What are the Methods for Diagnosing MCI?

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Speech-language pathologists will be increasingly called upon to screen for, identify, and assess mild cognitive impairment (MCI) as the population ages. The diagnosis of MCI involves several professionals and requires an evaluation of normal and abnormal cognition and cognitive-communication, which a speech-language pathologist is in a unique position to provide. The general diagnostic criteria for MCI diagnosis are largely agreed upon at this point in time, and subtypes of MCI are receiving increasing attention. Early identification of MCI and detailed characterization of functioning will be more important as therapy targeting prevention of dementia and early cognitive dysfunction is developed. Speech-language pathologists should have a working knowledge of the diagnostic criteria and currently accepted subtypes in order to serve this population.

Individuals who have communication problems associated with dementia are the fastest growing clinical population in speech-language pathology (American Speech-Language-Hearing Association [ASHA], 2005b). Mild cognitive impairment (MCI) is considered to be a prodrome of several types of dementia and neurodegenerative disease, including Alzheimer’s disease (AD). Speech-language pathologists (SLPs) have a primary role in identifying and screening those at risk for MCI, and they often provide evidence from cognitive and cognitive-communication assessment to other professionals for a medical diagnosis of MCI. This article will describe the currently accepted best practice for clinical diagnosis of MCI, including a description of the role of the SLP in that diagnosis, the subtypes of MCI, and tools available to the SLP for assessment.

SLPs who work with older adults, especially in acute care and skilled nursing facilities, are often in a unique position to observe and document the early functional changes in cognition and communication associated with MCI. They also may be called upon to screen for changes in cognition and communication noticed by clients, their families, or other professionals. According to ASHA, SLPs that have experience with older adults and have received appropriate training in dementia and cognitive-communication are responsible for the identification and assessment of cognitive-communication disorders (ASHA, 2003, 2005a, b). This responsibility includes the identification of persons at risk for dementia and assessment of cognitive-communication across the course of disease progression (ASHA, 2005a, b). The progression includes MCI because it is considered to be a prodrome of several types of dementia (Hughes, Snitz, & Ganguli, 2011). Documentation of early symptoms is especially important in MCI because change over time is a key clinical marker in diagnosis and identification of a clinical progression from MCI to dementia. See Fleming (2013, in this issue) for a discussion on differentiating MCI from normal aging.

Clinicians should be aware of the different roles of professionals in their workplace and avoid “turf battles” over the often-shared areas of cognitive performance and assessment (see
ASHA, 2003, for a thorough description in particular of the roles of SLPs and neuropsychologists). Diagnosis of MCI is made by a medical doctor, often a neurologist. Cognitive and cognitive-communicative assessments contribute to that diagnosis. SLPs are often called upon and qualified to assess cognition, but neurologists, neuropsychologists, psychologists, or other professionals may serve that need in a facility depending on needs, training, experience, and interest. Cognition and cognitive-communication assessment is within the purview of the SLP, and communication is inseparable from cognition (ASHA, 2003, 2005a). Even if it is the case that the SLPs do not commonly assess cognition, they still should document cognitive changes and screen for those changes when warranted. Repeated documentation over time is critical for identifying MCI, and early identification of MCI will become increasingly important as therapy that can prevent or delay dementia progression is further developed.

**Clinical Diagnostic Criteria of MCI**

Factors such as sensory function, mood disorders, delirium, and *polypharmacy* (i.e., multiple medications that may be clinically unwarranted and increase the chance of adverse drug reactions), among others, may contribute to, mask, or worsen changes in cognitive functioning and should be assessed prior to a diagnosis of MCI (ASHA, 2005a, b). Developmental or acquired disorders that affect cognition and have not changed over time would also rule out a diagnosis of MCI (Nelson & O’Connor, 2008). After other factors have been addressed, general diagnostic criteria for MCI diagnosis are now widely accepted (Albert et al., 2011; Hughes et al., 2011; Litvan et al., 2011; Nelson & O’Connor, 2008; Petersen & Negash, 2008; Reinvang, Grambaite, & Espeseth, 2012). These criteria are summarized below.

