication management is of eminent concern for health professionals as there is an increase in chronic disease and medication dependency among older adults (Orwig, Brandt, & Gruber-Baldini, 2006; Robnett, Dionne, Jacques, Lachance, & Mailhot, 2007). Poor medication management is related to an increased number of medication errors, hospital admissions and higher mortality rates in the older adult and those with chronic health issues, such as stroke (Elliott & Marriott, 2009; Hayes, Larimer, Adami, & Kaye, 2009). Medication management capacity is the result of intact higher level cognitive skills which enable a person to be independent and safe with this task. In our practice, occupational therapists are charged with assessing medication management capacity as it can impact independence and safety with daily functioning.
Statement of the Problem

Best practice in occupational therapy would indicate the use of comprehensive and psychometrically strong tools for client assessment when available (AOTA, 2008). In current practice, specifically in the rehabilitation setting, one often will find clinicians using clinical inference from observation of activities of daily living or ‘home grown’ screens or questionnaires to assess medication management capacity. Health professionals, such as occupational therapists, are not good at predicting a client’s ability with medication management based on observation; functional ability of this task is not always detected in routine assessments or observations (Elliott & Marriott, 2009). Wales, Clemson, Lannin & Cameron (2012) found that occupational therapists often do not use standardized assessment in practice due to their readiness, skill, time commitments, “motivation, self-confidence, lack of support from management, personal values and beliefs and lack of knowledge” or awareness of the availability of assessments (p. 2). Clinical judgment of performance of functional tasks, such as medication management, when completed in an unstructured and non-standardized manner, leads to decreased legitimacy and limited contributions to evidence-based outcomes in occupational therapy (Doucet & Gutman, 2013; Elliott & Marriott, 2009). Using standardized and normed instruments in clinical practice can assist with efficiency, documentation of changes in status, and improves overall effectiveness of occupational therapy practice (Doucet, 2013). Thus the approach to medication management capacity screening traditionally has not been standardized in occupational therapy, most likely due to lack of awareness of available screens and/or screens are not available for a specific population, such as clients post-stroke.
There are about a dozen screens in the open market labeled as medication management capacity screens (Appendix A); however upon further review of these screens we find many are not appropriate for use with clients post-stroke as they lack research on this population and key components within the screen specifically to assess cognitive and physical skills of clients post-stroke. The literature also indicates that assessing cognition alone does not equate to an accurate screen for medication management capacity, and for the stroke population physical performance must also be assessed (Donovan et al. 2008). Thus some of the screens only address cognition. Furthermore, many of these screens are profession specific (not occupational therapy), diagnosis specific (not stroke), or do not measure medication capacity, but rather adherence patterns.

When reviewing the literature on medication management capacity, the reader will find a plethora of research articles which discuss medication compliance or adherence. What is of concern for this capstone is the capacity to follow a medication routine based on a client’s cognitive and physical performance (not their choice to adhere to their prescribed medication routine). For a client post-stroke, the ability to manage medications can be impacted by changes in communication skills, physical abilities, cognition, behavior, sensation and visual-perception (Kaizer, Kim, Van, & Korner-Bitensky, 2010). Up to 65% of stroke survivors demonstrate changes in cognitive function including attention deficits, memory deficits, and spatial neglect, all of which can impact functional recovery and safety with medication management (Donovan et al., 2008; Wolf, 2006). To ensure clients post-stroke have the physical and cognitive skills for safe medication management, screens that are valid and reliable for this population to
assess these skills are needed. For this capstone, the focus will be specifically on clients post-stroke as this population typically will present with cognitive and physical performance deficits that can impact their capacity for safe and independent medication management.

Consensus from the literature also indicates that there is currently no gold standard assessment (e.g. best performing test) to measure medication management capacity in typical adults, let alone for those with specific diagnoses such as stroke (Elliott & Marriott, 2009; Donovan et al., 2008). There are about a dozen medication management screens that have been used over a few decades in various professions, but all have short-comings for use in occupational therapy and/or for clients post-stroke. As of early 2007, no published instrument with sufficient evidence of reliability and validity has been published to enable its recommendation for routine use in clinical practice (Elliott & Marriott, 2009).

Since 2007, two medication management screens have been developed and were found to be appropriate for use in occupational therapy: the ManageMed Screen (MMS) and the Screening for Self-Medication Safety Post Stroke (S5) (Robnett et al., 2007; Kaizer et al., 2010). The MMS and S5 were developed to meet the need for occupational therapists by addressing cognitive and physical performance skills required for medication management. The MMS was specifically developed by occupational therapists for assessing medication management with the general adult population; it is able to differentiate between adults who need assistance and those who are independent with this task (Robnett et al., 2007). The MMS is standardized and has undergone validation studies as well (Robnett et al., 2007). The S5 was developed for occupational
therapists to assess medication management capacity for clients post-stroke (Kaizer et al., 2010). The S5 has undergone only one pilot testing by its authors for use with adult clients post-stroke; thus the S5 has limited data to support its reliability and validity. These screens continue to need clinical research to support their use in specific client populations, such as stroke. In a rehabilitation setting for clients post-stroke, clinicians need a practical screen(s) that will accurately and efficiently assess each client’s cognitive and physical skills required to manage their medications. Clinicians generally are not using standardized assessments nor is there a gold standard for medication management capacity screening. This study will review two screens to address this need in clinical practice.

**Research Aim**

The purpose of this capstone was to determine which screen(s) is the most useful for occupational therapists based on quantitative and qualitative data. Assessing if the MMS and S5 are consistent in identifying clients who have poor medication management capacity skills can provide occupational therapists with more screening tools to use in practice, as there is a lack of standardized assessments for clients post-stroke to assess medication management capacity (StrokEngine, 2013a). Furthermore, qualitative information about these screens can give insight into their usefulness (defined for this capstone as accuracy, efficiency, and practicality) in clinical practice. Therefore, this capstone pilot study’s aim is to answer the following questions:
**Research Questions**

1. How consistent are the ManageMed Screen (MMS) and the Screening for Self-Medication Safety Post-Stroke Scale (S5) scores for assessing capacity in medication management?

2. How consistent are the ManageMed Screen (MMS) and the Screening for Self-Medication Safety Post Stroke Scale (S5) scores compared to the Montreal Cognitive Assessment (MoCA) for assessing cognition as an indicator for capacity in medication management?

3. Which of the medication management screening tools (or aspects of each screen) offer the most clinically relevant information to help inform decision making for treatment and discharge planning for medication management capacity for occupational therapy practitioners?
Literature Review

Introduction

This review provides a synopsis of literature about medication management capacity versus medication adherence, cognitive and physical performance deficits that are essential to consider when reviewing currently available medication management screens, and performance factors impacted by medications which clients post-stroke may be taking. Additionally, a summary of medication management screens used across different professions will be presented to highlight the need to assess these particular medication management screens for continued use in occupational therapy. The literature review will conclude with a rationale for the need for this capstone study in which specific medication management screens are compared for use with clients post-stroke and their impact on clinical practice in occupational therapy is investigated.

Medication Adherence versus Medication Management Capacity

In the literature, the terms medication capacity and medication adherence are often used interchangeably, when in fact these terms are fundamentally different. Medication adherence speaks to patterns or reasons individuals are not taking medications and not to the capacity to do so (Orwig, Brandt & Gruber-Baldini, 2006). Adhering to medications does not equate capacity to manage medications; for example, a client may be able to administer their medications daily, but perhaps are not able to follow the proper dose or instructions. Non-adherence includes client reasons for not taking medications routinely, which may be due to difficult medication schedules, lack of education on use of the medicine, lack of counseling, possible side effects, poor lifestyle adaptation, social vulnerability, polypharmacy, physical or cognitive impairments,
decreased communication skills, and financial considerations (Hayes et al., 2009; Robnett et al., 2007; Stilley, Bender, Dunbar-Jacob, Sereika, & Ryan, 2010).

In comparison, medication management capacity involves the skills and abilities to manage a medication routine; therefore, encompassing the cognitive and physical abilities needed to track, plan, and physically manipulate medications (Kaizer et al., 2010; Robnett et al., 2007). Medication management capacity encompasses a complex set of tasks involving intrinsic and extrinsic performance factors that can impact client safety (Stilley, et al., 2010). Intrinsic factors include the skills of attention, memory, perception, executive function, problem solving, reading, and insight; these skills enable understanding, planning, tracking, and taking medications as prescribed (AOTA, 2008; Neupert, Patterson, Davis, & Allaire, 2011; Robnett et al., 2007). Extrinsic factors related to managing medications include contexts such as the physical environment [home setup, tools or device use], client’s age, social support, cultural influences or beliefs, factors such as socioeconomic status, and belief or non-belief in medical treatment (AOTA, 2008; Neupert et al., 2011). All of these factors can also influence if or how a client will be able to follow through with a medication routine.

For example, the Medication Management Instrument for Deficiencies in the Elderly (MedMaIDE) is a screen designed to assess compliance or adherence of medications in the elderly – specifically knowledge of medications, how to take medications, and how to obtain medication (Orwig et al., 2006). This assessment does not assess cognitive and physical skills needed to safely and independently manage medications. A test such as the MMS contains tasks which assess short-term memory, safety, planning a task, and physical manipulation of items needed to carry out a
medication routine (Robnett et al., 2007). There are a limited number of studies that purely research medication management capacity, but by understanding the distinction of adherence versus capacity, one will understand how some screens labeled to assess capacity are actually assessing adherence, and therefore not beneficial for use in occupational therapy practice when the intent is to assess capacity. Some studies that discuss adherence were included in the literature review as they do reflect the importance of addressing cognition in relation to medication management capacity which can be impacted by stroke.

**Cognition, Stroke and Medication Management**

The literature suggests that a person’s cognition impacts his/her ability to safely and effectively manage daily living tasks, such as medication management. Assessment of cognitive performance of a client post-stroke is needed in occupational therapy to determine the client’s baseline and identify possible deficits from his/her stroke for intervention planning and discharge recommendations. Poor cognitive skills have been found to impact safety and independence with medication management capabilities in research studies time and time again.

Hayes et al. (2009) investigated the cognitive abilities of healthy independently living elders to follow a medication regimen in a five week long study. Thirty-eight participants were divided into two groups (high cognitive function [HCF] and low cognitive function [LCF]) based on outcomes of cognitive testing using the Alzheimer’s Disease Assessment Scale (Graham, Cully, Snow, Massman, & Doody, 2004) and the Mini Mental State Exam (Folstein, Folstein, & McHugh, 1975). Researchers added a daily vitamin C regime to the participants’ current medication routine. The participant’s
ability to manage medications was measured using a seven-day electronic pill bottle that tracked the time and frequency the pill bottle was opened. Additionally, a self-assessment questionnaire was provided for participants to complete at the end of the study. The authors found that the participants in the LCF group had poorer adherence (27.8%) to their medication routine than their counterparts in the HCF group (75%) (with 80% adherence considered good). This finding could be attributed to the participant’s ability to understand, plan and track their medication routines given their degree of cognitive impairment. While this study was concerned with adherence patterns, its does signify that cognitive function is an important aspect to assess in medication management capacity.

There is a general consensus in the literature regarding cognitive decline and stroke; “cognitive impairment is higher among stroke survivors than among age-matched stroke-free adults” (Wang, Capistrant, Ehntholt, & Glymour, 2012, p. 1). The study by Wang et al. analyzed 10 years worth of data from the Health and Retirement Study (HRS) (the HRS is a large, national cohort study of adults 50 years and older, initially without stroke) to examine the long-term pre-stroke and post-stroke memory changes among stroke survivors. Performance-based and informant-based assessments of immediate and delayed memory recall and incidence of stroke were of interest for this study (Wang et al.). The authors looked at the annual rate of memory change through linear and curvilinear trends and concluded that stroke survivors’ cognitive function significantly declined with each passing year. Memory decline among those surviving stroke was 42% faster than those with no recorded stroke. Evidence of cognitive impairments can be related to ischemic injury, silent strokes, and other stroke symptoms (Wang et al., 2012). While this study did not examine medication management capacity, it highlights the
importance of screening cognition (including memory and other aspects of cognitive functioning required for medication management) post-stroke to ensure safety and ability in all pertinent activities of daily living.

In a study of predictors for health risk management among stroke survivors, researchers found that cognitive losses can contribute to stroke as well as being an outcome of stroke (Ireland, Arthur, Gunn, & Oczkowski, 2011). Cognitive skill loss is associated with older age, is a precursor to stroke (e.g. transient ischemic attacks), and/or the incidence of previous stroke increases the risk of having subsequent strokes due to clients’ potential inability to effectively manage their health. Study participants post-stroke who were found to have executive function decline and/or visual perceptual changes led to a higher risk for poor outcomes, such as not having the capacity to follow their plan of care (e.g. medication routine, follow up appointments, etc) (Ireland et al., 2011). This study highlights the need to have a medication management capacity screen that is designed for clients post-stroke to accurately and efficiently assess cognitive skills.

In 2008, Donovan et al., sought to conceptualize cognition for clients post-stroke to enable more focused research in this area. Current clinical trials for stroke recovery often focus solely on physical recovery, thus the influence of changes in cognition post-stroke has not been well studied (Donovan et al., 2008). Through an extensive literature review, the authors of this study proposed 10 domains of functional cognition related to stroke as a means to study recovery centered on vascular distribution, neuroanatomic damage, and cognitive impairment following a stroke. The domains include: language abilities, reading and writing, numeric/calculation, limb praxis, visuospatial function, social use of language, emotional function, attention, executive function, memory
(Donovan et al., 2008). For medication management capacity, all these cognitive skills are used to plan, track and manipulate medications (Kaizer et al., 2010; Robnett et al., 2007). When reviewing a potential medication management capacity screen, the domains defined by Donovan et al., (2008) should be considered key components to assess in relation to medication management capacity. Given the complexity of the skills demanded by this health management task, a comprehensive screen incorporating performance-based assessments of cognitive and physical skills is needed rather than purely a cognitive screen.

