Detecting cognitive impairment in clients with mild stroke or transient ischemic attack attending a stroke prevention clinic

By Gail MacKenzie, RN, MScN, Linda Gould, RPN, Sandra Ireland, RN, PhD, Kathryn LeBlanc, BSc, PhD, and Demetrios Sahlas, MSc, MD, FRCP(C)

Abstract
Twenty clients diagnosed with probable transient ischemic attack (TIA) or stroke attending a stroke prevention clinic (SPC) were screened for cognitive function, as one inclusion criteria for a pilot study examining medication adherence and hypertension management. The Mini Mental State Examination (MMSE) was administered at study admission followed by a second screening within two weeks using the Montreal Cognitive Assessment (MoCA) tool. Individual scores for the MMSE and MoCA were compared. Results demonstrated that the majority (90%) of participants scored in the normal range (≥ 26) on the MMSE (M = 27.9 SD 2.15). However, more than half (55%) of participants had some degree of cognitive impairment based on MoCA scores of < 26 (M = 23.65 SD = 4.082). MoCA scores demonstrated a wider range (Range = 16) compared to the range of MMSE scores (Range = 8). MoCA scores were significantly (p = < 0.05) lower than the MMSE scores. Findings from this pilot study suggest that the MoCA test will identify more deficits in cognition among SPC clients diagnosed with cerebrovascular disease. Further investigation is underway to determine the implications of these deficits on SPC clients’ abilities to follow medication and other treatment regimens.

Key words: stroke, transient ischemic attack, prevention, cognitive testing

Introduction
Cognitive impairment is commonly associated with aging, hypertension, and cerebrovascular disease. The 1994 Canadian Study of Health and Aging identified a 16.8% prevalence of cognitive impairment without dementia in older adults within the general population, and an eight per cent prevalence of dementia in those over 65 years of age (Chertkow, 2002). Arterial hypertension is recognized as a major factor in the etiology of vascular cognitive impairment. Individuals with multiple risk factors for cerebrovascular disease have an increased risk of cognitive decline (Popovic, Seric, & Demarin, 2007). More than half of patients experiencing stroke have subsequent problems with cognition; for example, memory deficits and mental slowness (Bour, 2010).

In 2001, the Ontario Ministry of Health and Long-Term Care funded a number of secondary stroke prevention clinics (SPCs), as part of the Ontario Stroke System model. The purpose of SPCs is to facilitate access to diagnosis and treatment, as well as to promote vascular health and risk factor reduction. In our regional SPC, the majority of clients are over 65 years of age (M = 67.5 years), and hypertension is identified in 65% (Gould, 2009). SPC health care providers endeavour to implement preventive self-management based strategies to help clients identify and manage their risk factors and implement healthy lifestyle changes within two to three brief visits. Best practice recommendations for hypertension management include assessment of adherence to the treatment plan at each visit (RNAO, 2005). In an SPC with high referral volumes and limited visits, it is critical to identify those least likely to adhere to prescribed treatments, and to identify potential barriers to management of such major risk factors as hypertension—barriers such as memory problems or executive dysfunction.

Medication adherence levels for antihypertensive therapy and other treatments in studies of general populations are low (< 50%) (Haynes et al., 2005). Multiple factors contribute to clients’ non-adherence; for example, occurrence of side effects, personal beliefs about medication effectiveness, the complexity of pill regimens, and cost. As client lack of understanding about medication purposes, actions and administration, memory deficits, and ineffective communication with caregivers may all inhibit attainment of self-management goals, screening for cognitive impairments is an important component of care in ambulatory centres.

Two goals of a pilot study examining the influence of a nurse case management model to improve hypertension management and medication adherence (Ireland, MacKenzie, Gould, Dassinger, Koper, & LeBlanc, 2010) conducted in parallel to this study were to: 1) determine a screening process to identify clients at risk for non-adherence, and 2) evaluate and compare the ability of two screening tools to identify mild cognitive impairment in this ambulatory care population.

Literature review
Mild cognitive impairment (MCI) is a term referring to a transitional stage between normal aging and the dementia associated with conditions such as Alzheimer’s disease or cerebrovascular disease (Petersen, Smith, Waring, Ivnik, Tangalos, & Kokmen, 1999). It has alternately been described
as cognitive decline greater than expected for an individual’s age and education level, but not interfering with activities of daily life (Gauthier, Reisberg, Zaudig, Petersen, Ritchie, Broich, et al., 2006). MCI is not always obvious, as people are able to function socially and independently in their activities of daily living, but may still be at risk for memory and adherence issues. The most common distinction between healthy control subjects and subjects with MCI is in the domain of memory (Petersen et al., 1999; Chertkow, 2002). The management of patients with MCI is aimed at control of vascular risk factors (in particular, control of systolic hypertension), treatment of disorders such as depression and hypothyroidism, and discontinuation of anticholinergic drugs when possible. Typically, clients with MCI are living on their own and responsible for their own medication administration and health care decisions. Health care providers must assess how well clients with complex health care conditions understand how to care for themselves and partner with these clients to determine the most successful self-management strategies.

