

## Using the Telephone Interview for Cognitive Status and Telephone Montreal Cognitive Assessment for Evaluating Vascular Cognitive Impairment: Promising Call or Put on Hold?

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See related article, p 2952

The use of telemedicine for the assessment and follow-up of patients who have suffered a stroke or other neurological conditions has increased dramatically over the past decade. There are several compelling reasons for this, including the need for initial screening and rapid clinical decision making and triage. Telemedicine may also reduce costs associated with routine follow-up visits, increase the number of cases that can be followed by the limited number of neurologists with stroke specialty available in some localities, and improve access to health care for disabled patients, particularly those living far from specialized stroke services.<sup>1</sup> In this context, telephone assessment measures of cognitive functions have gained in popularity, providing clinicians with a way of conducting an initial evaluation of patients remotely or before coming to the hospital or outpatient office for more detailed assessments. The Telephone Interview for Cognitive Status (TICS)<sup>2</sup> has been used for patients with reported changes in cognitive function to determine whether dementia or less severe mild cognitive impairment (MCI) is present, with accuracy that may depend on the severity of impairment.<sup>3</sup> This type of assessment has been particularly useful for research studies in which the goal is to exclude individuals with early stage dementia and possible neurodegenerative disease or to help identify potential study participants with cognitive dysfunction to be confirmed in follow-up face-to-face detailed cognitive assessments. The Telephone Montreal Cognitive Assessment (T-MoCA), which was developed as an alternative to the TICS, provides a means of assessing mental status based on the parts of the MoCA that can be administered over the phone.<sup>4</sup> The MoCA and its telephone-based versions may have particular clinical value for the assessment of patients with nonamnestic MCI, who can have greater impairments related to attention and executive

functioning.<sup>5</sup> Despite the growing interest and use of these telephone-based cognitive assessments, studies to validate their performance have been limited and especially for evaluating cognitive function poststroke.

In their article entitled, "Validation of the Telephone Interview for Cognitive Status and Telephone Montreal Cognitive Assessment Against Detailed Cognitive Testing and Clinical Diagnosis of Mild Cognitive Impairment After Stroke," Zietemann et al<sup>6</sup> provide valuable psychometric information for clinicians who are considering using these measures for the assessment of vascular cognitive impairment in patients poststroke. Cognitive performance was analyzed in 105 patients from the Determinant of Dementia in Stroke cohort, a prospective longitudinal observational study of people who had experienced acute stroke. Strengths of this validation study include comparison to a relatively comprehensive cognitive assessment battery with 18 neurocognitive tests covering the domains of memory, executive attention, visuospatial function, and language, along with clinical evaluations, from which clinical dementia ratings (CDR) were determined. MCI was diagnosed based on impairment in one or multiple domains and also based on the CDR. The receiver operator characteristics of the TICS and T-MoCA were established to provide the sensitivity and specificity (ie, discrimination validity) of each telephone measure for correctly classifying MCI among patients in the cohort. The study's analyses provide important and helpful information on the ability of each test to correctly discriminate MCI based on the chosen test score that is used as a cut point for making a diagnosis.

The authors conclude that both the TICS and T-MoCA accurately detected MCI after stroke and that discriminability is greater when there is evidence of impairments in multiple cognitive domains versus 1 domain. This conclusion is supported by the results, particularly, if these telephone assessments are used primarily to identify stroke patients who may be experiencing MCI or dementia. Notably, the sensitivity of T-MoCA is 100% for multidomain MCI when a score of <19 serves as the cut point. The sensitivity of the TICS is not as strong, though respectable at 87% for multidomain MCI in this cohort when a cut point of <36 is used. Accordingly, the T-MoCA does an extremely good job at detecting patients who may have MCI poststroke, the TICS to a lesser extent. Clinicians using the T-MoCA will almost always avoid missing cases of MCI. This is important in research and clinical trials when the goal is to exclude participants who have indications of possible MCI or dementia.