**Cognitive and Physical Assessment Post-Stroke**

**Cognition.**

Cognitive function post-stroke is often assessed immediately upon admission to a hospital or rehabilitation center, as the presence of cognitive impairment can impact the potential for successful rehabilitation (Aggrawal & Kean, 2010). Occupational therapists have access to an assortment of cognitive assessments including standardized assessments such as the Cognistat (Kiernan, Mueller, Langston, & Van Dyke, 1987), Mini Mental State Exam (MMSE) (Folstein, Folstein & McHugh, 1975) or the Montreal Assessment of Cognition (MoCA) (Nasreddine et al., 2005) as well as non-standardized assessments such as ones devised by clinicians or setting specific developed tests or questionnaires. These assessments alone are not sufficient enough to assess medication management capacity in clients post-stroke, but should be used to help identify areas of cognition (e.g. memory, sequencing) that are negatively impacting safety with medication management.
The Cognistat is often cited as the gold standard of cognitive assessments as it has withstood years of validity and reliability research. This tool assesses language, constructions, memory, calculations, and reasoning (Kiernan, et al., 1987). The Cognistat has well defined validity and reliability across the lifespan and diagnoses; however, its administration is often lengthy and it is suggested the screen be scored by neuropsychologists, not always readily available for use by the occupational therapy practitioner (Friedman, 2012). The MMSE was designed to be a briefer tool to assess language, construction, and memory skills for the detection of cognitive impairment and differentiation of dementias (Aggrawal & Kean, 2010). Through further years of research the MMSE was found to have poor sensitivity for the detection of mild cognitive impairment (Aggrawal & Kean, 2010). To that end, the MoCA was developed as a brief screening tool to detect mild cognitive impairment and has been studied for use with clients post-stroke (Nasreddine et al., 2005). The MoCA examines attention and concentration, executive functions, memory, language, visuoconstructional skills, conceptual thinking, calculations, and orientation (Nasreddine, 2013). The MoCA is often used in clinical practice as it is brief, assesses an array of cognitive skills and provides a cutoff score for poor versus intact performance (Nasreddine, 2013).

In a study comparing the MMSE and MoCA for clinical use in a rehabilitation setting, Aggrawal & Kean (2010) found the MMSE did not perform as well for the detection of mild cognitive impairment. Even though the MoCA can take slightly longer to administer, the general consensus of occupational therapists is that the MoCA is a more comprehensive test, has adequate psychometrics, has multiple versions and language options, and has normative values that are easy to understand (Aggrawal &
Kean). In a study by Pendlebury, Cuthbertson, Welch, Mehta, & Rothwell (2010), researchers found that in a population of clients post transient ischemia attack (TIA), the MoCA detected more cognitive deficits than the MMSE. For the purpose of this capstone pilot study, the MoCA was therefore used to explore the relationship between cognition and medication management capacity for clients post-stroke.

**Physical assessment.**

Physical assessment of motor-performance skills is also completed in hospitals or rehabilitation facilities for clients post-stroke (AOTA, 2008). For independence in daily occupations, clients need adequate motor-performance skills often compromised by stroke. A variety of deficits can occur post-stroke; when classifying a stroke by cerebral hemisphere lesion alone, a stroke in the right hemisphere can affect sensory and motor skills of the left side of the body, vision, memory and behavior (American Stroke Association, 2012). A stroke in the left hemisphere can affect sensory and motor skills of the right side of the body, speech and language deficits, and memory (American Stroke Association, 2012). Strokes in general can result in commonly observed motor-performance skill deficits that impact occupational performance including poor trunk and postural control, lower extremity weakness and/or spasticity impacting balance, standing, and walking, and upper extremity dysfunction (pain, edema, contracture, weakness, poor motor control) (Gillen, 2006; Gillen, 2011). For the upper extremity alone, this can impact reaching and manipulation of the affected limb, thus impacting bilateral hand coordination for tasks such as opening containers, pouring water, and manipulating medications.
Clinicians routinely have access to a variety of motor assessments that ranges from impairment-based such as the Fugl Meyer Assessment of Physical Performance (FMA) (Fugl-Meyer, Jaasko, Leyman, Olsson, & Steglind, 1975), to performance-based assessment such as Chedoke Arm and Hand Activity Inventory (CAHAI) (Barreca, Stratford, Lambert, Masters, & Streiner, 2005). The FMA is a stroke-specific, performance-based impairment screen. It was designed by a physical therapist to assess motor functioning, balance, sensation and joint functioning in clients with post-stroke hemiplegia (Fugl-Meyer et al., 1975). Over the years it has often been used as a gold standard to measure other assessments against and the FMA has good evidence of validity and reliability (StrokEngine, 2013b). Occupational therapists often use a shorter version that measures the level of impairment of solely the upper extremity through motor function, joint pain, joint range of motion and sensory function (StrokEngine, 2013b). Scores from the FMA relay the level of disability on a severity scale, and the FMA is thus often used to assess recovery of physical impairment.

The CAHAI is a functional assessment that assesses the recovery of the arm and hand affected by stroke (Barreca et al., 2005). The original CAHAI consists of “13 functional items that are non-gender specific, involve both upper limbs, and incorporates a range of movements and grasps that reflect stages of motor recovery following stroke” (StrokEngine, 2013c). It includes items such as: open a jar of coffee, dial 911, draw a line with a ruler, pour a glass of water, wring out a washcloth, do up five buttons, dry back with a towel, put toothpaste on a toothbrush, cut medium consistency putty, clean eye glasses, zip up a zipper, place a container on a table, and carry a bag up the stairs (Barreca et al., 2005). The CAHAI has a 7, 8, or 9 item version as well; all versions have
demonstrated adequate validity and reliability (StrokEngine, 2013c). Outcomes from this screen indicate the level of independence a client has with a specific task aiding in treatment planning and assessing recovery. The CAHAI is well accepted by clients and clinicians due to the use of real-life objects and scenarios thus strengthening the desire to have a medication management capacity screen which uses a similar function-based approach to assess a real-life skill.

**Stroke and Medications**

After sustaining a stroke, clients potentially have performance deficits in relation to cognitive and/or physical skills; the combination of both can hinder safety and capacity for medication management. Factors such as other disease processes, types of medications being taken, and the demands of recovery and rehabilitation can additionally impact the client’s function as well as stroke location (hemisphere or lobe), type of stroke (embolic or hemorrhagic), number of days post-stroke, certain medications types, and poor stress and sleep patterns can negatively impact cognition potentially impairing function (Yassa, 2012).

Clients post-stroke generally are older, have comorbidities, may be taking a higher number of medications and/or require a specific schedule of prescriptions (Ostwald, Wasserman & Davis, 2006). Comorbidities can include depression, hypertension, diabetes, congestive heart failure, high cholesterol and atrial fibrillation (Ostwald et al., 2006). Complications during stroke recovery can include depression, urinary tract infection, limb pain, and the possible use of tubes (for catheterization, tracheotomies, or feeding) (Ostwald et al., 2006). Medications for clients post-stroke can range from anti-coagulant, anti-platelet, anti-hypertensive, anti-diabetic, anti-depressants,
anti-seizure, antibiotics, bowel regime medications, and pain reduction medications (Furie et al., 2011; Ostwald et al., 2006). Medications such as antidepressants, beta blockers (such as Propranolol), and barbiturates/benzodiazepines (such as Valium) and analgesics (such as Morphine or Oxycodone) can mimic neurological disorders, and/or impact brain functioning and performance (Yassa, 2012). The combination of comorbidities and complications is associated with higher medication use, and in one study by Ostwald et al., (2006) clients post-stroke were discharged with an average of 11 medications in five different drug classifications. Along with a potential for an increased number of medications, these medications may also have precautions (e.g. take with food), special instructions (e.g. storage), and side effects of which clients must be aware (Ostwald et al., 2006). Recognizing the number of medications and the types of medications a client is taking can be helpful for the occupational therapy practitioner to better appreciate the client’s performance and its impact on medication management capacity.

In summary, to safely manage medications, clients must be able to physically manipulate their medications, such as the packaging and pills, and use higher level cognitive skills to remember and follow their often complex medications and medication routines. There are a limited number of performance-based assessments to assess a client’s capacity to manage medication routines, especially for people with high risk diagnoses such as stroke. In the following section of this literature review, a summary of current medication management screens is presented. The weaknesses of a number of these screens as medication management capacity screens will be presented along with more in depth information about and comparison of the MMS and S5 will be presented.
Medication Management Screens

In current healthcare practice, there are a variety of medication management screens. As seen in Appendix A, some screens are used in specific settings, solely for research purposes, or in specific disciplines. The few screens that are used in occupational therapy often focus solely on cognition, such as the Cognistat or Mini Mental State Exam. These tests were not designed to assess medication management capacity, but rather the intrinsic skills that are necessary for medication management (e.g. memory, attention). The sample of screens listed below (also in Appendix A) will be further examined as follows.

The Self-Administration of Medication (SAM) is used by nurses to assess a person’s competence to self-administer medications when used in the acute care setting. This assessment uses interview and observation of patients (Manias, Beanland, Riley, & Hutchinson, 2006). The Medication Management Ability Assessment (MMAA) is a performance-based measure of medication management for patients with schizophrenia using role-play. The MMAA is a modification of the Medication Management Test (MMT) (Patterson et al., 2002); the MMT was initially designed to assess adaptive strategies in patients with dementia with regard to medication management (Gurland et al., 1994). It has since evolved to include the HIV population to assess ability to organize HIV medications into pill boxes. It has been reported that use of the MMT is simple, but that scoring is complex and not always clinically applicable (Farris & Phillips, 2008). The Drug Regimen Unassisted Grading Scale (DRUGS) screen is reported to be an easy-to-administer tool that assesses a highly functioning older adult’s ability in self-medication; the screen assesses the ability to identify, access, dose and time their
personal medication routine (Edelberg, Shallenberger, Hausdorff & Wei, 2000). The Medication Management Instrument for Deficiencies in the Elderly (MedMaIDE) is primarily used in research to assess medication adherence (e.g. compliance and management) (Orwig, Brandt, & Gruber-Baldini, 2006). The MedTake Test assesses understanding of dosage, indications, schedule, and safety through an interview of older adults (Kaizer et al., 2010). The fairly new Self-Medication Assessment Tool (SMAT) is a comprehensive tool used by pharmacists to assess deficits in self-management of medications by looking at function, cognition, self-reported adherence, medication recall and purposeful non-adherence (Irvine-Meek, Gould, Wheaton & Todd, 2010; Irvine-Meek & Gould, 2011).

All the previously mentioned screens have been critiqued through numerous research studies. Some of the mentioned assessments are profession specific (nursing or pharmacy), population specific (older adults, clients with dementia or schizophrenia), or rely on self-reports or interview for results. Furthermore, many studies did not define medication management, raising the question: was the intent to study capacity or adherence? Most of these screens have been found to be far removed from the actual performance of medication management as these screens are mainly observation, question/answer or paper-pencil based. Many of these screens have been critiqued to be too time consuming or not applicable to a clinical setting as they do not provide functionally relevant information. Moreover, these screens often lack important domains such as communication and physical skills when assessing the capacity to manage a daily medication routine for clients post-stroke as mentioned by Donovan et al., 2008, Kaizer et al., 2010 and Robnett et al., 2007.
New screening tools continue to be developed to address the increasing need in occupational therapy practice for comprehensive medication management screens that assess both cognitive and physical skills in a functionally relevant manner. Two such screens are the ManageMed Screen© and the Self-Medication Safety Post Stroke Screen.

ManageMed Screen©.

Robnett et al., (2007) developed a quick portable standardized functional test, the ManageMed Screen (MMS), to assess the capacity of adults 18 years and older to manage a moderately difficult medication routine (e.g. discriminates amongst normal and low functioning clients) (Robnett & Moyers, 2007). The MMS assesses medication management capacity, an activity of daily living for adults. The MMS was developed by occupational therapists for use by occupational therapists to serve as a quick screen to provide a “snapshot of the client’s ability to comprehend information related to prescription use” by utilizing four metacognitive questions, 32 questions addressing reading, medication knowledge base, problem solving, short-term and prospective memory, and calculations, and lastly a performance task to assess the client’s physical and cognitive ability to set-up a weekly medication organizer (Robnett & Moyers, 2007, p. 2).

When developing the MMS, authors collected data from a sample of convenience of 33 nursing home residents who needed assistance with medication management and 34 community living elders who were independent with medication management. All were tested with the MMS and 40 were also tested with the Cognistat. Exclusion criteria include moderate to severe dementia; disease processes were not recorded (therefore some participants may have been stroke survivors) (Robnett et al., 2007). The final
segment of the test, setting up the pill organizer, was additionally tested on 72 pharmacists and seven pharmacy technicians in order to establish content validity of the MMS. The authors found that participants tended to rate their ability to think and remember higher than they actually performed, and age was found to be related to performance. The test was able to differentiate the participants who were independent from those who required assistance with medication management, and a norms table based on age was developed (Robnett & Moyers, 2007). Results would suggest that subjective reports of a client’s ability to manage medications may not be reliable, especially if there is a cognitive limitation. Rather, objective measures of cognitive and physical performance are needed for accurate results in regards to medication management capacity.

As part of the development of the MMS, correlation between the MMS and Cognistat scores was conducted; it was determined the MMS is similar to the Cognistat, but the tests assess different aspects of cognition (Robnett & Moyers, 2007). The MMS and Cognistat assess key cognitive domains of orientation, language, reading and writing, numeric/calculation, visuospatial function, attention, and executive function (reasoning/judgment) as mentioned in Donovan et al., 2008 and Stilley et al., 2010. However the Cognistat does not thoroughly address limb praxis or physical performance as does the MMS. The Pearson correlation coefficient showed moderate correlation ($r = 0.696$, $p = .001$), and inter-rater reliability was assessed and ranges were in the satisfactory to high range (0.859 to 0.965) (Robnett & Moyers, 2007). Rasch analysis was conducted to look at the degree of difficulty of items; the items in the ManageMed Screen were deemed to be of moderate difficulty and without ceiling effect for detecting
medication management capacity. The MMS is therefore a standardized test that has been validated for adults over the age of 18; it is able to distinguish between adults who need assistance and those who are independent. However, the MMS has yet to be studied specially for use with clients with specific diagnoses or performance limitations, such as stroke. The author acknowledges the need for further validity and reliability studies in various client populations to ensure its effective use, however as the test is designed to distinguish among clients who are independent and need assistance. Thus the MMS would be an appropriate tool to use with clients post-stroke based on the performance factors assessed (Robnett et al., 2007; R.Robnett, personal communication April, 1, 2013).

