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# Cognitive screening in the acute stroke setting

DANIEL J. BLACKBURN<sup>1</sup>, LEILA BAFADHEL<sup>2</sup>, MARC RANDALL<sup>3</sup>, KIRSTY A. HARKNESS<sup>3</sup>

<sup>1</sup>Academic Neurology Unit, University of Sheffield, Sheffield Institute for Translational Neuroscience, 385a Glossop Road, Sheffield, S. Yorks S10 2HQ, UK

<sup>2</sup>Department of Care of the Elderly, Royal Hallamshire Hospital, Sheffield, S. Yorks, UK

<sup>3</sup>Department of Neurology, Royal Hallamshire Hospital, Sheffield, S. Yorks, UK

Address correspondence to: D. Blackburn. Tel: (+44) 01142222268; Fax: (+44) 01142222290. Email: d.blackburn@shef.ac.uk

## Abstract

**Background:** current literature suggests that two-thirds of patients will have cognitive impairment at 3 months post-stroke. Post-stroke cognitive impairment is associated with impaired function and increased mortality. UK guidelines recommend all patients with stroke have a cognitive assessment within 6 weeks. There is no ‘gold standard’ cognitive screening tool. The Montreal cognitive assessment (MoCA) is more sensitive than the Mini-Mental State Examination (MMSE) in mild cognitive impairment and for cognitive impairment in the non-acute post-stroke setting and in a Chinese-speaking acute stroke setting.

**Methods:** a convenience sample of 50 patients, admitted with stroke or transient ischaemic attack (TIA), were screened within 14 days, using the MoCA and the MMSE.

**Results:** the mean MoCA was 21.80 versus a mean MMSE of 26.98; 70% were impaired on the MoCA (cut-off <26) versus 26% on MMSE (cut-off <27). The MoCA could be completed in <10 min in 90% of cases.

**Conclusion:** the MoCA is easy and quick to use in the acute stroke setting. Further work is required to determine whether a low score on the MoCA in the acute stroke setting will predict the cognitive and functional status and to explore what the best cut-off should be in an acute post-stroke setting.

**Keywords:** stroke, cognitive impairment, post-stroke dementia, older people

## Introduction

Current literature suggests that 20–30% of patients will have dementia 3 months post-stroke [1] but up to two-thirds of patients will have cognitive impairment, if tested in the acute stroke period [2]. Post-stroke cognitive impairment results in impaired function, distress to patients and carers and is associated with increased mortality [3]. It is a hidden cost because if not specifically looked for it

can be missed. A recent surveys by the Stroke Association ([http://www.stroke.org.uk/information/our\\_publications/other\\_material/needs\\_survey.html](http://www.stroke.org.uk/information/our_publications/other_material/needs_survey.html)) found cognitive impairment to be one of the silent unmet needs in >50% of stroke survivors at 1 year after stroke.

Recent Stroke Quality Standards from the National Institute of Excellence (NICE) state ‘All patients after stroke are screened within 6 weeks of diagnosis, using a validated tool, to identify mood disturbance and cognitive

impairment'. (<http://www.nice.org.uk/aboutnice/qualitystandards/stroke/mooddisturbanceandcognitiveimpairments.jsp>). Vascular cognitive impairments are different from those seen in degenerative dementias, with greater numbers having executive dysfunction, which comprises planning, maintaining and switching attention. The ability to make decisions, plan, use judgment, self-correct are all essential for complex activities of daily living (ADL) and for functioning independently [4]; 40.6% of post-ischaemic stroke patients have executive dysfunction and these patients are more impaired on measures of ADL [5]. Post-stroke patients may have isolated impairment in just one cognitive domain [6] and be better described as vascular cognitive impairment not demented (VCIND) and these patients can improve and deteriorate. Most commonly used cognitive screening tools were designed to detect Alzheimer's disease, which is primarily a disorder of memory and they may be insensitive in the post-stroke setting.

The aim of this study was to assess if the MoCA could be used in the acute stroke setting within an English-speaking population. This study adds to the literature on the usefulness of the MoCA in the acute [7] and non-acute stroke setting [8] and highlights that the MoCA can be performed usually <10 min and within 48 h of stroke. We need further long-term data to determine how effective the MoCA is at predicting cognitive impairment in the future.