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In contrast to their sensitivity, the T-MoCA and TICS have only moderate specificity, with a maximal accuracy of 73% when the cut points of 19 and 36 are used for diagnosing MCI. In this case, the likelihood of false-positive errors is  $\approx 1$  in 4 for each of these tests, such that clinicians will more often classify patients as having MCI when in fact they do not actually meet criteria based on a more comprehensive neurocognitive assessment or CDR. Although this false-positive rate is well above chance, a clinician should not be highly confident in making a diagnosis of MCI based solely on performance on either of these 2 telephone-based measures. Although it is possible to achieve greater specificity by shifting to a lower cut point on each measure, this comes at the cost of significant sacrifices in sensitivity, potentially leading to many MCI cases going undetected. In sum, the results strongly support the use of these measures if the intent is to alert clinicians that additional assessment is warranted, but not as an indication of the actual presence of MCI.

For single-domain MCI, the accuracy discrimination ability of the T-MoCA and TICS is weaker,  $\approx 81\%$  for the T-MoCA and 73% for the TICS if one hopes to achieve specificity greater than chance. It is noteworthy that at the cut point that provides optimal diagnostic discrimination of single-domain MCI, the T-MoCA has the same false-positive rate as for multiple domain MCI ( $\approx 25\%$ ), whereas the probability of missing cases increases from near zero to  $\approx 20\%$ . In fact, when sensitivity and specificity are considered together, the TICS does not seem to be a particularly good tool for detecting single-domain MCI in stroke patients, as the rates of both types of errors may be unacceptably high.

The accuracy of these measures for correctly classifying MCI as defined by CDR is even less encouraging with sensitivity dropping to  $\approx 80\%$  and specificity only a bit above chance. This is not altogether surprising given that the CDR is a rating based on a qualitative clinical judgment of cognitive and functional impairment rather than a direct quantitative measure of cognitive performance.

Another important consideration when using either the T-MoCA or TICS is that there is a restricted range of possible scores and that a difference of only 1 point in total score can result in a dramatic difference in their accuracy of discrimination. For example, while using a cut point of 19 on the T-MoCA yields close to 100% sensitivity, dropping this threshold by 1 point to 18 decreases sensitivity to 87% for multidomain MCI. A single-point increase in the cut point, from 19 to 20, reduces specificity from 73% to 54%. This characteristic has potentially important clinical implications apart from the psychometric properties of these tests. That such a large change in the accuracy of detection occurs with such a small difference in scores makes them potentially vulnerable to minor deviations in how they are administered and interpreted by the clinicians using them. In a well-controlled research study, this problem can be overcome by standardizing the administration and scoring methods and insuring that all test administrators are certified, by receiving the same training. However, when used in routine clinical settings, it is likely that clinicians will differ some in their approach and scoring of responses. Although it is possible to overcome this

tendency, if all clinicians using these instruments undergo specialized training, it may be important to focus on working to further enhance these telephone-based screening measures to be less impacted by such variation in test performance and administration.

In conclusion, the results of this study from the Determinant of Dementia in Stroke cohort provides useful information about the relative accuracy of the T-MoCA and TICS for detecting MCI in stroke patients. Zeitemann et al<sup>6</sup> have conducted a rigorous analysis of the psychometric properties of these 2 tests. Both tests perform well in detecting possible MCI with strong sensitivity to cognitive impairment, though the results from this sample suggest that the T-MoCA is probably better. Importantly, these measures have adequate validity if the goal is to identify patients who should be evaluated further in a clinical setting or if there is a need to exclude anyone who has MCI in a research study. Unfortunately, they seem to be less useful for correctly diagnosing stroke patients as definitively having MCI, because of their susceptibility to false-positive errors. Therefore, it is essential that clinicians not rely on these telephone cognitive assessment screening instruments as a substitute for a standardized comprehensive neurocognitive evaluation in patients suspected of having MCI. When patients score either very high or very low on these instruments, the question of cognitive status is easier to address. However, for patients whose scores hover around the chosen cut points, caution should be exercised, particularly, because a difference in a point or two in total score can dramatically alter diagnostic accuracy. Accordingly, it is essential that these tests be administered and interpreted in a uniform and standardized manner by trained clinicians or psychometrists. Ultimately, the T-MoCA and TICS serve well for their original purpose as initial screening measures to support subsequent clinical or research assessments and decision making.

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## Disclosures

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