Theoretical perspective
Self-managed care is a model in which health care workers provide education and supportive interventions to increase clients’ skills and confidence in managing their illness conditions. The client is an active partner in setting health goals, and participating in training while being followed by a health care practitioner (South West Local Health Integration Network, 2009). Self-management education emphasizes teaching individuals how to perform tasks that must be undertaken to live well with one or more chronic conditions. Goals of self-management are to strengthen the person’s competence and confidence to manage his/her condition, make informed decisions about care, and adopt healthy behaviours (South West Local Health Integration Network, 2009). An underlying assumption of self-managed care is that clients have the ability to remember and follow treatment recommendations correctly. Where there are deficits in memory, it is important to help people find coping strategies such as visible cues and schedules to improve adherence to treatments.

Screening instruments for MCI
The Mini Mental State Examination (MMSE) is widely used and considered to be a clinical standard in screening for cognitive impairment and dementia in geriatric and in-patient stroke populations. It is composed of 30 items assessing orientation, attention, learning, calculation, delayed recall and construction with scores ranging from 0 to 30. A score < 26 indicates some degree of cognitive deficit (Folstein, Folstein, & McHugh, 1975; Molloy, 1999). The MMSE was designed to identify dementia, delirium and cognitive changes over time (Bour, Rasquin, Boreas, Limburg, & Verhey, 2010). Test-retest reliability varies from 0.82 to 0.98, and a sensitivity of 87% and specificity of 82% has been reported (Cockrell & Folstein, 1988). However, the MMSE lacks sensitivity in detecting MCI or early stages of dementia (Popovic, Seric, & Demarin, 2006). Other limitations of the MMSE as a screening instrument for stroke clients include: ineffectiveness in differentiating between focal and diffuse lesions, language (English-only tool), dependency on age and education factors, and insensitivity to right-sided stroke lesions (Nys, van Zandvoort, de Kort et al., 2005; Feher, Mahurin, Doody, et al., 1992).

The Montreal Cognitive Assessment (MoCA) is a newer instrument that is gaining in popularity as a quick, easy to administer tool capable of determining mild cognitive impairment and assessing executive function (Nasreddine, Phillips, Bédirian, Charbonneau, Whitehead, Collin, et al., 2005). It is composed of 30 items and a score of < 26 is considered less than normal. In a study of 413 patients with TIA and stroke, Pendlebury et al. (2010) determined that the MoCA detected substantially more cognitive abnormalities than the MMSE. More participants with cerebrovascular disease in this study demonstrated deficits in executive function, attention, delayed recall and repetition when compared to those identified using the MMSE. Previously, the MoCA was primarily used to evaluate cognitive function in populations diagnosed with Alzheimer’s and Parkinson disease. High sensitivity and specificity for detecting MCI compared with normal elderly control subjects (0.90 and 0.87 respectively) have been reported for the MoCA (Nasreddine et al., 2005). The MoCA has been translated from English into 33 other languages. Both instruments may be administered in approximately 10 minutes’ time.

<table>
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<tr>
<th>Table 1. Study participant characteristics</th>
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<tr>
<td><strong>Characteristic</strong></td>
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<td>Age &gt; 65 years</td>
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<tr>
<td>Probable TIA or confirmed stroke</td>
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<tr>
<td>Blood pressure exceeding national</td>
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<tr>
<td>recommendations</td>
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<td>Medication self-efficacy rating &lt; 100%</td>
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<td>Self-reported adherence to medication &lt; 100%</td>
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<td>Mini-Mental State Examination &lt; 26</td>
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<tr>
<td>Education Level &lt; 9 years</td>
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<tr>
<td>Lives alone</td>
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<tr>
<td>Hyperlipidemia (documented)</td>
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<tr>
<td>Diabetes (documented)</td>
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<tr>
<td>BMI &gt; 30</td>
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<tr>
<td>Current smoker (within last 6 months)</td>
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<tr>
<td>Former smoker (quit &gt; 6 months ago)</td>
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<tr>
<td>Never Smoked</td>
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<td>Depression (treated)</td>
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In summary, a review of the literature indicated that the MoCA had demonstrated increased ability to detect mild cognitive impairment in the broader stroke and other populations when compared to the MMSE. However, there was insufficient evidence to direct practitioners to the best cognitive screening tool to use to detect MCI in an ambulatory population with mild stroke or TIA attending an SPC.

Design
Study participants were enrolled in a prospective pilot study to determine the feasibility of nurse case management to improve SPC client hypertension management and medication adherence. The study was approved by the Hamilton Health Sciences and McMaster University Research Ethics Board (Ireland et al., 2010). The comparative analysis of cognitive screening data in the study reported here was completed as a sub-study of the larger study by Ireland et al. (2010). Informed consent was obtained from all participants. Twenty participants had cognition assessed at two separate visits. The MMSE was administered as a screening measure at study admission followed by a second screening within two weeks using the MoCA tool. MMSE and MoCA scores for participants were matched and compared. A score of ≥26 indicated normal cognitive function on the MMSE and on the MoCA. As previous studies indicated that participants with 12 years of education or less performed more poorly on the MoCA, one point is added to the total MoCA scores of participants who have less than grade 12 education if the total score <30. A Students’ t-Test was performed to compare the scores in both groups. Analysis was performed by the investigators using a commercially available software program, Statistical Package for the Social Sciences (SPSS), version 12 (SPSS Inc., Chicago, IL, USA).