## Methods

A convenience sample of 50 patients, aged >18 admitted with a stroke or transient ischaemic attack (TIA) within the last 14 days and medically stable for 24 h were eligible for screening with the MoCA and MMSE. We excluded patients with major physical disability, significant aphasia or dysarthria that impeded cognitive assessment or had a major active psychiatric disorder. This was a convenience sample and we do not have the data on the excluded patients but accept that a significant number of patients were ineligible for screening. A previous study of first-ever stroke excluded just over 28% of patients due to similar exclusion criteria [9] and we expect to have excluded more in our study due to including all, not just first ever, stroke. We were most interested in patients with mild stroke (majority) and TIA who are often fit for discharge within 1 or 2 days and have limited motor impairment but who may have cognitive impairment especially executive dysfunction.

The montreal cognitive assessment (MoCA) is a 30-point global cognitive screening. It detected 90% of mild cognitive impairment compared with the 18% with the MMSE

[10]. It has acceptable specificity, 87 versus 100% with the MMSE [10]. It has been shown to be more sensitive in detecting cognitive impairment in the post-stroke rehabilitation [8] and acute setting [7, 11]. It is free, available in >30 languages ([www.mocatest.org](http://www.mocatest.org)) and has more measures of executive dysfunction. The MoCA has been suggested as a screening tool by National Institute of Neurological Disorders and Stroke–Canadian Stroke Network Vascular Cognitive Impairment Harmonization Standards [12] and by the UK NHS improvements for stroke documents ([www.improvements.nhs.uk/stroke](http://www.improvements.nhs.uk/stroke)).

This was part of a service evaluation and passed the ethics review used within this body.

## Results

We screened 50 patients admitted to the hyperacute stroke unit with acute stroke or high-risk TIA within 14 days. We do not routinely admit patients with high-risk TIA but some patients have medical co-morbidity, mobility or social issues which preclude immediate discharge after urgent TIA assessment; mean age: 66.16 (range: 20–89; SD: 15.49). We had a male preponderance (M:F, 31:19). The mean MoCA was 21.80 (SD: 4.41) versus a mean MMSE of 26.98 (SD: 3.89) (see Table 1). We had 13 patients with TIA; mean age 66.78 and the mean MoCA was 23.8 and the mean MMSE was 28.3. Six out of 13 (46.2%) patients with TIAs were impaired on the MoCA and 3 out of 13 (23.1%) were impaired on the MMSE.

Thirty-five out of the 50 patients (70%) were impaired on the MoCA (with a cut-off <26/30) versus 15 (30%) on the MMSE (cut-off <27, this is the cut-off used by Pendlebury *et al.* in a UK post-stroke rehab cohort [8]) (see Table 2). If we used a lower cut-off score of 24 for the MMSE which other authors have used [7] only 6 out of 50 patients (12%) were impaired. Of those impaired on the MoCA, 60% had a MMSE >27. One patient had a normal MoCA and an abnormal MMSE (MoCA: 27 and MMSE: 26). A Fisher's exact test on the results showed a  $P = 0.021$ , showing a statistically significant association between the MMSE and MoCA.

The mean length of time after a stroke for our cognitive assessment was 3 days (median 2 days). We performed cognitive assessment on Day 1 in 14 patients and on Day 2 in 15 patients. We timed the MoCA and MMSE in 35 of the assessments and found that the MoCA took longer (MoCA mean time 7.37 min versus MMSE, 5.95 min) (see Table 1). The maximum time taken to perform the MoCA was 30 min and only 6 out of 35 took more than 10 min, all of whom were cognitively impaired.

**Table 1.** Mean scores for all stroke and TIAs plus time taken for the MoCA and the MMSE

	Stroke + TIA (50)	Stroke (37)	TIA (13)	Mean time (35 cases) (min)
Mean age	66.16 (SD 15.49)	65.96 (SD 15.60)	66.77 (SD 16.40)	
MoCA	21.80 (SD 4.41)	20.22 (SD 5.15)	23.85 (SD 5.86)	7.37 (SD 2.30)
MMSE	26.98 (SD 3.89)	25.92 (SD 5.45)	28.31 (SD 5.92)	5.95 (SD 1.89)