The MMS is available for commercial purchase online; the clinician is provided with a thorough test manual, “three simulated pill vials (with candy imitation pills), a mock prescription, three realistic medication information sheets, a pill organizer, the test forms, and a magnifying glass” (Robnett et al., 2007, p. 11). As this test is standardized, a norms table was developed on a second group of 100 independent adults to determine age-related norms, and is found in the test manual (Robnett & Moyer, 2007).

**Self-Medication Safety Post Stroke Screen.**

Authors Kaizer et al., (2010) conducted a literature review to determine if any medication management tools in existence could be used with clients post-stroke (the MMS was not included in this review). Concluding “none were tailored to the multifaceted needs of the stroke population,” the author set out to develop the Self-Medication Safety Post Stroke Screen (S5) to meet the needs of occupational therapy practitioners by having a tool that can assess medication management capacity that is diagnosis specific to stroke (Kaizer et al., 2010, p. 239). The development of the S5 was done in three
phases: 1) a literature review of nine medication management tools, 2) the development and draft of a new screening tool, and 3) pilot testing of the screen.

Nine tools were reviewed [Self-Administration of Medication (SAM), The Medication Management Ability Assessment (MMAA), The Drug Regimen Unassisted Grading Scale (DRUGS), Hopkins Medication Schedule, The Medication Management Instrument for Deficiencies in the Elderly (MedMaIDE), Self- Medication Risk Assessment Instrument, The Medication Management Tasks, Standardized Medication task (SM task), and MedTake Test] as cited in Kaizer et al. (2010) and were found to have limitations in their design and clinical use. The main limitations were that none of the tools were standardized for clients post-stroke and none met the cognitive or physical demands to be used for the stroke population as mentioned by Donovan et al., 2008 and Kaizer et al., 2010. From this review, the authors identified factors that needed to be included in a new screen for use with clients post-stroke; these included: memory, orientation, physical ability, communication and planning an action (Kaizer et al., 2010). Test items were then developed and a screen was drafted.

The authors had eleven stroke experts review the screen that included five occupational therapists, one speech language pathologist, one neurophysiologist and one pharmacist. These interviews aided authors to devise a final draft of the screen that was then pilot tested on six participants who were purposively chosen. From a post-test interview of the six participants, changes were made to the screen for clarification of test items and expansion of client instructions.

The S5 includes basic orientation questions, the manipulation of medication bottles, calculating medication doses, immediate and delayed memory recall tasks,
manipulating a syringe (if appropriate for the client), completing visual recognition and
visual spatial tasks, problem-solving questions to assess cognition (orientation;
immediate and delayed memory recall), communication (comprehension; reading), motor
function, visual-perception, and judgment/executive functions/self-efficacy (Kaizer et al.,
2010; StrokEngine, 2013d). Preliminary testing was completed on a target population on
a sample of five subjects; test-rest reliability is still under study, however content validity
has been reported as satisfactory making it a potential valid and reliable screen
(StrokEngine, 2013d). Moreover, the S5 reflects some of the cognitive domains of
concern (memory, initiation, communication and planning) mentioned by Donovan et al.
(2008), Neupert et al. (2011), and Stilley et al. (2010), and the physical capacities
highlighted by Robnett et al. (2007). The S5 is the first known stroke-specific medication
management screen. The S5 is available free online for clinical use; however, the current
version is based on pilot testing only and thus has undergone only a preliminary
validation study by its authors (Kaizer et al., 2010). Clinicians are given a one page
instruction handout for kit assembly and a one page checklist for questions and scoring.

**Summary**

Occupational therapy practitioners need screening tools that will assess and
address capacity for medication management and that are objective, quantitative, valid,
reliable, administered with minimal training, easily and immediately scorable, brief,
small, portable, and non-threatening to the client to make them useful in the clinical
setting (Elliott & Marriott, 2009). Adults can be at risk for poor medication management
capacity due to potential comorbidities along with age-associated changes in function.
However, adult clients post-stroke are at even greater risk of difficulty with medication
management due to changes in cognitive and physical functioning. After reviewing various assessment tools there is no gold standard or widely accepted method or tool, especially as many tools measure adherence patterns related to cognition rather than capacity to manage medications. Additionally, stand-alone cognitive assessments can not be used to assess medication management capacity. Traditional assessments as reviewed in Donovan et al. (2008) and Kaizer et al. (2010) do not meet the needs for the stroke population as they lack attention to key factors and domains related to cognition and physical performance. Additionally many of the screens reviewed for this study are paper-pencil assessments that are somewhat removed from the actual performance of medication management. While the MMS was not specifically designed for use with clients post-stroke, it has strong validity and reliability in which to discriminate among adults who are independent with medication management and those who need assistance. The S5 was designed to assess medication management capacity of clients post-stroke, but continues to need further research to assess reliability, validity, and clinical usefulness as its development was based on such a small selected group of participants. This capstone study is a pilot study to begin the investigation of how the MMS compares to the S5 for assessment of medication management capacity of clients post-stroke in regards to consistency of scoring. Factors including scores and clinician feedback will be use to assess their usefulness for used with clients post-stroke in a rehabilitation setting.
Methodology

Research Design

This capstone is a mixed methods pilot study design including quantitative and qualitative data collection and analysis. This study was approved by the IRB at Nova Southeastern University and the IRB of HealthSouth Corporation (Appendix D, E).

Part I: quantitative data was gathered by clinicians trained by the primary investigator to assess a client’s medication management capacity post-stroke utilizing two medication management screens and a cognitive screen. The purpose was to compare consistency of scores from the MMS, S5 and MoCA in relation to detecting medication management capacity. Part II: qualitative data was obtained from the clinicians who participated in a focus group interview after data collection was completed. The purpose of the focus group was to gather information from the clinicians regarding their perceived usefulness of the screens by discussing positive and negative aspects of each screens and their use in clinical practice with clients who have sustained a stroke.

Participants

Clinician participants were recruited from New England Rehabilitation Hospital, an inpatient rehabilitation hospital, in Portland, Maine (Appendix I, K). Clinicians were used in Part I and II of this study. Clinicians included one male and two females with clinical experience ranging from 3 to 15 years.

Client participants were recruited by clinicians during their rehabilitation stay at New England Rehabilitation Hospital, an inpatient rehabilitation hospital, in Portland, Maine. Clients were recruited based on specific inclusion/exclusion criteria (Appendix I, J). Five clients participated in the study, including three females and two males with a
mean age of 72.6 years. Twenty percent of client participants had a right hemispheric stroke of embolic origin, days post-stroke ranged from 9 to 17 with a mean of 11.6 days, and clients were taking medications ranging from 4 to 13 medications with an average of 9.8 medications at the time of screen administration. For visual deficits, 40% were reported to have a deficit (field cut or neglect) (client specific demographics also seen in Table 1 below).

Table 1. Client Participant Demographics

<table>
<thead>
<tr>
<th>Client</th>
<th>Age</th>
<th>Gender</th>
<th>Stroke Type &amp; Location</th>
<th>Days Post Stroke</th>
<th>Number of Medication</th>
<th>Visual Deficits</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>80</td>
<td>Male</td>
<td>Embolic, Left hemisphere</td>
<td>9</td>
<td>10</td>
<td>Neglect &amp; field cut</td>
</tr>
<tr>
<td>2</td>
<td>67</td>
<td>Male</td>
<td>Embolic, Left hemisphere</td>
<td>8</td>
<td>12</td>
<td>Other</td>
</tr>
<tr>
<td>3</td>
<td>86</td>
<td>Female</td>
<td>Unknown, Right hemisphere</td>
<td>17</td>
<td>13</td>
<td>None</td>
</tr>
<tr>
<td>4</td>
<td>64</td>
<td>Female</td>
<td>Embolic, Left hemisphere</td>
<td>15</td>
<td>10</td>
<td>None</td>
</tr>
<tr>
<td>5</td>
<td>66</td>
<td>Female</td>
<td>Embolic, Left hemisphere</td>
<td>9</td>
<td>4</td>
<td>None</td>
</tr>
</tbody>
</table>

Additional data were collected on each subject including hand dominance, types of medication taken in specific categories, self rated score for level of stress and difficulty with sleep on a scale of one to five (one being no problem with stress or sleep and five being high stress or severe difficulty with sleep) (see Table 2).
Table 2. Client Participant Demographics - Secondary Data

<table>
<thead>
<tr>
<th>Client</th>
<th>Hand Dominance</th>
<th>Medication Type</th>
<th>Level of Stress</th>
<th>Difficulty with Sleep</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Left</td>
<td>Beta blockers</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Analgesics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Left</td>
<td>Beta blockers</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Analgesics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Right</td>
<td>Beta blockers</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Analgesics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Right</td>
<td>Beta blockers</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Right</td>
<td>N/A</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

**Instrumentation**

Part I: Instruments used in data collection include the ManageMed Screen (MMS), the Screening for Self-Medication Safety Post Stroke (S5), and the Montreal Assessment of Cognition (MoCA) (Robnett et al. 2007; Kaizer et al., 2010; Nasserdine et al. 2005) (Appendix F).

The MMS has 30 questions and performance tasks to assess “reading, medication knowledge base, problem solving, short-term and prospective memory, and calculations” (Robnett & Moyers, 2007, p. 2). The MMS is standardized and has strong validity and reliability. A sample question for reading, medication knowledge base, problem solving is “If this [prescription A] were a prescription from you doctor, would it be safe to take?” The client is given a prescription bottle with printed label information to review; the client is to note the date the medication expired. Other questions related to problem-solving, short-term memory, calculation and physical skills include “Can you open these
containers? Count the number of pills. How long will these pills last if taken as prescribed?” Lastly, one task in particular requires the client to successfully utilize all cognitive skills and assesses physical skills when the patient is asked to set up a pill organizer using three medications based on instructions on each prescription bottle while recalling that their meals are taken at 8am, noon and 5:30pm. Slots in a plastic organizer must be opened and the client puts in the correct number of pills at the correct times. Performance on this screen is scored on a 0 or 1 scale with 0 indicating unable to perform or performed incorrectly and 1 as performed correctly. The maximum score one can obtain is 39 points; the client’s score can then be compared to age-related norms developed by the authors.

Potential impairments that can be distinguished with use of this screen include decreased vision, decreased prospective memory, decreased recognition, decreased safety awareness, decreased attention to detail, decreased physical ability, decreased calculation skills, decreased retrospective memory, decreased organizational skills, and decreased insight (Robnett & Moyer, 2007). The findings of these impairments would indicate poor medication management capacity and also provide areas for occupational therapist to focus either rehabilitation or remediation intervention strategies.

The S5 has 16 questions on a checklist to assess basic orientation, the manipulation of medication bottles, calculating medication doses, immediate and delayed memory recall tasks, manipulating a syringe (if appropriate for the client), completing visual recognition and visual spatial tasks, and problem-solving questions to assess cognition (orientation; immediate and delayed memory recall), communication (comprehension; reading), motor function, visual-perception, and judgment/executive
functions/self-efficacy (Kaizer et al., 2010; StrokEngine, 2013d). A sample question which addresses calculation, visual recognition, and problem solving includes ‘If you have to take 2 pills in the morning and 2 at night, show me how you would group the pills’ after providing an open bottle with 8 identical white disc-shaped pills. To assess physical skills, some test items include providing a syringe without a needle and asking the client to demonstrate how to inject their medications or providing the client with a bottle of liquid medication and asking them to “Open the bottle and pour out 10ml of the liquid into this cup.” Scoring is completed by indicating if the task was done correctly by checking Yes or No boxes beside each question. The score is out of 16 questions; in general a higher score of more Yes responses would indicate less difficulty with medication management. More importantly, the screen offers specific areas of concern when a question is marked as No that can be addressed in occupational therapy intervention. Scoring criteria was not developed beyond a yes/no checklist. For the purpose of this study, questions marked yes were counted as 1 point. If a client scored a 14, 15 or 16 on the S5 this equated ‘normal’ performance capacity; if a client scored 10 to 13 this equated ‘questionable’ performance capacity, and if a client scored 9 or less, this equated ‘poor’ performance capacity with medication management.

For the purpose of this pilot study, the MoCA was also used to assess the clients’ cognition and explore the relationship with medication management capacity. The MoCA is a performance-based screen to assess cognitive skills which contains 16 test items that examine attention and concentration, executive functions, memory, language, visuoconstructional skills, conceptual thinking, calculations, and orientation (Nasreddine, 2013). A sample question to assess attention, concentration, executive function,
visuoconstructional skills, and conceptual thinking is drawing a clock; the client is asked to draw a clock, place all numbers in the clock and set the time to five past four (Nasreddine, 2013). The client is scored based on contour of the clock, correct sequence and placement of numbers in the clock along with correct placement of the hands of the clock. Points are given based on correct answers/performance of task. Another sample item that assesses attention and calculation is asking the client to subtract serial 7s starting with number 90; points are given based on correct subtractions. The entire assessment is based out of 30 points with 26 points or greater indicting normal cognitive performance, thus any score under 26 should be investigated further (1 point is given to the final score if the client has less than 12 years of formal education) (Nasreddine, 2013). The MoCA has undergone years of research and studies have consistently demonstrated excellent validity and reliability (StrokEngine, 2013e).

