Although common in academic centers, structured cognitive testing instruments can be unwieldy in clinical practice. Here’s how to quickly get a reasonable assessment of cognitive function.

A “Field Guide” to Mental Status Testing

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The practicing neurologist is often asked to evaluate individuals with impaired cognition. The conditions encountered range from delirium to post-stroke syndromes to dementia or any combination of these entities, so the evaluation can be daunting. If you’re intimidated by the “alphabet soup” of cognitive tests (MMSE, ADAS, GOAT, GCS, SIB, SPMSQ, IMCT, NCSE, CAST and so on), take heart: even a short mental status exam is often sufficient to determine the necessity of further evaluations to ultimately arrive at an accurate final diagnosis and for making decisions about treatment(s).

In this article, we describe a general approach to in-office mental status testing suitable for busy clinicians, as well as describe structured mental status exams that can be employed in selected situations as necessary.

Getting an Unbiased History
As in all aspects of medicine, and particularly neurology, the most important first step of evaluating an individual with impaired cognition is establishing a clear and accurate history. It’s critical to have a discussion with a collateral historian, such as a friend or family member, especially when caring for older patients with suspected dementia.

Important elements of the history include onset, course, affected areas or spheres of cognition and associated symptoms. For example, the abrupt onset of aphasia might suggest stroke, whereas a gradually progressive course of focal language impairments might suggest a primary progressive aphasia. Word finding and object naming difficulties with declining recent memory, anoma and apraxia would indicate a dementing disorder such as Alzheimer’s. Any other changes in behavior, daily living skills or personality should also be noted. Finally, carefully observing the patient during the period of history taking can help you obtain initial impressions of the patient’s affect, behavior, attentional, language and even memory abilities.

Clues in Physical/Neurologic Exam
Of course, a thorough physical and neurological examination should always be performed on any patient that visits your practice. While these exams are often normal in individuals with dementia, signs suggestive of cardiac disease, infection, other medical diseases, medication effects or stroke—which can potentially lead to cognitive impairment—may present. Pay special attention to involuntary movements, such as tremor or chorea, muscle tone, gait, visual fields and eye movements.

The mental status examination begins with observations made during the initial history, physical and neurological examination. In particular, take note of the patient’s behavior, demeanor, affect and ability to understand and attend to the evaluation. Formal testing then proceeds in a necessarily hierarchical fashion, with one element building on another.

An adequate evaluation will screen multiple spheres of cognition including language, memory, visuospatial and executive function—and therefore necessarily, multiple brain regions. More detailed assessment, or referral for comprehensive neuropsychological evaluation, can then...
focus on any suspect areas as the clinical picture and subsequent testing dictates. Because much of the subsequent evaluation depends on intact attentional and language abilities, these areas must be evaluated first. Interpretation of all subsequent testing must take into account any attentional and language impairments that are detected during screening. In addition, many patients may have chronic visual impairments or hearing loss. Based on these initial evaluations, the neurologist will often need to be flexible in order to tailor the examination to the clinical condition of the patient.

EVALUATING ATTENTION
The patient’s level of consciousness must be clearly described. Further mental status testing is typically not possible in patients with coma, stupor or severe obtundation. In such cases, the Glasgow Coma Scale and Galveston Orientation and Amnesia Test provide the best means to follow a patient’s progress. A number of tests can be used to examine attention in the non-comatose patient. Orientation to time is a particularly sensitive measure. Normal individuals may miss the
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day of the month by one or two days or the present clock time by up to two hours. However, missing the day of the week or month of the year (much less the current year) is considered abnormal.

One very useful tool is the digit span procedure. The patient is asked to repeat a series of random (single) digits in forward and reverse order. The examiner gives progressively longer sequences until the patient fails on two series of the same length. A normal forward digit span is five to nine with a reverse span usually being one or two digits less.

Another test of attention is the “A” vigilance test. In this test, the patient is read a series of random letters interspersed with the letter “A” at a greater-than-random frequency and asked to indicate whenever an “A” occurs. The examiner recites letters at one per second, with “A”s accounting for about 25 percent of the letters. Normal patients rarely make errors, with an error rate of more than two omissions indicating an impairment of attention. Errors of commission (e.g., the patient raising his/her hand when a letter other than “A” is called) suggest abnormal impulsiveness, which might be seen in disorders affecting the frontal lobes.

**Evaluating Language**
The initial history will allow you to get a first impression of the patient’s language ability. This also gives you an opportunity to judge spontaneous fluency. For example, a patient with Broca’s aphasia will demonstrate an effortful, dysfluent speech with limited vocabulary and production of written language. More formal testing of speech comprehension can be quickly achieved by asking the patient a series of yes/no questions or asking the patient to follow a series of simple one-step commands, such as “raise your right hand, close your eyes, make a fist.”