Results
The study sample included a total of 20 participants with probable TIA or confirmed stroke, hypertension, and one or all of the following: cognitive deficit (MMSE <26), a score of ≤7 on a researcher designed medication self-efficacy scale, and/or any self-reported non-adherence to medications (see Table 1). Age of participants ranged from 32 to 87 years (M = 67.5 years SD 16.077). The majority of the study group was male (60%) and had three or more risk factors for stroke (60%). The risk factor profile of the participants was comparable to that of the SPC population at the study site. However, the study group was composed of more patients with hypertension (100% versus 71.8%), diabetes (50% versus 21%) and hyperlipidemia (65% versus 58.1%) (HHS, 2009). Only two of the 20 participants scored below normal (<26) on the MMSE scores.

Although the majority of participants scored in the normal range (MMSE score >26) for cognition on the MMSE, (M = 27.9, SD + 2.15), MoCA test scores showed more participants (13/20, 55%) had mild to severe cognitive impairment (MoCA score <26, adjusted for <12 years of education) (M = 23.65, SD + 4.082) (Figure 1). Additionally, the range of scores with the MoCA (14 to 30, Range 16) was wider when compared to the MMSE (22 to 30, Range 8). MoCA scores were significantly (p = 0.05) lower than the MMSE scores (Table 2). There were no significant differences between those diagnosed with mild stroke or TIA in total scores or within subcategories of the MoCA; that is, visuospatial/executive, naming, attention, language, abstraction, delayed recall or orientation test categories (p > 0.05). Overall, on average, participants scored lowest in language, abstraction and delayed recall subcategories of the MoCA.

Discussion
Study findings indicate that the MoCA was more sensitive than the MMSE in establishing the presence of mild cognitive difficulties in a group of outpatients with new symptoms of cerebrovascular disease, and that deficits were most pronounced in short-term memory function. The trend to lower scores in language, abstraction and delayed recall in this study suggests that clients with mild stroke or TIA have difficulties in comprehension and memory that may compromise adherence to a treatment regimen.

Similarly, in Pendlebury’s study (2010), the MoCA test showed a population with cerebrovascular disease had deficits in multiple cognitive components not detected by the MMSE, such as, executive function and attention (not tested by the MMSE), and recall and repetition. In a study of patients with asymptomatic carotid stenosis, the MoCA test was also shown to be more sensitive to mild cognitive changes—visuospatial/executive and short-term memory functions (Popovic, Lovrencic-Huzjan, & Demarin, 2009).

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<th>Table 2. Comparison of MMSE and MoCA scores</th>
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<td>Instrument</td>
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<tr>
<td>MMSE</td>
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<td>MoCA</td>
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Figure 1. Comparison of MMSE and MoCA scores
Limitations
The generalizability of the results of this study are limited by the small participant sample and recruitment at a single site. In addition, with the exception of the adjustment made on MoCA screening scores for those participants with less than grade 12 years of education, no adjustments were made for age and education.

Implications for practice and research
The findings from this study suggest that if a MoCA screening test for cognition of < 26 is used as a cognitive screening measure in SPC practice and research, more clients will meet the criteria of having cognitive deficits when compared to the number identified by the MMSE. Results from this study are consistent with those from other studies indicating that the MoCA screening test is more sensitive in identifying mild cognitive impairment in stroke populations when compared to the MMSE (Popovic et al., 2007). Establishing normative values for the MoCA cognitive screening test in SPC populations will be important before using scores in clinical decision-making.

Conclusion
The results from this small study sample of SPC clients with mild stroke or TIA confirm the findings of other research in suggesting that the MoCA test will identify more clients with MCI in populations with mild stroke or TIA when compared to the MMSE. Further investigation is underway to determine the implications of these deficits on SPC clients’ abilities to follow medication and other treatment regimens.

About the authors
Gail MacKenzie, RN, MSN, Clinical Nurse Specialist, Stroke Prevention Clinic, Hamilton Health Sciences (HHS)—General Site, Hamilton, ON.

Linda Gould, RPN, Central South Regional Stroke Data and Evaluation Specialist, Hamilton, ON.

Sandra Ireland, RN, PhD, Chief of Nursing Practice, HHS—General Site, Hamilton, ON.

Kathryn LeBlanc, BSc, MS, Manager—Central South Regional Stroke Program, Hamilton, ON.

Demetrios Sahlas, MSc, MD, FRCP(C), MG DeGroote Professor in Stroke Management, McMaster University, Department of Medicine, HHS—General Site, Hamilton, ON.

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References