This research project required two kits for the MMS, two kits for the S5 and two sets of printed instructions for the MoCA that were provided by the primary investigator. Two kits of each were made to avoid delay in data collection should some testing occur simultaneously by one or more clinicians. A copy of the testing materials can be found in Appendix F. Beyond test scores, secondary information was collected to further explore client performance and relationships between screen scores or other factors. Information such as client age, gender, hand dominance, stroke hemisphere location, stroke type, number of days post-stroke, number of different medications and if specific medication types were used, presence of visual impairment, self-rating on perceived level of stress and difficulty with sleep, and total number of minutes needed for testing were collected. Specific medication types, presence of visual impairment, self-rating on perceived level
of stress and difficulty with sleep is interesting secondary data as studies show that specific medication, poor sleep and stress impact cognitive performance, and visual impairment can also impact the ability to perform certain tasks on these screens (Yassa, 2012). As a means to collect and record data from 3 assessment tools, a data collection sheet was devised for clinicians to record information into one location (Appendix G).

Part II. The instrument that was used in the guided focus group for clinician participants was an open-ended interview guide of 10 questions devised by the primary investigator. The questions were intended to evoke dialogue among the clinicians to solicit feedback regarding their impression of the screens, the value of information obtained from testing, advantages or disadvantages of each screen, scoring discrepancies, and overall usefulness the screens. A sample question includes “share your impression or feedback on the administration of each test, such as ease of setup, clarity of instructions, items in test kits, questions asked etc.” The question guide can be found in Appendix H.

Procedure

Recruitment.

With approval from the IRB at HealthSouth and IRB at Nova Southeastern University (Appendix D, E), clinician participants were recruited to participate in this capstone pilot study during a 4 week period. A presentation was provided to the inpatient occupational therapy department to recruit interested clinicians. Emails were exchanged as needed to clarify inclusion criteria and set-up a time to consent their participation. Inclusion criteria included: one year experience on the “Stroke Team” at the inpatient rehabilitation center as an occupational therapist, show interest in using medication
management capacity screens to better serve their clients, be willing to participate in training sessions, test clients for data collection [part I], and participate in a focus group [part II]. As clinicians were part of data collection procedures for this research study, they were included as research assistants for this study in the IRB protocol and were required to complete the CITI training and adhere to the approved IRB protocol.

Client participants were patients recruited from New England Rehabilitation Hospital (an inpatient rehabilitation center in Portland, Maine) during a 6 week period. Five of seven clients recruited consented to participate in the study. Participants were recruited based on the following inclusion/exclusion criteria: cognitively intact to consent, adult with the diagnosis of stroke, taking daily prescription medication(s), without moderate to severe receptive or expressive aphasia (4 or greater on functional independence measure (FIM) for comprehension and expression), able to read or write in English, and the participant was 72 hours from discharge from acute rehabilitation.

Clients were flagged by the rehabilitation director and occupational therapy clinical leader at New England Rehabilitation Hospital when the client was anticipated to be discharged, and were presented with the study. They then determined their interest in participating. Clients were provided with written information and consent forms to participate (see Appendix I, J). A mutually convenient time for testing was scheduled based on client’s consent. The study was approved for 25 participants.
Training.

Clinicians were recruited from the New England Rehabilitation Hospital and participated in four hours of training prior to client recruitment and data collection. Prior to direct training, clinicians were provided with a packet of information detailing the research study’s introduction, purpose of research, overview of tests and target population and overview of the commitment for participation (e.g. training, data collection, focus group participation). Four clinicians consented to participation in the study, and three were able to complete all trainings and collect data. Clinicians were also provided with sample test packets of the MMS, S5, and MoCA, and test kits to familiarize themselves with these prior to training. The four hours of training (two sessions of two hours each) were scheduled based on staff availability and rehabilitation director approval for date and time of day.

The first session was devoted to introduction, practice, and competency testing to establish inter-rater reliability for the MoCA. An informal presentation by the primary investigator was given, along with supervised practice between clinicians. To establish inter-rater reliability, a clinician tested the primary investigator who role played a client. The session was observed by the participating clinicians for scoring. The primary investigator then assessed inter-rater reliability based on each question and overall score for the assessment.

The next two hour session consisted of the same format but was for the MMS and S5. Again an informal presentation by the primary investigator and co-investigator (R. Robnett) was given, along with supervised practice between clinicians. To establish inter-rater reliability, the co-investigator tested the primary investigator who was again role
playing a client. The clinicians observed and scored on an individual basis. Score sheets were reviewed after these training sessions, but before participant data collection. An acceptable level of inter-rater reliability was established at 80% agreement of each test (Tickle-Degnen, 2008). For the MoCA, there was 100% inter-rater reliability, for the MMS there was 96.875% inter-rater reliability and for the S5 there was 91.964% inter-rater reliability (Appendix B). For any one item that was below 80% inter-rater reliability, the question and scoring method was reviewed with clinicians for clarification. Inter-rater reliability did not need to be reestablished for these test items as the criteria was to have an overall inter-rater reliability of 80% for the entire test score.

Clinicians were also trained in the use of the de-identified data collection sheets (Appendix G) and procedures for data storage during the study were established. Once clinicians completed their screen training and CITI computer training for human research, amendments were sent to IRB with their names to be added to the protocol as research assistants. Approval was obtained to add clinicians as research assistants enabling the start of data collection from clients (Appendix L).

**Data collection part I.**

Data collection lasted 6 weeks for a minimum of five client participants. Test packets (including de-identified data sheets, instructions for the MoCA, and score sheets for the MMS and S5) were made available by the primary investigator. Prior to testing, clinicians gathered basic information about the participant from the medical chart and indicated the information on the Data Collection sheet (Appendix G). Clients were given information about the assessment (e.g. purpose, duration) by the trained clinicians to confirm consent and to remind the client the assessment could be stopped at any time for
any reason. When participants consented, they signed the form and began testing. The goal for the screening was for clients to complete them all in one day in a quiet, designated area.

Testing commenced per testing and manual instructions. Information such as age, gender, hand dominance, stroke location/type, days post-stroke, medication questions, presence of visual impairment and ratings for stress and sleep were always completed first and in numerical order. Questions for the screen score of the MoCA, MMS, and S5 (questions 13, 14, 15) were not always listed in the same numerical order on each data collection sheet to enable random order of testing of the screens between clients. Clinicians were told to complete each screen in the order in which they were listed on the data sheet and not necessarily numerical order for questions 13, 14, 15.

Blank test packets were kept in labeled folders with instructions in the rehabilitation director’s office; completed test packets were kept in a secured drawer in the locked office of the rehabilitation director for the duration of the study. Once data collection was completed, the primary investigator collected the data sheets ensuring no participant identifier/confidential information was on the data sheets. This data was then stored in the co-investigators locked office at the University of New England, Portland, Maine.

**Data collection part II.**

After the clinicians completed a minimum of five assessments and six weeks from the start of data collection, the clinicians participated in a 1 hour and 30 minute focus group interview. The interview took place in the office of the clinical leader at New England Rehabilitation Hospital of Portland, Maine at a convenient time for the clinicians.
Due to the small sample size of clinicians, the interview was transcribed verbatim by hand by the primary investigator during the interview process. The primary investigator facilitated the discussion with focus on: clinician feedback on administration of each screen (ease, setup, instructions etc.), value of data obtained from the screens, advantage/disadvantage of each screen, and usefulness of the screens to clinical practice. The interview guide can be found in Appendix H.
Data Part I

Primary Data

As seen in Table 3, compared to the normative scores by age, client 1 scored within one standard deviation above the mean score for the MMS, ‘normal’ performance on the S5, and below the mean score for the MoCA. Client 2 scored well above one standard deviation of the mean score for the MMS, ‘normal’ performance on the S5, and above the mean score for the MoCA. Client 3 scored within one standard deviation below the mean score on MMS, ‘questionable’ performance on the S5, and at the mean for the MoCA. Client 4 scored within one standard deviation below the mean score for the MMS, ‘normal’ performance on the S5, and below the mean for the MoCA. Client 5 scored within one standard deviation above the mean score for the MMS, ‘normal’ performance on the S5, and at the norm for the MoCA.

Table 3. Client Scores on MMS, S5, and MoCA

<table>
<thead>
<tr>
<th>Client</th>
<th>MMS (mean +/- SD*)</th>
<th>S5**</th>
<th>MoCA***</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>30 (29 +/- 3.39)</td>
<td>15</td>
<td>21</td>
</tr>
<tr>
<td>2</td>
<td>35 (29 +/- 3.39)</td>
<td>15</td>
<td>28</td>
</tr>
<tr>
<td>3</td>
<td>26 (29 +/- 3.39)</td>
<td>13</td>
<td>26</td>
</tr>
<tr>
<td>4</td>
<td>32 (34 +/- 3.29)</td>
<td>15</td>
<td>19</td>
</tr>
<tr>
<td>5</td>
<td>31 (29 +/- 3.39)</td>
<td>14</td>
<td>26</td>
</tr>
</tbody>
</table>

*MMS age norms based on client age +/- standard deviation (SD) (Robnett & Moyers, 2007)

**S5: 14, 15 or 16 = ‘normal’ performance capacity;
10 to 13 = ‘questionable’ performance capacity;
9 or less = ‘poor’ performance capacity

***MoCA: 26 or better = normal performance
Secondary Data

From the secondary data collected, consistency of mean scores for age, gender, hand dominance, right versus left hemisphere stroke, embolic versus hemorrhagic stroke and medication type between the MMS, S5 and MoCA were compared.

**Age, gender and hand dominance.**

The mean age for client participants was 72.6 years; as seen in Table 4, the youngest client at age 64 scored below the norm on the MoCA, but had normal performance for the MMS and S5. The oldest client at age 86 scored normal performance for the MMS and MoCA, but had questionable performance on the S5. In Table 7, values for nonparametric two-tailed test of Spearman’s rho correlations was conducted on the client age and screen scores can be found indicating no consistent relationship.

*Table 4. Client Scores by Age on each Screen*

<table>
<thead>
<tr>
<th>Client</th>
<th>MMS (mean +/- SD*)</th>
<th>S5**</th>
<th>MoCA***</th>
<th>Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>30 (29 +/- 3.39)</td>
<td>15</td>
<td>21</td>
<td>80</td>
</tr>
<tr>
<td>2</td>
<td>35 (29 +/- 3.39)</td>
<td>15</td>
<td>28</td>
<td>67</td>
</tr>
<tr>
<td>3</td>
<td>26 (29 +/- 3.39)</td>
<td>13</td>
<td>26</td>
<td>86</td>
</tr>
<tr>
<td>4</td>
<td>32 (34 +/- 3.29)</td>
<td>15</td>
<td>19</td>
<td>64</td>
</tr>
<tr>
<td>5</td>
<td>31 (29 +/- 3.39)</td>
<td>14</td>
<td>26</td>
<td>66</td>
</tr>
</tbody>
</table>

* MMS age norms based on client age +/- standard deviation (SD) (Robnett & Moyers, 2007)
** S5: 14, 15 or 16 = ‘normal’ performance capacity;
  10 to 13 = ‘questionable’ performance capacity;
  9 or less = ‘poor’ performance capacity
*** MoCA: 26 or better = normal performance
As seen in Graph 1 there was no notable difference in performance of male and female in all three screens. The mean for males on the MoCA was 24.5 and females were 23.6 (26 or better = normal performance); the means for males on the MMS was 32.5 and females was 29.6 (see Table 3 for age norms by client); and the means for males on the S5 was 15 and females was 14 (14, 15 or 16 = ‘normal’ performance capacity; 10 to 13 = ‘questionable’ performance capacity; 9 or less = ‘poor’ performance capacity). By means alone, both males and females scored below the norm on the MoCA, within age norms on the MMS and ‘normal performance’ on the S5 suggesting no notable difference in performance. Similarly, there were no notable differences in scores between individuals with right hand dominance and left hand dominance as that two male clients were left handed and the three females were right handed.

Graph 1. Mean Scores of Each Screen by Gender and Hand Dominance

Stroke location and type of stroke.

In Graph 2 below, right versus left hemisphere stroke comparison revealed the client with a right hemisphere stroke scored a mean of 26 on the MoCA (normal
performance), 26 on the MMS (normal performance) and a 13 on the S5 (‘questionable’ performance). The remaining clients had a left hemisphere stroke and scored a mean of 23.5 on the MoCA (below norm), a 32 on the MMS (normal performance) and a 14.75 on the S5 (‘normal’ performance). The consistency that is presented here is that the client with a right sided hemisphere stroke had ‘questionable’ performance on the S5 when compared to the other clients with a left hemisphere stroke, and the clients with a left hemisphere stroke performed below the norm on the MoCA. The client with the right sided hemisphere stroke was right handed, thus should have had intact motor skills of his/her dominant hand to complete the tasks but may have some mild difficulty with memory impacting his/her performance on the S5 (American Stroke Association, 2012). The clients with a left side hemisphere stroke were split 50/50 with being right hand versus left hand dominant, thus the clients who were right handed may have had some difficulty with motor tasks and/or mild speech, language or memory deficits impacting performance (American Stroke Association, 2012).

The means of each screen are the same when comparing stroke location to stroke type as the one client who had a right hemispheric stroke from unknown origin. The four remaining clients who had an embolic stroke where also the clients who had a stroke in the left hemisphere (thus the same distribution of right and left handed comparisons above). The only consistency seen here is the clients with an embolic stroke (left hemisphere) scored lower than the client with the stroke of unknown origin on the MoCA, but higher on both the MMS and S5.
Days post stroke.

As seen in graph 3, when graphing client performance on all screens by clients based on days post-stroke, the client with most days post-stroke (client 3) performed at the norm for the MoCA and MMS, but ‘questionable’ performance on the S5. The client with the least days post-stroke (client 2) performed ‘normal’ all three scores. Clients 1 and 5 with nine days post stroke had normal performance on the MMS and S5, but Client 1 scored poorly (below the norm) on the MoCA (similar performance to client 4). There does not appear to be a relationship between days post-stroke and performance from each screen, except that clients with fewer days post-stroke had overall better performance.
Graph 3. Client Performance Based on Number of Days Post-Stroke

Number of medications.