Repetition tests are next. These should include phrases of at least five words in length, with a normal subject being able to repeat phrases of up to eight words without error. Examples include: “I got home from work,” “Near the table in the dining room” and “They heard him speak on the radio last night.” The examiner should listen carefully for paraphasias.

Evaluate confrontation naming by simply asking the patient to name a series of visually presented objects that are readily available in the exam setting (e.g., watch, watchband, pen, paper clip, etc.). Finally, the ability to read and write can be quickly assessed by asking the patient to read a short passage from a magazine or newspaper and to write a sentence (both spontaneously and to dictation).

Another particularly useful task is the one-minute category fluency test. This calls for the patient to generate aloud as many items in a particular category (or beginning with a specific letter of the alphabet) as possible in one minute. For example, the patient might be asked to name as many items as possible from a supermarket (or letters such as F, A and S) in one minute. Normal performance on this task is highly age-dependent. Normal subjects under the age of 70 should produce 17 to 24 items. Those between the ages of 70 and 80 should produce 14 to 20 items and those over the age of 80 should produce 10 to 20 items.

Note that verbal fluency in the sense tested here is not the same as the fluency of spontaneous speech. Verbal fluency is a high-level test that stresses not only the fluency of articulation but also executive function and semantic memory. The quality of the performance also needs to take premorbid functioning and demographic factors into account.

**Evaluating Memory**
Bedside memory testing is often limited to anterograde memory, or the ability to learn and retrieve new information. In practice, this most often involves learning a list of three words that assess immediate and recent recall. Unfortunately, this is a relatively insensitive measure of memory. Some individuals, particularly those with very high premorbid cognitive function, may perform well on this task despite impaired memory. The use of a longer list in the range of five to ten words might be more useful, though this is often considered impractical at the bedside because of time considerations.

Alternatively, when attempting to test non-verbal anterograde memory, the examiner might hide a series of four or five objects around the room and ask the patient to recall the hiding places after a delay. An individual with intact memory will typically identify the locations of all objects correctly.

**Evaluating Visuospatial Function**
Assuming grossly intact primary vision, higher-order visual function is measured to some degree by confrontational naming. You can test visuoconstructual abilities by asking the patient to copy various geometric figures, such as a cube or intersecting pentagons.

Another popular technique is to ask the patient to draw a clock, and place the hands to indicate a particular time. This is a complex task, as it draws on visuoconstructual abilities, executive skills and semantic memory. Clock drawing may also provide clues to a hemineglect syndrome that can be further delineated through the use of visual cancellation tests.

**Evaluation of Executive Function**
Executive functions are perhaps the most difficult aspect of cognition to test in the clinic. This is, in part, related to a relative lack of efficient and sensitive screening measures. Nevertheless, there are a number of tasks that can be employed to give some measure of executive function. In considering execu-
utive function, the examiner should endeavor to assess speed of cognition, working memory ("mental control"), motor programming and the dependence of behavior on environmental cues.

The speed of cognition can be assessed with a one-minute category fluency test (described above). Working memory can be assessed by the reverse digit span test. Similar to the forward digit span test, the subject is read series of digits of increasing length and asked to recite the digits back in reverse order. Normal performance is usually considered a span of two less than the forward digit span.

Motor programming can be tested with the Luria fist-edge-palm test, in which patients are requested to imitate three sequential hand shapes demonstrated by the examiner. The examiner taps the table with a closed fist, then the ulnar edge of an open hand and, finally, the open palm down. If the patient is unable to imitate this sequence correctly, it is again demonstrated. A normal subject will need no more than two trials to correctly execute this sequence of motions.

Dependence of behavior on the environment refers to a syndrome first described by Francois Lhermitte and is considered a sign of orbitofrontal damage. Patients with this condition tend to engage objects in their environment in a prepotent way that is insensitive to social context. In its full-blown form it consists in prehension behavior (grasping), imitation behavior and utilization behavior. Imitation behavior and grasp responses generally occur before utilization behavior appears.

The examiner can test the grasp response by brushing his/her hand across the patient's open palm. If the patient closes his hand around the examiner's hand, the grasp response is present. Utilization behavior is testing by brushing a tool, such as a pen or pencil, across the patient's hand. If the patient grasps the object and attempts to use it, the response is considered present. Finally, imitation behavior (or echopraxia) is present when the patient, without being instructed, mimics a number of movements by the examiner such as clapping or motioning.

Additional simple bedside executive function tests include the Go/No Go test, Design Fluency and Parapets (drawing perseveration) tests. Cognitive flexibility—the ability to shift cognitive set rapidly and an important component of executive function—can be tested using an alternating sequences test (see Grabowski et al 2002 and Strub and Black 1997 for more detail).