**General Diagnostic Criteria for MCI**

- Subjective cognitive complaint or concern
- Abnormal cognition for age in one or more domains
- Essentially normal activities of daily living
- Absence of dementia
- Cognitive decline observed over time

(Albert et al., 2011; Nelson & O’Connor, 2008; Petersen & Negash, 2008; Rainvang et al., 2012)

These core criteria are intended to differentiate MCI both from normal aging and from dementia, but the distinctions between them are on a continuum (Albert et al., 2011; Qualls, 2005; Reinvang et al., 2012). Abnormal changes that warrant a diagnosis of MCI can be difficult to distinguish from normal aging, and changes that warrant a dementia diagnosis over MCI can be challenging as well. The clinical picture of MCI to keep in mind is that the patient or someone that knows them well must have noticed a decline in their cognition over time, and it must affect their life but not to the point of keeping them from successfully completing normal daily activities in a familiar setting. There are biomarkers used in more detailed diagnoses of MCI, but they are used mainly in research settings. Use of biomarkers may be more widely used clinically in the near future as more is understood about the physiological processes of aging and neurodegeneration related to dementia (e.g., Albert et al., 2011).

After a diagnosis of MCI is made, the clinical subtype must be identified. In early studies of MCI, some investigators believed that MCI was always a symptomatic pre-dementia phase of AD. However, while AD is still considered to be the most common underlying etiology, four major subtypes are now recognized with different cognitive and etiological profiles: (a) amnestic MCI–single domain; (b) amnestic MCI–multiple domain; (c) nonamnestic MCI–single domain; and (d) nonamnestic MCI–multiple domain. Further research is expected to better describe the connections between the MCI cognitive profile and the etiology. The current divisions between the four subtypes are summarized in Table 1.
Table 1. Four Subtypes of MCI

<table>
<thead>
<tr>
<th>Subtype</th>
<th>Cognitive Profile</th>
<th>Possible Etiologies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amnestic MCI</td>
<td>Single domain Memory impairment only</td>
<td>AD, depression</td>
</tr>
<tr>
<td></td>
<td>Multiple domain Memory and other cognitive impairment</td>
<td>AD, vascular dementia, depression</td>
</tr>
<tr>
<td>Nonamnestic MCI</td>
<td>Single domain Single cognitive impairment, memory unimpaired</td>
<td>Frontotemporal dementia, Parkinson's disease¹, normal aging²</td>
</tr>
<tr>
<td></td>
<td>Multiple domain More than one cognitive impairment, memory unimpaired</td>
<td>Dementia with Lewy bodies, vascular dementia</td>
</tr>
</tbody>
</table>

(Albert et al., 2011; Litvan et al., 2011; Nelson & O’Connor, 2008; Petersen & Negash, 2008; Reinvang et al., 2012)

¹Impairments can occur in memory and other cognitive domains, but a recent review of the literature on MCI in Parkinson’s disease found that single domain, nonamnestic MCI, was most common (Litvan et al., 2011). ²An extreme group of normally aging older adults may have nonamnestic MCI affecting only executive functioning (Reinvang et al., 2012).

Assessment of MCI

Overview of the Process

Complaints and concerns about cognition are the first step in a MCI diagnosis. Common complaints are often related to cognitive-communication: word-finding difficulties, forgetting names, and losing track of a conversation (ASHA, 2005a, b). Other common complaints include losing or misplacing items; taking too long or making errors when performing previously familiar tasks, such as paying bills or preparing a meal; and getting lost or disoriented in unfamiliar environments (Albert et al., 2011; Nelson & O’Connor, 2008). These complaints are quite common in older adults, and identifying when these seemingly “normal” aging changes are pathological is a challenge in MCI diagnosis.

After a subjective complaint of cognitive decline is reported, described, and documented, the next step is determining the possible source for that decline. Sensory functioning must be screened, mood must be evaluated, and other possible medical causes should be explored. A SLP is most likely to see a patient with suspected MCI once a physician has ruled out other possible medical sources of subtle cognitive complaints, but not necessarily before all the other appropriate screenings have been conducted. In order for MCI to be diagnosed, other causes of cognitive decline must be ruled out or corrected, or they must not fully explain the observed level of functioning or changes in functioning.

Once sensory functioning has been accounted for, cognitive evaluation is warranted to document impairments and functioning. The best case for diagnosis and care is when a professional has documented cognitive functioning using formal assessments at several points in time. Realistically, cognitive functioning often must be assessed in a single diagnostic consultation using simple measures of global function or informal cognitive assessment. Cognitive change may also often be inferred from patient history and validated by an informant. The value of input from an informant, such as a family member or caregiver, has been stressed in the literature on MCI (e.g., Petersen & Negash, 2008). The Blessed Dementia Rating Scale (Blessed, Tomlinson, & Roth, 1988) and the Clinical Dementia Rating (Berg, 1988) are brief measures of behavioral functioning based on an interview with an informant.