While this study was not investigating clients’ abilities to manage their own personal medication routine, data on the number of medications clients were taking at the time of testing (Graph 4) was obtained for comparison and to demonstrate the high number of medications clients post-stroke must take and the implications on health and safety that poor medication management capacity can mean for these clients. In Table 7, values for nonparametric two-tailed test of Spearman’s rho correlations was completed using the average number of medications (9.8) against each client’s screen score indicating no consistent relationship between performance and the number of medications the client was taking in this study.
Graph 4. Number of Medications Taken by Client Participants

<table>
<thead>
<tr>
<th>Client</th>
<th>Number of Medications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Client 1</td>
<td>14</td>
</tr>
<tr>
<td>Client 2</td>
<td>12</td>
</tr>
<tr>
<td>Client 3</td>
<td>10</td>
</tr>
<tr>
<td>Client 4</td>
<td>8</td>
</tr>
<tr>
<td>Client 5</td>
<td>6</td>
</tr>
</tbody>
</table>

Medication types.

From secondary data collection, clinicians were asked to indicate if the clients were prescribed antidepressants, beta blocker, barbiturates/benzodiazepines or analgesics (as these can impact cognitive performance). Client 1, 2, 3 took both beta blockers and analgesics, client 4 took only analgesics, and client 5 took no medications in these categories. From Table 5, the clients taking beta blockers and analgesics on average scored higher than the one client taking beta blockers alone for the MoCA and MMS, but slightly less than the one client not taking any medication in those categories. The clients taking beta blockers and analgesics scored lowest on the MMS, and near the same value on the S5 as the client not taking medications in these categories. The one client taking beta blockers alone scored best on the MMS and S5 but worse on the MoCA. The final client not taking any medicines in these categories scored highest on the MoCA but average on the MMS and S5. These variations do not support any type of relationship, except that clinicians should be aware of clients taking beta blockers as this does seem to impact cognition as seen by the score of 19 below for the MoCA.
Table 5. Mean Scores of Screens by Medication Category

<table>
<thead>
<tr>
<th></th>
<th>Beta blockers and Analgesics</th>
<th>Beta Blockers Only</th>
<th>No Medications in these Categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>MoCA</td>
<td>25</td>
<td>19</td>
<td>26</td>
</tr>
<tr>
<td>MMS</td>
<td>30</td>
<td>32</td>
<td>31</td>
</tr>
<tr>
<td>S5</td>
<td>14.3</td>
<td>15</td>
<td>14</td>
</tr>
</tbody>
</table>

Visual impairment.

Clinicians were asked to indicate by reviewing the client’s medical record if the client who was participating in testing had any of the following: visual neglect, field cut, cataracts, glaucoma or other. Of the five clients, client 1 was reported to have a visual impairment of left neglect and a left field cut. Clients 3, 4, and 5 reported having no visual impairments and client 2 had ‘other’ marked but not identified. Scores and clinician feedback did not indicate the impact of these visual deficits on performance.

Stress and sleep post-stroke.

In review of client participant secondary data in regards to self-perceived level of stress and difficulty with sleep post-stroke, a five point Likert scale was used (1 = no problem, 5 = severe problem). Sixty percent of clients reported little to no stress (less than a score of three for three of the clients) since their strokes, and 100% reported little to no difficulty with sleep since their stroke (less than a score of two for all clients) (graph 5). There does not appear to be a consistent relationship between stress, sleep or performance on these screens.
Graph 5. Client Participant Rating of Stress and Sleep

Testing time.

The average time to complete the testing was 72 minutes (which included all three assessments completed in one sitting. In Table 7, values for nonparametric two-tailed test of Spearman’s rho correlations was conducted on the average time of testing (72 minutes) against each screen indicating no relationship in this study.
**Results Part I**

Using visual comparison of data and statistical data analysis presented in the above sections, the question: “How consistent are the ManageMed Screen (MMS) and the Screening for Self-Medication Safety Post Stroke Scale (S5) scores for assessing capacity in medication management?” can be answered by reviewing data in Table 6. Overall, all clients scored within their age norms on the MMS, and all but client 3 scored ‘normal’ performance capacity on the S5. Using the Statistical Package for Social Sciences (SPSS – version 20), each test score were correlated using nonparametric two-tailed test of Spearman’s rho correlations. The MMS score was compared to the S5 score and was found to be statistically non-significant ($r=0.671, p=0.215$).

**Table 6. Score Comparison of the MMS and S5**

<table>
<thead>
<tr>
<th><strong>Client</strong></th>
<th><strong>MMS Score</strong> (mean score +/- SD)*</th>
<th><strong>S5 Score</strong>**</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>30 (29 +/- 3.39)</td>
<td>15</td>
</tr>
<tr>
<td>2</td>
<td>35 (29 +/- 3.39)</td>
<td>15</td>
</tr>
<tr>
<td>3</td>
<td>26 (29 +/- 3.39)</td>
<td>13</td>
</tr>
<tr>
<td>4</td>
<td>32 (34 +/- 3.29)</td>
<td>15</td>
</tr>
<tr>
<td>5</td>
<td>31 (29 +/- 3.39)</td>
<td>14</td>
</tr>
</tbody>
</table>

* MMS age norms based on client age +/- standard deviation (SD) (Robnett & Moyers, 2007)
** S5: 14, 15 or 16 = ‘normal’ performance capacity; 10 to 13 = ‘questionable’ performance capacity; 9 or less = ‘poor’ performance capacity

When comparing the client’s performance on the MMS to the S5, the trend appears to be the clients who scored the highest on the MMS also scored highest on the
S5 (e.g. Clients 2 and 4 in Table 6). However, this pattern is not consistent as clients 1, 3 and 5 also performed within the norm on the MMS and clients 1 and 5 scored 14 or 15 on the S5 suggesting ‘normal’ performance capacity. Nonetheless, client 3 who scored the lowest on the MMS (but still within age norms) also scored the lowest on the S5 (‘questionable’ performance capacity). This pattern does not suggest a true pattern of consistency between the MMS and S5 scores for higher scores, but was able to detect lower scores consistently.

When looking at secondary data in which other factors are considered in regards to mean scores of the screens we find the following (see Table 7 using nonparametric two-tailed test of Spearman’s rho correlations):

1.) there are no age differences between screens,
2.) there are no notable differences in scores between gender and hand dominance,
3.) a client with right sided hemisphere stroke had ‘questionable’ performance on the S5 when compared to the other clients with a left hemisphere stroke; clients with a left hemisphere stroke performed below the norm on the MoCA when compared to the client with a right sided hemisphere stroke (graph 2),
4.) clients with an embolic stroke scored lower than that of the client with the stroke of unknown origin on the MoCA, but higher on both the MMS and S5 (graph 2),
5.) clients with lesser days post-stroke on average had ‘normal performance’ on all screens (graph 3),
6.) there are no differences between number of medications and screen scores (graph 4),
7.) a client taking beta blockers alone scored the lowest on the MoCA suggesting this
medication category does seem to impact cognition – thus performance on
cognitive screens (Table 5),

8.) there is no significance with visual impairments on performance between clients,
9.) there is no significance regarding ratings of stress and sleep (graph 5), and
10.) there is no significance among duration of time* and screen.

Just as the nature of stroke leads to variable presentations and outcomes among
clients, so does it appear that the only true comparative relationship of the MMS and S5
based on this sample, is that the MMS was consistent with the S5 in regards to
identifying the client who consistently scored the lowest on the MMS and S5 (client 3)
which is where occupational therapy would need to provide intervention.

Table 7. Spearman’s Rho Correlations of Secondary Data

<table>
<thead>
<tr>
<th>Correlation Coefficient</th>
<th>Significance*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age vs. MMS</td>
<td>-.700</td>
</tr>
<tr>
<td>Age vs. S5</td>
<td>-.447</td>
</tr>
<tr>
<td>Number of Medications vs. MMS</td>
<td>-.205</td>
</tr>
<tr>
<td>Number of Medications vs. S5</td>
<td>-.229</td>
</tr>
<tr>
<td>Number of Medications vs. MoCA</td>
<td>.368</td>
</tr>
<tr>
<td>Time vs. MMS</td>
<td>.791</td>
</tr>
<tr>
<td>Time vs. S5</td>
<td>.412</td>
</tr>
<tr>
<td>Time vs. MoCA</td>
<td>-.216</td>
</tr>
</tbody>
</table>

*significant is p = .001, thus no relationships of significant value in this study
To answer the second research question, “How consistent are the ManageMed Screen (MMS) and the Screening for Self-Medication Safety Post Stroke Scale (S5) scores compared to the Montreal Cognitive Assessment (MoCA) for assessing cognition as an indicator for capacity in medication management?” using visual comparison of data and statistical data analysis the data in Table 3 (re-inserted here from page 44) was reviewed.

Table 3. Client Scores on MMS, S5, and MoCA

<table>
<thead>
<tr>
<th>Client</th>
<th>MMS (mean +/- SD*)</th>
<th>S5**</th>
<th>MoCA***</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>30 (29 +/- 3.39)</td>
<td>15</td>
<td>21</td>
</tr>
<tr>
<td>2</td>
<td>35 (29 +/- 3.39)</td>
<td>15</td>
<td>28</td>
</tr>
<tr>
<td>3</td>
<td>26 (29 +/- 3.39)</td>
<td>13</td>
<td>26</td>
</tr>
<tr>
<td>4</td>
<td>32 (34 +/- 3.29)</td>
<td>15</td>
<td>19</td>
</tr>
<tr>
<td>5</td>
<td>31 (29 +/- 3.39)</td>
<td>14</td>
<td>26</td>
</tr>
</tbody>
</table>

*MMS age norms based on client age +/- standard deviation (SD) (Robnett & Moyers, 2007)

**S5: 14, 15 or 16 = ‘normal’ performance capacity;
10 to 13 = ‘questionable’ performance capacity;
9 or less = ‘poor’ performance capacity

***MoCA: 26 or better = normal performance

When comparing client scores from the MMS and the MoCA, the general trend was a client who scored normal performance on the MoCA also scored ‘normal’ performance based on age for the MMS (e.g. Client 2, 3, 5 in Table 3). Clients who scored below the norm on the MoCA, scored within one standard deviation on the MMS
still indicating ‘normal performance’ (e.g. Client 1, 4 in Table 3). There is no consistency between the MoCA and MMS.

When comparing the MoCA to the S5, we find clients 1 and 5 who scored below norms on the MoCA scored within ‘normal’ performance on the S5; conversely, client 3 who scored ‘questionable’ performance on the S5 scored at the norm on the MoCA. There does not appear to be a consistent relationship between the S5 and the MoCA.

Using Statistical Package for Social Sciences (SPSS – version 20), the test scores for the MMS and MoCA were correlated using nonparametric two-tailed test of Spearman’s rho correlations (Table 7). The MMS score was correlated to the MoCA score and was not found to be significant at a value of .205 with p=.741. The S5 score was also correlated to the MoCA score using SPSS and was found to have a non-significant value of -.287 and p=.640.

From the comparison of the both the MMS and S5 to the MoCA for consistency of scoring, we can conclude based on this sample, that there is not a consistent relationship with scores for medication management capacity and cognition. Normal performance based on norms of the MMS does not indicate ‘normal’ performance on the MoCA, much like ‘normal’ performance on the S5 does not indicate ‘normal’ performance on the MoCA. However, the MMS and S5 were similar in regards to indicating the same client who scored the lowest on both perhaps suggesting the screens are able to detect those who have ‘normal performance capacity’ versus those who have ‘poor performance capacity’ for medication management. However, any relationships or trends noted must be interpreted with the utmost caution.
Data Part II

Thematic qualitative analysis from the transcribed focused group data was completed for data analysis of part II. The process used the following steps as described by Creswell (2009):

1. Organize and prepare thorough transcription of notes
2. Initial processing for general sense of themes, phrases, keywords
3. Coding of themes throughout transcript manually
4. Discussion of any found patterns or themes that have emerged
5. Analysis and interpretations of themes
6. Recommendations related to the findings

The primary investigator conducted and transcribed verbatim clinicians’ responses during the focus group. Questions can be found in Appendix H.

Thematic analysis of all 10 questions and answers led to the development of general themes that enables this data presentation. Theme A (questions 1 and 3) entails clinician feedback on usefulness of the screens via administration, ease of setup, clarity of instructions, test kit assembly/use and advantages/disadvantages of each screen. Theme B (questions 2, 4, 5, 6, 8 and 9) relates the use of the screens in clinical practice via the value of the data collected for treatment planning and discharge recommendations, and clinicians’ impression with the screen’s ability to differentiate adequate from inadequate medication management skills. Theme C (questions 7 and 10) relates to the clinicians preference of screen for future use and the subjects’ responses to testing.
Theme A: Usefulness of the Screens

Usefulness was defined to the clinicians as being accurate, efficient and practical to their work setting and clinical practice. Clinicians did not experience first hand how to obtain or put together their testing kits due to the nature of the study and requirements for testing prior to data collection. However, clinicians were made aware that the MMS comes assembled but needs to be purchased, while the S5 is free but must be assembled by the practitioner. A clinician stated the MMS “comes in a complete kit which is helpful [efficient and practical] for a busy work setting,” while the S5 requires clinicians make their own kit adding a burden to the clinician and can impact accuracy as the screen is “less standardized”. Both kits have “items/pieces that could easily get lost” especially as more clinicians start using the kits in practice which could cause efficiency challenges (e.g. locating all testing items or replacing missing items) in the future due to the fast-paced work setting.

To collect more information on usefulness, clinicians were asked to state advantages and disadvantages of each screen where advantages would relate to being useful (accurate, efficient, practical) in clinical practice and the disadvantages would make the screen less useful. Advantages to the MMS screen as identified by the clinicians included: the screen is “more relevant and practical to every life,” test “items are realistic,” “good variety of questions and test items,” “generally has easy to follow instructions for clinician and client,” and it is “standardized with norm values.”

Disadvantages to the MMS included: “it’s time consuming” “difficult to score during administration,” and “pill box labeling for scoring is not consistent with instructions.” The disadvantages make the MMS less useful in practice to clinicians; however clinician
consensus from the focus group was that advantages outweighed the disadvantages while the MMS lacks efficiency in time to conduct and score the test, it contained practical test items, and had easy instructions to follow enabling the clinician to be more accurate with testing and scoring.