**Table 2.** MoCA and MMSE scores

	MoCA <26	MoCA ≥26	Total
MMSE <27	14	1	15
MMSE ≥27	21	14	35
Total	35	15	50

## Discussion

The MoCA is easy and quick to use and detects a higher rate of patients as cognitively impaired compared with the MMSE in the acute post-stroke setting. This is consistent with the literature from a study of >400 stroke patients seen at between 6 months and 5 years which found 70% of patients impaired on the MoCA (55% of patients impaired on the MoCA had normal MMSE) [8]. They found five patients with a normal MoCA but impaired on the MMSE. The MoCA picked up substantially more cognitive abnormalities than MMSE, demonstrating deficits in executive function, attention and delayed recall. A study of Singaporean acute stroke patients [7] (using a cut-off <21, derived from data from their local memory clinic) found 61 out of 101 (61%) were impaired on the MoCA. A French study [13] using an adjusted MoCA cut-off of 27 showed sensitivity of 1.00, but low specificity of 0.13 but an adjusted MoCA cut-off of 23 gave a sensitivity of 0.84, specificity of 0.81. This study suggested that the MMSE may be as good if not better than the MoCA using an adjusted MMSE cut-off 24, which gave a sensitivity of 0.7, specificity of 0.97. A previous validation of the MMSE in acute stroke setting, of only 34 patients, but performed within 1 week of stroke, found the MMSE with a cut-off <24 had sensitivity of 0.34 and specificity of 0.7 but misclassified as cognitively normal, 69% of patients with reasoning disturbances and 64% with executive disorders [2].

The speed of using the MoCA is important for the busy acute stroke setting. We have previously shown that the Addenbrooke's cognitive exercise (ACE-R) is more sensitive at detecting cognitive impairment in the non-acute post-stroke setting. Fifty-five per cent of patients with cognitive impairment (cut-off 82 using ACE-R) were not detected by the MMSE alone (presented at UK stroke forum) [14]. We felt that the ACE-R might be too long for use in a busy acute stroke ward. The length of time taken in our study (mean: 7.37 min) is quick and compares with the original article that set up to design a tool to use in <10 min [10] and a study in a neurological rehabilitation centre for >65 s, where the mean time for the MoCA was 14.8 min (range 5–30) [15].

Stroke care has changed considerably over recent years with rapid assessment, and a reduction in the length of stay in hospital. This means that patients with mild strokes, especially those without motor or other obvious disability, are discharged quickly. Executive dysfunction may be present in mild strokes, which have minimal motor difficulties and manage basic daily tasks, but struggle with more complex activities such as work, leisure and family responsibilities. These patients are often discharged with little or no follow-

up because on the surface, without appropriate assessment, they appear to be functioning well. Accurate and appropriately timed assessment is essential as evidence suggests that the identification of participatory problems resulting from high-level (non-obvious) difficulties such as cognitive executive function problems is crucial [16].

It is important to see whether performing cognitive screening testing is valid even if patients appear medically well within 2 weeks of a stroke. It is likely that the 70% of post-stroke patients impaired on the MoCA will include those with a dementia at 3 months but what are also important are whether an impairment on the MoCA helps define VCIND, whether these patients are functionally impaired and whether early intervention can help reduce disability and aid recovery of cognitive impairment. Further validation of the MoCA with formal neuropsychological validation and clinically meaningful outcome measures are required in order to investigate the clinical usefulness and ecological validity [17] of early cognitive screening in the post-stroke setting.

This project was approved as a service review from the Sheffield Teaching Hospitals NHS Trust and complied with clinical governance requirements and ethical principles of that process. We would like to acknowledge all the patients and their families and carers who took part in this service review plus the junior doctors, therapists and nurses working on the hyperacute and acute stroke unit who helped treat these patients and help collect these data.

## Key points

- MoCA is more sensitive than MMSE.
- Post-stroke cognitive impairment is very common early post-stroke.
- Post-stroke screening tools need more assessment of their ecological validity.

## Conflicts of interest

None declared.

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## Potentially inappropriate prescribing in older residents in Irish nursing homes

CRISTIN RYAN<sup>1,3</sup>, DENIS O'MAHONY<sup>2</sup>, JULIA KENNEDY<sup>3</sup>, PETER WEEDLE<sup>3</sup>, ELMARIE COTTRELL<sup>3</sup>,  
MARIANNE HEFFERNAN<sup>3</sup>, BRID O'MAHONY<sup>3</sup>, STEPHEN BYRNE<sup>3</sup>

<sup>1</sup>School of Pharmacy, Queen's University Belfast, 97 Lisburn Rd, Belfast BT9 7BL, UK

<sup>2</sup>Geriatric Medicine, Cork University Hospital, Cork, Ireland

<sup>3</sup>Pharmaceutical Care Research Group, School of Pharmacy, University College Cork, Cork, Ireland

Address correspondence to: C. Ryan. Tel: (+44) 28 9097 2027; Fax: (+44) 28 9024 7794. Email: c.ryan@qub.ac.uk

### Abstract

**Background:** STOPP/START was formulated to identify potentially inappropriate prescribing (PIP) and potential prescribing omissions (PPOs) in older people. The purpose of this study was to determine the prevalence of PIP and PPO in older Irish patients in residential care using STOPP/START.