This assessment is most effective when it includes observation and assessment in the patient’s most familiar environment (e.g., at home) and thorough interviews of an informant (e.g., family member; Albert et al., 2011; ASHA, 2005a, b). These observations contribute to an
assessment of activities of daily living and functional status of cognition, which are key components of diagnosis. When cognitive performance is then shown to be abnormal and declining without substantially preventing the patient from participating in activities of daily living, a MCI diagnosis can be made.

**Assessment of Cognitive Functioning**

Impaired cognitive functioning is integral to the diagnosis of MCI, though there is currently no consensus on a test battery that is best for use in identifying, screening, or diagnosing MCI. Therefore, diagnosis of cognitive impairment in MCI relies on the wide range of existing cognitive tests, both formal and informal (Albert et al., 2011; Nelson & O’Connor, 2008). Diagnosis of MCI is often made on the basis of global functioning screenings (e.g., Montreal Cognitive Assessment [MoCA], Nasreddine et al., 2005; Mini-Mental State Examination [MMSE], Folstein, Folstein, & McHugh, 1975) and informal assessment of cognition (Nelson & O’Connor, 2008). A more thorough assessment does assist in making a confident MCI diagnosis, including determining subtype, especially in cases where impairments are subtle. However, the main purpose of a complete cognitive evaluation is to provide a baseline for measuring change, to detect and describe subtle deficits that may be easy to miss using only informal measures, and to assist in treatment decisions. Subtle changes are especially important in MCI because identifying and describing subtle changes are two of the main benefits in making a diagnosis. Eventually, early identification of MCI may be used in preventing the development of dementia, but even before that time, early identification may give patients and caregivers more time to make important life decisions before further cognitive decline.

Thorough assessment should include a range of cognitive areas and levels of difficulty, taking into account patient and informant reports, estimates of IQ or baseline abilities, and clinical judgment of current functional ability. Domains for assessment of cognitive performance include memory, attention, executive function, language, and visuospatial function. There are many tools available to assess cognitive functioning in older adults, though they must be evaluated for appropriateness to the age, education, language and culture of each patient (ASHA, 2005a, b). As a general rule of thumb, performance by someone with MCI on cognitive batteries is usually between 1 to 1.5 SD below an age-normed mean (Albert et al., 2011). Keep in mind, however, that normative data for older adults were usually collected before there was a general consensus on the diagnostic criteria for MCI (Nelson & O’Connor, 2008). Clinical judgment is particularly necessary in interpreting the borderline scores expected during an evaluation of MCI.

**Global Cognitive Function.** Measures of global cognitive function, including screening measures, are good tools for gathering a wide range of information across time (Nelson & O’Connor, 2008). They are widely available, relatively easy and quick to administer, and can be administered to patients with a wide range of cognitive abilities. The MoCA (Nasreddine et al., 2005), MMSE (Folstein et al., 1975), Dementia Rating Scale-2 (DRS-2; Jurica, Leitten, & Mattis, 2004), Repeatable Battery for the Assessment of Neuropsychological Status (RBANS; Hobson, Hall, Humphreys-Clark, Schrimsher, & O’Bryant, 2009) and the Cognitive-Linguistic Quick Test (CLQT; Helm-Estabrooks, 2001) are five commonly available tests, though there are many others. The MoCA in particular has strong evidence supporting its use in identifying MCI (Nasreddine et al., 2005; Taler & Phillips, 2008).

Informally, several measures may provide insight into overall functioning. Clock drawing is a commonly used, simple measure that may identify a number of changes, including changes in planning, organization, or visuospatial function (Shulman, Sheldetsky, & Silver, 1986; Wolf-Klein, Silverstone, Levy, & Brod, 1989). A recent review of the clock drawing task did not find evidence to support its use as a stand-alone screening measure for MCI (Ehreke, Luppa, König, & Riedel-Heller, 2010), but the task may still provide useful information about cognition and change over time. The patient is asked to draw a clock on a blank piece of paper and label a particular time, often “ten after eleven.” There are various methods for scoring
performance based on errors in numerical sequence, clock quadrants, and handwriting, and these are available in the CLQT (Helm-Estabrooks, 2001) and in other stand-alone clock drawing measures.