Advantages to the S5 screen regarding usefulness (accurate, efficient, practical) included: “quick, uses easily available items to put the kits together, and has a variety of bottles and pills” and is “easy to score and administer at the same time.” “It’s a good tool for clients who may be resistive to testing or easily frustrated.” Disadvantages to the S5 included: “too simple and too subjective in scoring,” “no way to accurately score or interpret results,” “does not provide enough information,” and it does not appear to be “standardized and has no norms values.” These disadvantages make the S5 less useful in practice to clinicians in regards to being accurate and therefore a less practical screen to use; however clinicians consensus from the focus group was S5 has its place in practice for the right client, such as one who may be resistive to more formal testing like the MMS. Clinicians did not rule the S5 out from their clinical practice, but felt the MMS may be more generally more useful.

Clinicians were asked to share feedback on their impressions of the MoCA. They reported: “the purpose, directions and scoring is easily understood,” but the MoCA is a screen typically used by speech therapy in this setting, “but now it’s nice to understand the screen better and be able to compare scores,” and “it’s standardized.” However, clinicians reported the MoCA “does not relate to function,” “can be too long and abstract for some clients,” and “not a good screen if the client is aphasic.” Clinicians agreed that the MoCA would not be a useful tool for assessing medication management capacity as it
would not accurately screen the client’s skills; however, it is a worthwhile tool to have access to in the practice setting to be able to offer a cognitive screen and it does enable interdisciplinary care.

**Theme B: Applicability to Clinical Practice**

Clinicians were asked to discuss the applicability and value of the data obtained from the screens and how it would impact clinical practice in regards to treatment planning and discharge recommendations. Clinician responses included: “results were an eye opener for me [clinician] and client as it identified areas of need or risk,” “enabled better discharge planning,” and the screens were very “applicable to this setting.” With these tools “testing will help the entire rehabilitation team be more proactive with discharge planning by identifying specific areas to assess in a standardized approach,” and “tools such as these can help our department have a more formal process for client teaching and programs around medication management.” One clinician felt that if these screens were done earlier in the rehabilitation process “referrals to speech could be made to help address cognition should they score poorly on the MoCA.” The theme that emerged suggests that these screens are applicable to clinical practice in identifying clients who may have difficulty with medication management. This information informs accuracy of treatment planning, discharge recommendations and referrals to other disciplines.

Clinicians stated the clients generally performed as anticipated based on their functional performance of activities of daily living. However, one client (client 4) who was doing very well with self-care and mobility performed poorly on the MoCA and was receiving speech therapy for cognitive deficits. While this client had normal performance
with the MMS and S5, the fact that she scored poorly on a cognitive screen was of concern for the occupational therapist. This suggests that the MoCA is applicable to occupational therapy practice as it is a means to do more in depth screening of cognition. Additionally, one clinician reported one client “did okay on the verbal questions, but did not perform as well on motor tasks” which was good to see both on one screen for efficiency. Clinicians also reported that some clients did poorly on the MoCA “but performed well on the MMS perhaps indicating the MMS is more functional.” The clients who had difficulty with testing “often made up excuses, stating it was not their own routine” possible indicating challenges with abstract problem solving. “Higher level clients were tested and they found parts of the screen very challenging, such as the pill box in the MMS” and then realized how their stroke affected their thinking skills. The screens were a good way to start a dialogue with clients about their medication management capacity.

Clinicians were asked to share their impression of each screen’s ability to detect medication management skills. Clinicians stated: “All screens provided good info, some better than others;” the MMS “did well for assessing memory, used a variety of tests and skills, and generally indicated the client’s ability” with medication management. “You could detect if the problem was visual, manipulation or memory” from using the MMS. The S5 “would be hard to get enough information if you were doing it alone, as it is too basic and vague” even though it uses a nice variety of pill and liquid bottles and a variety of pill sizes. As the MoCA assess only memory and not performance of medication management, “it would not be a good stand alone test.”
In regards to treatment planning and discharge recommendations, clinicians reported: “results will help with discharge recommendations especially related to safety,” and “enable patient and family education regarding this task at home.” Clinicians felt that while collecting data about one week prior to discharge was helpful, had it been done earlier in the rehabilitation process “more nurse and doctor communication could have happened” facilitating more in depth teaching from multiple disciplines or modification or reduction of medications.

**Theme C: Clinician’s Preference**

Clinicians were asked to consider each screen, their usefulness and applicability to practice, in order to state their preference of a screen they are most likely to adopt into their practice. Clinicians stated they feel they could make use of all three screens in future practice. However, “generally the MMS will be used most often” as clinicians stated in theme A the MMS is relevant, practical, realistic, contains a variety of questions and test items, easy to follow instructions, and it is standardized with norm values. As the occupational therapy clinicians did not typically use the MoCA at this setting, now being trained in its use and scoring, clinicians stated: “the MoCA will help broaden the tools we use and enable better collaboration with SLP [speech], and its use can help increase justification for rehab stay, and/or adding SLP services, and better communication at team meetings for discharge planning.” Future plans for focus on medication management with the stroke population at this hospital will entail “following through on consistent testing, recommendations and teaching and patient education,” and these tools can help with that.
Clinicians reported that in general, the clients’ responses to testing were positive, they understood the purpose and learned about themselves through the process. Clients generally reported most difficulty with the MMS in regards to the pill box organization task, an instrumental activity of daily living.

Clinicians also found areas of the screens that could be improved to enhance clinical practice. Specifically, “testing was not as complicated as real life” and it “would be helpful if a test could be tailored to the client’s actual medications or routines.” Also, the “pill box scoring on the MMS needs clearer directions for scoring” for the clinician.

Table 8. Selected Quotes from the Focus Group

<table>
<thead>
<tr>
<th>Regarding the MMS screen:</th>
<th>“relevant and practical to every life,” “good variety of questions and test items”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regarding the S5 screen:</td>
<td>“It’s a good tool for clients who may be resistive to testing or easily frustrated”</td>
</tr>
<tr>
<td>Regarding the MoCA:</td>
<td>“does not relate to function”</td>
</tr>
<tr>
<td>Overall Comments:</td>
<td>“results will help with discharge recommendations especially related to safety”</td>
</tr>
<tr>
<td></td>
<td>“generally the MMS will be used most often”</td>
</tr>
</tbody>
</table>
Results Part II

The three clinicians’ consensus revealed that they felt the MMS was the more useful screen of all screens uses when comparing advantages and disadvantages in regards to accuracy, efficiency, practicality and clinical relevance. This directly answers the third research question, “Which of the medication management screening tools (or aspects of each screen) offers the most clinically relevant information to help inform decision making for treatment and discharge planning for medication management capacity for occupational therapy practitioners?” While the MMS was the longest to administer, previously mentioned advantages appear to make it the most clinically useful tool for clients post-stroke in this setting when compared to the S5 and MoCA. The MMS offers more clinically relevant information by screening visual, cognitive and physical performance skills by having clients read medication information and pill bottles, manipulate pill bottles and pills, and complete memory and problem solving tasks. The filling of the pill organizer of the MMS was the most revealing in terms of where clients could have difficulty with managing a medication routine. However, it was also this component that was the most challenging for clinicians to administer and score.

Clinicians also felt that they would adopt the use of the MoCA in their clinical practice, but not as a medication management capacity screen. The MoCA provides clinically relevant information as it can detect what areas of cognition are challenges for the client (visuospatial/executive, naming, memory, attention, language, abstraction, and/or orientation). The use of the MoCA can target treatment towards compensation or remediation approaches to the deficits. Additionally, the MoCA is well understood by the
other team members and can create a dialogue during team rounds to ensure the client is receiving the necessary services while in rehabilitation.

The S5 was the least likely of the screens to be frequently used by these clinicians as it lacks usefulness and clinically relevant information. The S5 was found to be too subjective, vague and the overall score does not relate to a norm. Generally, clinicians felt that while the S5 was the quickest and simplest screen to administer, it did not yield data with enough depth to be useful. Clinicians did appreciate that a variety of pill sizes, colors, and pill or liquid bottles that were included in the screen, but the score was not as meaningful. The S5 will continue to be a possible tool that clinicians can offer a client should the MMS be too challenging or if the client is resistive to the screening process.

This qualitative thematic analysis based on clinician feedback suggests that overall the MMS offers the most clinically useful and relevant information for treatment and discharge planning.
Discussion

Best practice would indicate the use of comprehensive and psychometrically strong tools for client assessment; clinicians often choose assessments tools based on their usefulness and practicality to their practice (AOTA, 2008). From the literature, clinicians were made aware of several medication management screens available on the market for use in practice. However, clinicians were also informed of key items that should be included in a medication management screen, such as language abilities, reading and writing, numeric/calculation, limb praxis, visuospatial function, social use of language, emotional function, attention, executive function, memory and observation of performance of medication management tasks from the literature of Donovan et al. (2008) and Robnett et al. (2007). When comparing these key items to current assessments, the only medication management capacity screens remaining that fit these criteria were the MMS and S5. The MMS and S5 were chosen for further study in this capstone because of their content and format that included cognitive and physical assessments. The screens have also shown to have adequate psychometrics that are supported in the literature which creates sound assessment tools for use in clinical practice. The purpose of this capstone was to compare the consistency of scores of MMS and S5 and MoCA to determine their usefulness in occupational therapy practice.

The results from this pilot capstone study have introduced data for the usefulness of the ManageMed Screen and the Screening for Self-Medication Safety Post Stroke for assessing medication management capacity for clients post-stroke. While statistical significance of scores between the MMS and S5 was not obtained, the most significant and consistent finding was a low score on the MMS equated to a low score on the S5.
This potentially indicates that the MMS and S5 measure similar constructs of medication management capacity for clients post-stroke perhaps supporting the validity of the MMS for use with the stroke population. When comparing the MMS, S5 and MoCA, the researcher learned there is not a consistent relationship with scores for medication management capacity screens and cognition. However, cognition is one factor in medication management capacity that can be assessed with the MoCA which enables the clinician to determine what area of cognition may be impacting performance with medication management.

The second focus of the capstone utilized qualitative analysis of clinician responses for the usefulness of the medication management screens in clinical practice. General consensus is that occupational therapy practitioners preferred the use of MMS due to the depth and breadth of information the screen was able to provide. This information then aids to inform clinical practice regarding client safety with medication management. Clinicians did state that the cost of the kit to their department was not a deterrent to obtaining and using this kit. Overall, clinicians indicated in their responses that the MMS offered the most useful information to inform their practice for clients post-stroke as it assesses “reading, medication knowledge base, problem solving, short-term and prospective memory, and calculations, and lastly a performance” (Robnett & Moyers, 2010, p. 2) all crucial to safety and independence with medication management.

In current practice, occupational therapists are often not using standardized assessment for assessing medication management capacity in the rehabilitation setting. ‘Homegrown’ assessments lack reliability and validity, and using assessments designed for other professions does not measure occupational therapy outcomes (Doucet &
Gutman, 2013). Occupational therapy practitioners need to adopt new, valid, reliable, easily administered and client-friendly tools to strive for professional excellence and effectiveness (Doucet, 2013). It appears the MMS is a useful screen that could be adopted in occupational therapy with clients after they have sustained a stroke.

This capstone pilot study does give merit and cause for ongoing research of this nature. The trends and clinician comments indicate that there is a difference in client performance and utility for each screen. A research study with a greater sample size conducted over a longer period of time could yield data that has more statistical significance. Further research is needed on the general topic of medication management capacity in occupational therapy. Additionally, further research is needed on the use of medication management screens for clients post-stroke.
Study Limitations

A number of limitations must be considered in the interpretations of this pilot study’s findings. First, the sample size for clients was small ($N = 5$), and even smaller for clinicians ($N=3$). Because of the small sample size of clients, some clinicians only conducted the screens on one client therefore the depth of information provided in the focus group was limited. Additionally, the focus group was not audio recorded which could have resulted in some loss of meaning or key phrases provided by clinicians.

Furthermore, the data collected on each screen was only a score; therefore content of each test item could not be further analyzed. In regards to the S5, this screen did not have norm values to relate the score to; thus the value of the score was left to subjective interpretation. Results therefore cannot be generalized and strong conclusions regarding comparisons between screens cannot be made.

Finally, authors of the S5 have indicated a newer version of the S5 is under study and literature will be made available soon to the public. Researchers should review the literature and research for this newer version and utilize it in future studies. Future studies should include more client participants to enable clinicians to conduct screening on more than one client for more in depth data.
Acknowledgments

I would like to thank New England Rehabilitation Hospital of Portland, Maine management, clinicians and clients for their participation in this pilot study. I would also like to thank my co-investigator – Dr. Regula Robnett for her expertise, time and donation (of the MMS kits) for this capstone research project. “Better than a thousand days of diligent study is one day with a great mentor” – Japanese Proverb
References


### Appendix A: Sample of Medication Management Assessments

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<th>Assessment</th>
<th>Description</th>
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<td>Self-Administration of Medication (SAM)</td>
<td>Questionnaire, used by nurses to assess a person’s competence to self-administer medications</td>
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<tr>
<td>Medication Management Ability Assessment (MMAA)</td>
<td>Used with clients with schizophrenia, assessment in completed through role-play</td>
</tr>
<tr>
<td>Drug Regimen Unassisted Grading Scale (DRUGS)</td>
<td>Assesses a highly functioning older adult’s ability for self-medication by looking at ability to identify, access, dose and time their personal medication routine</td>
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<tr>
<td>Medication Management Instrument for Deficiencies in the Elderly (MedMaIDE)</td>
<td>Used for assessment of compliance and management of medication routine</td>
</tr>
<tr>
<td>Medication Management Tasks (MMT)</td>
<td>Developed for assessment of adaptive strategies in patients with dementia</td>
</tr>
<tr>
<td>MedTake Test (MT)</td>
<td>Assesses understanding of dosage, indications, schedule, and safety through interview of older adults</td>
</tr>
<tr>
<td>Self-Medication Assessment Tool (SMAT)</td>
<td>Used by pharmacists to assess deficits in self-management of medications by looking at function, cognition, self-reported adherence, medication recall</td>
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(Adapted from Kaizer et al., 2010)
## Appendix B: Inter-Rater Reliability

### MoCA

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Sharon Hartl, OTR/L
Director of Therapy Operations
New England Rehabilitation Hospital of Portland
335 Brighton Ave.
Portland, Me. 04102

November 12, 2012

Jessica Bolduc, MS OTR/L
43 Elmwood St.
Portland, Me. 04103

Dear Ms. Bolduc,

I want to express my appreciation for the request to participate as a site for your research project titled “Medication Management Capacity of Clients Post Stroke”. I understand that you are listed as the primary investigator for this project. This project is of interest to the Stroke Team at New England Rehabilitation Hospital of Portland as we are currently measuring our success with medication competency for our stroke patients. I believe that your study can provide valuable information to us as it relates to the ability to more accurately screen our patients for their level of knowledge in this area.

The ability to participate in the study is contingent upon your successful IRB approval from Nova Southeastern as well as the approval from HealthSouth’s Clinical Research Committee. I look forward to assisting with this approval process and will be scheduling opportunities for you to come and present your study to the medical staff and the Stroke Team.

Sincerely,

Sharon Hartl, OTR/L
Director of Therapy Operations
Appendix D: HealthSouth Study Approval

Corporate Clinical Research Application

Please read the Human Subject Clinical Research Activity Policy Compliance Guide before beginning this application.

Requested By:
Hartl, Sharon

Phone:
207-662-8428

Corporate Approved Date:
04/26/2013

New Study
130001

HealthSouth (Study) Number:

Usefulness of the ManagedMed Screen and the Screening for Self-Medication Safety Post Stroke for Assessing Medication Management Capacity of Clients Post Stroke

Title of Study:

Medication Management Capacity of Clients Post Stroke

Study Short Name:

Data Review

Topic:

Therapy Study

Sub-topic:

03010100

Hospital ID:

Portland

Hospital Name:

Jessica Bolduc, M.S. OTR/L.

Name of Principal Investigator:
Appendix E: IRB Approval

MEMORANDUM

To: Jessica J. Bolduc, M.S. OTR/L
HPD – College of Health Care Sciences

From: David Thomas, M.D., J.D. (Chair, Institutional Review Board)

Date: January 24, 2013


I have reviewed the above-referenced research protocol by an expedited procedure. On behalf of the Institutional Review Board of Nova Southeastern University, Usefulness of the ManageMed Screen and the Screening for Self-Medication Safety Post Stroke for Assessing Medication Management Capacity for Clients Post Stroke is approved in keeping with expedited review category #7. Your study is approved on January 23, 2013 and is approved until January 22, 2014. You are required to submit for continuing review by December 22, 2013. As principal investigator, you must adhere to the following requirements:

1) CONSENT: You must use the stamped (dated consent forms) attached when consenting subjects. The consent forms must indicate the approval and its date. The forms must be administered in such a manner that they are clearly understood by the subjects. The subjects must be given a copy of the signed consent document, and a copy must be placed with the subjects’ confidential chart/file.

2) ADVERSE EVENTS/UNANTICIPATED PROBLEMS: The principal investigator is required to notify the IRB chair of any adverse reactions that may develop as a result of this study. Approval may be withdrawn if the problem is serious.

3) AMENDMENTS: Any changes in the study (e.g., procedures, consent forms, investigators, etc.) must be approved by the IRB prior to implementation.

4) CONTINUING REVIEWS: A continuing review (progress report) must be submitted by the continuing review date noted above. Please see the IRB web site for continuing review information.

5) FINAL REPORT: You are required to notify the IRB Office within 30 days of the conclusion of the research that the study has ended via the IRB Closing Report form.


Cc: Dr. M. Samuel Cheng
    Dr. Ariela Neuman
    Ms. Jennifer Dillon

Institutional Review Board
3301 College Avenue • Fort Lauderdale, Florida 33314-7796
(954) 255-3398 • Fax (954) 255-3537 • Email: irb@nova.edu • Web site: www.nova.edu/irb
Appendix F: Copies of Testing Materials

MONTREAL COGNITIVE ASSESSMENT (MOCA)
Version 7.2 Alternative Version

VISUOSPATIAL / EXECUTIVE

Copy rectangle

Draw CLOCK (Five past four) (3 points)

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

[ ]

NAMING

[ ]

MEMORY

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

<table>
<thead>
<tr>
<th>TRUCK</th>
<th>BANANA</th>
<th>VIOLIN</th>
<th>DESK</th>
<th>GREEN</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st trial</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>2nd trial</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

No points

ATTENTION

Read list of digits (1 digit/sec.). Subject has to repeat them in the forward order and backward order.

Subject has to repeat them in the forward order: [ ] 3 2 9 6 5
Subject has to repeat them in the backward order: [ ] 5 2 8

2 points

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


1 point

Serial 7 subtraction starting at 90:

[ ] 83 [ ] 76 [ ] 69 [ ] 62 [ ] 55

4 or 5 correct subtractions: 3 pts, 2 errors: 2 pts, 1 correct: 1 pt, 0 correct: 0 pt

3 points

LANGUAGE

Repeat: A bird can fly into closed windows when it’s dark and windy.

The caring grandmother sent groceries over a week ago.

Fluency / Name maximum number of words in one minute that begin with the letter S. (N ≥ 11 words)

2 points

ABSTRACTION

Similarity between e.g. carrot - potato - vegetable. Diamond - ruby - gem. Cannon - rifle

2 points

DELAYED RECALL

Has to recall words:

WITH NO CUE

<table>
<thead>
<tr>
<th>TRUCK</th>
<th>BANANA</th>
<th>VIOLIN</th>
<th>DESK</th>
<th>GREEN</th>
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</tbody>
</table>

Points for UNCUED recall only

5 points

Optional

Category cue

Multiple choice cue

ORIENTATION

[ ] Date [ ] Month [ ] Year [ ] Day [ ] Place [ ] City

Points for uncued recall only

6 points

TOTAL

30 points

Adapted by: Z. Nasreddine MD, N. Phillips PhD, H. Chertkow MD

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Maryland Institute for Emergency Medical Services Systems

Normal 26 / 30

Add 1 point if ≤ 12 yr educ.
Appendix A

ManageMed Screening© Form

The following test sheets may be copied by owner as often as needed, but must be used with the ManageMed Screening© 2003 Test Kit.

ManageMed Screening© 2003

Examiner: ____________________

Date: ____________________

No of Medications: ____________________

Age: ___________ Gender: _________ Dx: ____________________

Visual Status (best corrected vision):

1) On a scale of 1 to 10 (10 is perfect), how would you rate your thinking skills?

1 2 3 4 5 6 7 8 9 10

2) On a scale of 1 to 10 (10 is perfect), how good is your memory? (In general)

1 2 3 4 5 6 7 8 9 10

3) You are about to take a test about managing medications. On a scale of 1 to 10 (10 being the best score), how well do you think you will do?

1 2 3 4 5 6 7 8 9 10

4) At the end of the test I would like you to remind me to refill my prescription at the local pharmacy on my way home from work. Do you think you can do that? Y/N

If no, why? Refused _______ “Won’t be able to remember” _______ Other _______

Please answer the following questions about the pills in front of you. The pills are for blood pressure management, pain control and the treatment of an infection.

<table>
<thead>
<tr>
<th>Question</th>
<th>Comments/Answers</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>5) Pretend that this is a prescription from your doctor. Does the prescription match any of these pill bottles? (A)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6) If this (A) were a prescription from your doctor, would it be safe to take?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you usually read the handouts from your pharmacist?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Question</td>
<td>Answer</td>
<td></td>
</tr>
<tr>
<td>-------------------------------------------------------------------------</td>
<td>--------</td>
<td></td>
</tr>
<tr>
<td>7) Read the highlighted portion aloud.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8) If you miss a dose of medication A by 23 hours, what should you do?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9) Which medication is for blood pressure management?</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Remove handouts now</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10) What is normal blood pressure?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11) Are there any side effects of this medication (B)? If yes…</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12) What is or are the side effects?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13) Under what conditions should you take this medication? (A)?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14) Which of these pills should you take with food?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15) Which medication should you avoid if you needed to drive somewhere right away?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16) What would you do if you could not open the containers?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17) Which medication should NOT be taken sprinkled over applesauce?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18) Which pill should you NOT take first thing in the morning before breakfast?</td>
<td></td>
<td></td>
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<tr>
<td>19) What would you do if you had <strong>severe</strong> difficulty breathing after taking medication B?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20) Can you open these containers? (Open C, please).</td>
<td></td>
<td></td>
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<tr>
<td>21) Count the number of pills (C).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22) How long will these pills (C) last if taken as prescribed?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>23) After 3 days of taking medication A, you feel fine but you still have 8 pills left. What should you do?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24) If you feel a little drowsy after taking medication C, what should you do?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25) What do you think this test was designed for?</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Remove pills now.</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26) What were the 3 different kinds of pills for?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>27) How many pills did you count in the container?</td>
<td></td>
<td></td>
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</tbody>
</table>
Setting up a Medication Routine

Please pretend that you eat your meals at:

8am          noon          5:30 pm

Please set up the pill organizer for one week, following the directions on the labels of the three prescriptions here in front of you. (10 points)

<p>| | | | | | | | | | |</p>
<table>
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</table>

Draw in results of task.

28) Now that you’ve finished, how well do you think that you did? (10 is best.)

1  2  3  4  5  6  7  8  9  10

It’s the end of the test, thank you. (Wait ten seconds...if no response, ask “Is there anything else you were going to do at the end of the test?)

29) Remembered task (with or without cue) ______ (1 point)

30) Remembered task without cue____ (1 point)         Forgot task ____ (0)

Total points:       /39
Screening for Safe Self-medication Post Stroke Scale (S-5)

Instructions for Administration
Note: If patient wears glasses, make sure they are worn throughout the test.
Note: If patient has upper limb paralysis give demonstration using one hand where appropriate.

Materials required
1- Pill bottle with childproof cap
2- Pill bottle without childproof cap
3- Pill bottle with a pharmacy label: must include the information commonly found on a label (medication name, dosage, frequency, time of day to take medication and the name of a person)
4- Liquid bottle with “push and turn” cover and a medicine cup
5- 1 syringe without needle
6- 8 disc-shaped white pills (e.g.: shape of a vitamin C)
7- 1 oval-shaped blue or green gel-capsule pill
8- 1 oval shaped orange pill
9- 1 small and 1 larger disc-shaped white pill
10- Three objects: pen, coin & a key

Diagram #1 - indicating placement of pills for questions #11 and #12

Diagram #2 - indicating placement of pills for question #13
Screening for Self-Medication Safety Post Stroke Scale (S-5)

Evaluator’s name: ____________________ Date: ____________________
Dysphagia (Y / N): ____________________ Mini-Mental State Examination Score (if available): __________

*Concerns and Recommendations (Note further testing/referrals/training needed)

Questions 1-3: Patient needs to succeed in 2/3 questions to continue screening

1. Say: *What month is it?* (Accept +/- 1 month from the correct month)

2. Say: *What time of the day is it?* (Should identify morning, afternoon or evening)

3. Say: *Where are we right now?* (Should identify name of hospital or ward or site)

4. Provide an open bottle with 8 identical white disc-shaped pills and say: *If you have to take 2 pills in the morning and 2 at night, show me how you would group the pills.* (Repeat once if needed)

5. Provide a pill bottle label and say: *Can you read to me what it says on the label?*

6. Present a pen, coin, and key and say: *Remember these three objects: a pen, a coin and a key. Remove the objects and ask patient to name the objects. Please tell me what they are.* (Patient must correctly name all 3 objects.) Then say: *I will ask you to remember these objects later.*

7. Provide a pill bottle with childproof cap and say: *Open this bottle and take out one pill.* (If accomplished: skip to #9, If not accomplished: proceed to #8)

8. Provide a pill bottle without childproof cap and say: *Open this bottle and take one pill.*

Self-Injection (Assess if necessary)

9. Provide a syringe without a needle and ask patient to demonstrate how to inject their medication. Note if patient uses 1 or 2 hands. __________

10. Say: *Can you name the three objects I showed you earlier?* (Patient must correctly name 2/3.)

Randomly place 3 pills (blue, orange, and white) in triangle with pill bottle as in diagram #1.

11. Say: *Point to the disc-shaped pill, then to the oval pill, and finally to the capsule-shaped pill.* (Patient must correctly identify all 3)

12. Say: *Point to the blue pill, then to the orange pill and finally to the white pill.* (Patient must correctly identify all 3)

Place 2 disc-shaped pills (large and small) with pill bottle in the middle as in diagram #2.

13. Say: *Point to the large and then to the small sized pill.* (Patient must correctly identify both pills.)

14. Say: *Imagine you need to take 3 pills every day for your blood pressure and you only have one pill left. Suppose you cannot go to a pharmacy for 4 days, what do you do?* (Repeat once if needed)

15. Provide a liquid medication bottle with “push and turn” cover and say: *Open the bottle and pour 10 ml of the liquid into this cup.* (Accept +/- 2 ml from 10ml)

16. Say: *Do you feel confident in taking your medication on your own?*
Appendix G: Data Collection Sheet

1.) Participant # _____  
2.) Age: _____  
3.) Gender: female  male  
4.) Hand dominance: right  left  
5.) Stroke location: R hemisphere stroke  L hemisphere stroke  
6.) Stroke type: Embolic  Hemorrhagic  Unknown  
7.) Number of days post-stroke: _________  
8.) Number of different medications currently taking: _________  
   - 9.) circle if any of the participants medications fall into the following categories:  
      o antidepressant  beta blocker  barbiturates/benzodiazepines  analgesics  
10.) circle:  
      Does the participant have: visual neglect  field cut  cataracts  glaucoma  
      Other visual impairment ____________________________  

Ask the participant to rate the following:  
11.) Since your stroke, please rate you level of stress on the scale below:  
      NO STRESS  RARELY  EVERY ONCE IN A WHILE  SOMETIMES  ALL THE TIME  
      1 2 3 4 5  
12.) Since your stroke, please rate your sleep behavior on the scale below:  
      NO PROBLEM  RARELY  EVERY ONCE  SOMETIMES  ALL THE TIME  
      A PROBLEM  IN A WHILE  
      1 2 3 4 5  
13.) Screen score of MoCA (version B): _________  
14.) Screen score of MMS: _________  
15.) Screen score of S5: _________  
16.) Total duration of data collection: _________ minutes  

Participant’s comments:  
_______________________________________________________  

Tester’s comments:  
____________________________________________________________  

*CLIENT SCREENED AND UNABLE TO COMPLETE DUE TO:
Appendix H: Focus Group Questions

1. Share your impressions or feedback on the administration of each test, such as ease of setup, clarity of instructions, items in test kits, questions asked

2. Describe the value of information obtained from the tests

3. What do you see as the advantage or disadvantages of each screen

4. Do you find the screens applicable to your clinical practice

5. Did anything surprise you about the participant’s performance on the tests

6. Did you find any discrepancies between test results and the client’s actual performance

7. What were the participant’s general reactions to testing

8. Did information from the screens help you devise your treatment plans or recommendations for discharge

9. Do you feel the MMS did well with detecting medication management skills in clients post-stroke? The S5? Any recommendations for either test?