Another simple screening measure that can be included in a global functioning assessment is a “walk and talk.” The SLP or other professional converses with the patient while walking somewhere for a short distance. The increased cognitive load due to the dual task and potentially other environmental distractions may result in conversational disruptions (e.g., losing the train of thought, stopping mid-conversation) and particularly gait disruptions in adults with MCI during this task (Kemper, Herman, & Lian, 2003; Montero-Odasso, Muir, & Speechley, 2012). These global screening measures and scales can be given repeatedly to document change, and results on these measures can help guide the selection of tests and subtests in a more thorough assessment.

**Memory and Attention.** There are a wide variety of measures of memory functioning, from tests of immediate recall of small amounts of information to tasks that require delayed recall of narratives. They vary in presentation modality and whether they require linguistic processing. The primary purpose of memory testing is to determine if there is an abnormal impairment of memory. An important secondary purpose of testing memory is to determine whether impairments are to a particular stage of memory (i.e., encoding, sensory memory, short-term storage, long-term storage, or retrieval) or whether functional changes observed in memory performance may be due to impairments to other cognitive constructs. Memory is complex and requires attention, language, executive function, and visuospatial function. Attention is particularly fundamental to memory, and many tests of memory include subtests that assess attention.

Memory assessment is usually completed with selections from a number of tests, including the California Verbal Learning Test (CLVT; Delis, Kramer, Kaplan, & Ober, 2000), the Rey-Osterrieth Complex Figure Recall (“The Rey”; Osterrieth, 1944), the Ross Information Processing Assessment (RIPA; Ross, 1986), or the Wechsler Memory Scale (WMS-IV; Wechsler, 2009). Of particular interest to SLPs, the WMS-IV includes an assessment of narrative memory. Informal measures of memory are often also collected. One task recommended by Albert et al. (2011) involves asking a patient to learn a street address and then repeat it after a 2-minute delay. Another informal task involves asking a patient to name three objects, placing them in different locations around the room, and then asking the patient to later recall the object names and their locations. Both measures would be useful if a quick memory screening was needed.

Several aspects of attention should also be assessed, including attention span, sustained attention, and processing speed. Impairment of attention is not usually seen in MCI in isolation, but it supports and is supported by other aspects of cognition. Attention span (or short-term memory span) is frequently assessed informally using an auditory digit span task (e.g., subtest of the WMS-IV) or a spatial span task, where the examiner asks the patient to point to an increasing number of locations in the room. Trail Making Task-A (Tombaugh, 2004) is a simple task of sustained attention. Processing speed can be observed throughout the cognitive assessment as it is a fundamental component of most performance measures.

**Executive Function.** Executive functioning is another multifactorial cognitive construct and should be observed and evaluated throughout an assessment. Aspects of attention such as selective attention and set shifting are considered to be part of executive functioning. Other aspects include initiation, resisting interference, planning, goal-setting, cognitive flexibility, organization, and problem-solving. The term executive function is often used synonymously with frontal lobe function, but executive function deficits may indicate problems outside of the frontal lobes as well.

There are too many tasks of executive function to fully describe here, but there are a few commonly used clinical measures that are useful to review. The Stroop task (Golden, 1978)
is considered to test resistance to interference; the patient is asked to read names of colors that do not match the color of the word (e.g., the word green printed in red ink) while being timed. The Trail Making Test-B (Tombaugh, 2004) tests flexibility. In this task, the patient is timed while drawing a single continuous line between alternating numbers and letters (e.g., A to 1 to B to 2). The Wisconsin Card Sorting Test (Heaton, 1993) is a complex task involving learning, set maintenance, and set shifting. Executive function is often observed throughout an evaluation session, with performance on other measures being analyzed for a possible relationship to impaired executive function. For example, in a discourse task, planning, goal-setting, cognitive flexibility, organization, and problem-solving could all be observed along with language performance.

**Visuospatial Function.** Impairments involving visuospatial function may be evident in MCI. Many tests of other cognitive functions either include a visuospatial subtest (e.g., MoCA) or also require visuospatial function (e.g., Trail Making Test; clock drawing test). Cancellation tasks and figure-copying, such as those used to evaluate neglect, can also be used. Poor performance on many of these tasks may come from several sources, including visual perception, executive function, or organization. Clinicians should be aware of the visual requirements of the tasks they use so that they can identify patterns in performance indicative of visuospatial or visual processing impairments during an evaluation.