10. Do you have a preference as to which screen you’ll continue to use
Appendix I: NOVA IRB Approved Recruitment Letter

Dear Occupational Therapy Practitioner:

My name is Jessica Bolduc; I am an occupational therapist and currently enrolled in a doctoral program at Nova Southeastern University. As part of the program requirement, I will be conducting a research project that will be examining the usefulness of two fairly new performance based screens and a cognitive screen for assessing medication management capacity for clients post stroke. As you know, clients post stroke are at higher risk for poor medication management skills due to a potential decline in cognitive skills, such as memory, attention, problem-solving and executive function skills, along with possible physical changes. The goal of this research is to gather more information about two screens being used by occupational therapists to determine a person's capacity for medication management. I am interested in assessing the screen's consistency and for detecting medication management capacity in clients post stroke.

I would like to thank you for your interest in this project and let you know more about what would be included in your role. First, you will need to consent to participate in this study which includes training, screen administration, client recruitment, data collection and participation in a focus group. Prior to training you will also have access to the screen packets and screening tools to review and familiarize yourself with the screens. Next, I will be conducting a few training sessions for each screen, at that time you'll have time to practice administration of each screen. Additionally, it will be required that you complete a short on-line training for conducting human research (e.g. CITI Training).

Once training is completed, you will be conducting the medication management screens on clients in your facility if they meet the criteria below. The goal is to collect a minimum of 10 participant’s data. Per agreement with the rehabilitation manager, you will be given time during your work day to conduct screening. Once data collection is completed, you will be asked to attend a 2 hour focus group to gather your feedback on the use of the medication management screens. Again, per agreement with the rehabilitation manager, you will be given time during your work day to attend this focus group.

Clients that meet the following criteria may be eligible:
- consenting adult with a medical diagnosis of stroke
- taking daily prescription medication(s)
- without moderate to severe receptive or expressive aphasia
- able to read and write in English
- plan to return home and be independent with medication management
- 72 hours from discharge from acute rehabilitation

I look forward to working with you; please feel free to contact me with questions.

Sincerely,

Jessica J. Bolduc, MS, OTR/L
Principle Investigator

Doctoral Student @ Nova Southeastern University
802.734.8289

Health Professions Division
College of Health Care Sciences • Occupational Therapy Department • International Institute for Leadership in Occupational Therapy
3000 South University Drive • Fort Lauderdale, Florida 33328-2318
(954) 282-1252 • Fax (954) 282-5290

College of Osteopathic Medicine • College of Pharmacy • College of Optometry • College of Health Care Sciences
College of Medical Sciences • College of Dental Medicine • College of Nursing
Appendix J: NOVA Approved Consent Forms Client

Adult Informed Consent - Client

Consent Form for Participation in the Research Study Entitled
"Usefulness of the ManageMed Screen and the Screening for Self-Medication Safety
Post Stroke for Assessing Medication Management Capacity for Clients Post Stroke"

Funding Source: None
IRB protocol #: 12191218

Principal investigator
Jessica J. Bolduc, MS OTR/L
43 Elmwood St, Portland, ME 04103
802.734.8289

Co-Investigator
Regula Robnett, PhD, OTR/L
716 Stevens Ave, Portland, ME 04103
207.221.4102

Research Advisor
Ariela Neuman, PhD, OTR/L
3200 S. University Dr, Ft. Lauderdale, FL 33328
954.262.1224

Research Site
New England Rehabilitation Hospital
335 Brighton Avenue, Portland, Me 04103
207-775-4000

For questions/concerns about your research rights, contact:
Human Research Oversight Board (Institutional Review Board or IRB)
Nova Southeastern University
(954) 262-5369/Toll Free: 866-499-0790
IRB@nsv.nova.edu

What is the study about?
After a person has a stroke they can have difficulty with taking their medications due to
to changes in cognitive skills, such as memory, attention, and problem-solving, along with
possible physical changes, such as weakness. The goal of this research study is gather
more information on the usefulness different tools to assess medication management
skills for clients post stroke.

Why are you asking me?
This study is looking for about 25 people who are in acute rehabilitation following a
stroke, who plan on returning home and being independent with their medications.
What will I be doing if I agree to be in the study?
You will be asked to complete two medication management screens and one cognitive screen. It should take no longer than 90 minutes to do, and can be spread over 1-2 days as needed. The tools measure a person’s ability to manage a medication routine which can help with discharge planning and/or treatment by the occupational therapist. Your name or other personal identifiers will not be recorded on the screening materials. By agreeing to be in this study, you will be asked to share some health information outlined below either through interview or clinician looking at your medical chart.

- Age
- Gender
- Hand dominance
- Stroke location and type
- Presence of visual impairment
- Number of days post stroke
- Number of medications taken and medication categories

Is there any audio or video recording?
Screening will not be recorded in any format

What are the dangers to me?
There is no anticipated danger to participants of the study; foreseeable risks or discomfort could include screening anxiety or stress during the screening procedures. All efforts will be made to reduce this stress. You will be encouraged to take rest breaks to reduce stress and/or you have the right to discontinuing with the study.

If you have any questions about the research, your research rights, or have a research-related injury, please contact Jessica Bolduc (principal investigator). You may also contact the IRB at the numbers indicated above with questions as to your research rights.

Are there any benefits for taking part in this research study?
The benefit of your participation in this study include: assessment of your skills for cognition and medication management. Results can help your occupational therapists to work together with your team members to meet your rehabilitation needs.

Will I get paid for being in the study? Will it cost me anything?
There are no costs to you or payments made for participating in this study.

How will you keep my information private?
All information obtained in this study is strictly confidential unless disclosure is required by law.
Confidentiality will be kept of your results as your name will not appear on any screening materials; data will be stored in a locked office to ensure security until the study is completed. Data will then be moved to the locked office of Dr. Robnett (research supervisor) at The University of New England. Data will be kept for a minimum of 36 months from the conclusion of the study as required. That data is being used for a doctoral level research and can be reviewed by the primary investigator, co-investigator and research adviser.

What if I do not want to participate or I want to leave the study?
You have the right to leave this study at any time or refuse to participate. If you do decide to leave or you decide not to participate, you will not experience any penalty or loss of services you have a right to receive. If you choose to withdraw, any information collected about you before the date you leave the study will be kept in the research records for 36 months from the conclusion of the study and you may choose to have your information removed from the research.

Other Considerations:
If significant new information relating to the study becomes available, which may relate to your willingness to continue to participate, this information will be provided to you by the investigator.

Voluntary Consent by Participant:
By signing below, you indicate that
- this study has been explained to you
- you have read this document or it has been read to you
- your questions about this research study have been answered
- you have been told that you may ask the researchers any study related questions in the future or contact them in the event of a research-related injury
- you have been told that you may ask Institutional Review Board (IRB) personnel questions about your study rights
- you are entitled to a copy of this form after you have read and signed it
- you voluntarily agree to participate in the study entitled “Medication Management Capacity of Clients Post Stroke”

Participant’s Signature: __________________________ Date: __________________________

Participant’s Name: __________________________ Date: __________________________

Signature of Person Obtaining Consent: __________________________

Date: __________________________

Institutional Review Board
Approval Date: JAN 2 3 2013
Continuing Review Date: JAN 2 2 2014
Appendix K: NOVA Approved Consent Form Clinician

NOVA SOUTHEASTERN UNIVERSITY

General Informed Consent -Clinicians
Consent Form for Participation in the Research Study Entitled
"Usefulness of the ManageMed Screen and the Screening for Self-Medication Safety
Post Stroke for Assessing Medication Management Capacity for Clients Post Stroke"

Funding Source: None
IRB protocol #: 12191218

Principal investigator
Jessica J. Bolduc, MS OTR/L
43 Elmwood St, Portland, Me 04103
802.734.8289

Co-Investigator
Regula Robnett, PhD, OTR/L
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Research Site
New England Rehabilitation Hospital
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For questions/concerns about your research rights, contact:
Human Research Oversight Board (Institutional Review Board or IRB)
Nova Southeastern University
(954) 262-5369/Toll Free: 866-499-0790 or IRB@nova.edu

What is the study about?
Clients post stroke are at higher risk for poor medication management skills due to a
potential decline in cognitive skills, such as memory, attention, problem-solving and
executive function skills, along with possible physical changes. The goal of this research
is gather more information on the usefulness performance based screens for assessing
medication management capacity for clients post stroke.

Why are you asking me?
This study is looking for approximately 3-4 participants (who served as clinicians in this
study).

Page 1/3
What will I be doing if I agree to be in the study?
In this study, clinicians are asked to conduct screening on participants to gather research data regarding medication management capacity of clients post stroke. As a clinician gathering data, you are also being asked to participate in a focus group to discuss the medication management screens in relation to administration, scoring and data obtained and its impact on clinical practice. Participation in the focus group should be no longer than 120 minutes.

Is there any audio or video recording?
The focus group will be audiotaped and then transcribed for use in data analysis. This audio recording will be heard by the investigators; it will be transcribed by the primary investigator who will use earphones while transcribing the interviews to guard your privacy. The recording will be kept securely the co-investigator’s office in a locked cabinet. The recording will be kept for 36 months from the end of the study. The recording will be destroyed after that time by shredding the tape. Because your voice will be potentially identifiable by anyone who hears the recording, your confidentiality for things you say on the recording cannot be guaranteed although the researcher will try to limit access to the tape as described in this paragraph.

What are the dangers to me?
Risks to you are minimal, meaning they are not thought to be greater than other risks you experience everyday. Being recorded means that confidentiality cannot be promised. Sharing your opinions about these screens may make you anxious. If this happens efforts will be made to reduce this stress.

If you have any questions about the research, your research rights, or have a research-related injury, please contact Jessica Bolduc (principal investigator). You may also contact the IRB at the numbers indicated above with questions as to your research rights.

Are there any benefits for taking part in this research study?
You will learn two medication management screens, and be able to share input that may impact the future of the screens in the field of occupational therapy.

Will I get paid for being in the study? Will it cost me anything?
There are no costs to you or payments made for participating in this study.

How will you keep my information private?
All information obtained in this study is strictly confidential unless disclosure is required by law.
Data will stored in the locked office of Dr. Robnett at The University of New England. Data will be kept for a minimum of 36 months from the conclusion of the study as required.
That data is being used for a doctoral level research and can be reviewed by the primary investigator, co-investigator and research adviser.
What if I do not want to participate or I want to leave the study?
You have the right to leave this study at any time or refuse to participate. If you do decide to leave or you decide not to participate, you will not experience any penalty or loss of employment.

Other Considerations:
If significant new information relating to the study becomes available, which may relate to your willingness to continue to participate, this information will be provided to you by the investigator.

Voluntary Consent by Participant:
By signing below, you indicate that
• this study has been explained to you
• you have read this document or it has been read to you
• your questions about this research study have been answered
• you have been told that you may ask the researchers any study related questions in the future or contact them in the event of a research-related injury
• you have been told that you may ask Institutional Review Board (IRB) personnel questions about your study rights
• you are entitled to a copy of this form after you have read and signed it
• you voluntarily agree to participate in the study entitled “Medication Management Capacity of Clients Post Stroke”

Participant’s Signature: ______________________ Date: ______________

Participant’s Name: ______________________ Date: ______________

Signature of Person Obtaining Consent: ______________________

Date: ______________________
Appendix L: NOVA IRB Amendment Approval

MEMORANDUM

To: Jessica J. Bolduc, M.S., OTR/L
   HPD – College of Health Care Sciences

From: David Thomas, M.D., J.D.  [in red]
   Chair, Institutional Review Board

Date: June 11, 2013

   Research Protocol No. 12191218Exp.

I have reviewed the amendment to the above-referenced research protocol by an expedited procedure. On behalf of the Institutional Review Board of Nova Southeastern University, the following amendment to Usefulness of the ManageMed Screen and the Screening for Self-Medication Safety Post Stroke for Assessing Medication Management Capacity for Clients Post Stroke is approved:

- The addition of the following research assistants: Wendy DiBrigida, Sharon Hartl, Erin Jaqueith

Please note that this does not affect the continuing review date for this protocol.

Cc: Dr. M. Samuel Cheng
    Dr. Ariela Neuman
    Ms. Jennifer Dillon
MEMORANDUM

To: Jessica J. Bolduc, M.S., OTR/L
   HPD – College of Health Care Sciences

From: David Thomas, M.D., J.D. [DA] for DT
       Chair, Institutional Review Board

Date: July 2, 2013

    Research Protocol No. 12191218Exp.

I have reviewed the amendment to the above-referenced research protocol by an expedited procedure. On behalf of the Institutional Review Board of Nova Southeastern University, the following amendment to Usefulness of the ManageMed Screen and the Screening for Self-Medication Safety Post Stroke for Assessing Medication Management Capacity for Clients Post Stroke is approved:

- The addition of a 4th research assistant – David Hesselink

Please note that this does not affect the continuing review date for this protocol.

Cc: Dr. M. Samuel Chung
    Dr. Ariela Neuman
    Ms. Jennifer Dillon