**Cognitive-Communication and Language.** The term cognitive-communication refers to the inseparability of cognition and communication (ASHA, 2005a). The cognitive constructs outlined in this article may all affect communication. Attention and executive function impairment may make following a conversation difficult, for example. Memory impairment may make remembering what to say or retrieving stored information during a conversation difficult. The “walk and talk” method, described as a global measure of functioning, highlights how the complexity of language can provide insight into overall cognitive function. In addition, most tests of cognition involve language at some level, so linguistic processing is an important piece of any cognitive assessment.

SLPs should evaluate cognitive-communication, keeping in mind that impairments may be mild in a patient with suspected MCI. The Arizona Battery for Communication Disorders of Dementia (ABCD; Bayles & Tomoeda, 1993), the Ross Information Processing Assessment-Geriatric: 2nd Edition (RIPA-G:2; Ross-Swain & Fogle, 2011), and the Functional Linguistic Communication Inventory (FLCI; Bayles & Tomoeda, 1994) are all intended to be used with older adults and adults with dementia. Like other formal assessments, they do not currently have normative data on adults with MCI.

Complex discourse tasks require many areas of cognition and language and should be used to screen and evaluate MCI. Discourse evaluation is typically completed informally in multiple ways, including eliciting a narrative using Norman Rockwell pictures (Coelho, Liles, & Duffy, 1995) or by descriptively analyzing spontaneous speech as observed through conversation. A complex, elicited discourse task is another simple way to analyze generative discourse that has support in the literature for use with people with MCI. Fleming and Harris (2008) examined discourse by asking people with MCI and people with normal cognition to describe a “Trip to New York” in 5 minutes (see article for procedures). Results illustrated subtle differences in length and complexity of discourse between groups that would be easy to miss in individuals with cognitive complaints who perform within normal limits on more basic measures of cognition and language.

Basic language functioning should also be assessed, because it may be impaired in MCI or dementia and may at least partially account for performance on other measures. Typical adult tests and subtests that examine general naming, language comprehension, and literacy may be used in a qualitative way depending on their intended purpose and normative data. The Boston Naming Test (BNT; Kaplan, Goodglass, & Weintraub, 2001) is frequently used as a measure of naming, for example, partly because naming is known to be impaired in AD. Results with individuals with MCI have been mixed, but change over time should be observed
Verbal fluency or speed of word retrieval is another useful measure that can be tested using the Controlled Oral Word Association Test (COWAT; Ruff, Light, & Parker, 1996). During this task, patients generate as many words to a letter (i.e., F, A, or S) or category (e.g., animals) cue that they can in 1 minute. Most adults do much better in response to a category cue, but individuals with MCI or dementia may perform disproportionately worse on the category task due to semantic system impairment (Taler & Phillips, 2008). Fluency impairments are not a stand-alone diagnostic tool because other sources of impairment, even mild depression, may worsen letter fluency (Taler & Phillips, 2008); however, the task still provides a useful source of information about semantic processing.

Careful interviews with the patient and family members are important in assessment of language and cognitive-communication in this population because subtle deficits may be manifesting in unexpected ways during functional communication. Observation of conversation and other types of discourse during an assessment and in other settings, if possible, will provide valuable information as well. Identification of communication deficits and contributing factors to those deficits will help a SLP in determining the current level of functioning and what sort of management and therapy is likely to help a patient.

**Conclusions**

SLPs are likely to be increasingly involved in the identification and diagnosis of MCI (ASHA, 2005b). Thorough assessment of cognition and cognitive-communication is not currently a requirement for a diagnosis of MCI to be made. However, careful assessment by an experienced clinician can highlight subtle deficits in functioning that might be missed in a more shallow evaluation. At the present time, there is limited evidence supporting the idea that therapy and lifestyle changes can prevent conversion from MCI to dementia (Albert et al., 2011; Nelson & O’Connor, 2008); by the time a MCI diagnosis can be made, neuropathology is likely to be extensive (Nelson & O’Connor, 2008). Medical intervention and preventative measures may be more fully developed in the near future, however, and it is necessary that identification and assessment be more widely understood when that happens. A thorough assessment by a SLP also provides evidence about prognosis and feasibility of intervention (ASHA, 2005b), which will be increasingly important as we understand more about the factors involved in the development of MCI and in the conversion of MCI to dementia.

**About the Author**

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**References**