### Table 1. Key Elements of the Mental Status Examination

<table>
<thead>
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<th>Cognitive Sphere</th>
<th>Useful Tests</th>
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| Attention        | • Orientation  
|                  | • Forward Digit Span  
|                  | • "A" Vigilance Test |
| Language         | • Initial Interview  
|                  | • Simple Commands  
|                  | • Confrontation Naming  
|                  | • Repetition  
|                  | • Category/Letter Fluency |
| Memory           | • List Learning  
|                  | • Location of Hidden Objects around exam room |
| Visuospatial Function | • Design Copy  
|                  | • Clock Drawing |
| Executive Function | • Category/Letter Fluency  
|                  | • Reverse Digit Span  
|                  | • Luria maneuvers  
|                  | • Prehension/imitation/utilization behavior |

### Standardized Bedside/Office Instruments

It is often useful to have some quantitative measure of cognition to allow comparisons over time. There is a wide array of standardized tools available at the bedside. Perhaps the most commonly used instrument in neurological clinical practice is the Mini-Mental State Examination (MMSE). This is an 11-question, 30-point test that takes only a few minutes to administer, testing orientation, attention, delayed recall, language and visuoconstruction. It provides a broad sampling of cognitive spheres and is commonly used for screening of dementia. However, it suffers from a dependence on language, a lack of executive function measurements and a lack of sensitivity, estimated as low as 50 to 60 percent in early Alzheimer's disease.

Other tests that can be easily administered at the bedside include the Blessed Dementia Scale. This is a two-part scale.
The first section consists of 22 items assessing the patient's functional status and habits. Scores on this section are primarily based on information from an informant. The second section (Information/Memory/Concentration Test) consists of tests of orientation to time, memory for personal and historical facts and recall of a newly learned name and address, and concentration (months backwards, counting 1-20, 20-1).

A recent addition is the screening battery known as the Seven-Minute Neurocognitive Screening Battery (Seven-Minute Screen). It was primarily developed to detect early Alzheimer's disease. It includes tests of orientation, memory, clock drawing and verbal fluency. Unfortunately, none of these instruments is sufficiently broad and sensitive in detecting cognitive impairment in general, and it is often necessary to follow them up with a tailored mental status examination based on the history and other findings on examination or refer for more formal neuropsychological assessment.

There are many additional instruments that find their use primarily in clinical trials. Among these is the Alzheimer's Disease Assessment Scale. This is a 21-item scale, initially developed in the early and mid 1980s, which combines both a mental status examination with a behavior rating scale. Often, the initial 11-item cognitive portion (ADAS-Cog) is administered alone. This portion can take up to 45 minutes to administer, with higher scores indicating greater impairment.

The Severe Impairment Battery (SIB) is a 40-item instrument measuring various aspects of cognition with excellent reliability in the setting of severe dementia where language skills often limit the use of other structured approaches. It provides a score ranging from 0 to 100, with lower scores indicating greater impairment, and takes approximately 20 minutes to administer.

A number of instruments have been devised in an attempt to provide a global measure of change during clinical trials. These include the Clinician's Interview Based Impression of Change (CIBIC) and the Clinician's Global Impression of Change (CGIC). These ratings generally involve the independent assessment of a clinician rater based on interviews with caregivers and assessments of subjects longitudinally over the course of a clinical trial.

Several structured examinations can also be used to encapsulate a patient's mental status. One practical approach in the office setting is reflected in the Cognitive Assessment Screening Test (CAST). This measure was developed to screen for dementia and is completed by the patient in the waiting room prior to being seen by the physician.

Other screening approaches include:

1. The Memory Impairment Screen (MIS), which uses four words from four categories to screen for dementia.
2. The Mattis Dementia Rating Scale (MDRS), a 20 to 45 minute structured examination that assesses for attention, verbal and visual memory, language, praxis and executive functions.
3. The Neurobehavioral Cognitive Status Examination (NCSE), which uses a hierarchical screening structure for 10 areas of function and can be completed in about five minutes in an intact patient.

Instruments developed to address other important aspects of dementia such as behavior (e.g., Neuropsychiatric Inventory) are beyond the scope of this discussion.

**Neuropsychological Evaluation**

Neuropsychological assessment can be an invaluable extension of the bedside mental status examination. This testing provides a number of advantages, including increased sensitivity, standardization and reproducibility. The evaluation is conducted or supervised by a clinical neuropsychologist and often consists of an initial core test battery along with a flexible, hypothesis-driven group of tests that can be tailored to the patient's specific needs and the nature of the disorder.
driven series of subsequent assessments. A typical assessment may last two to eight hours. As with any consultant, good communication with the neuropsychologist along with well considered, specific and appropriate referral questions can help enhance the quality of the neuropsychological evaluation. Reasons for referral are many and include questions of diagnosis, establishment of a baseline level of functioning, management problems, treatment response, and issues of disability and competency.

Impaired mental status is one of the most common reasons for neurological consultation. With a proper understanding of the available tools for bedside evaluation, an initial impression can often be attained after a relatively short interview and examination.

Interpretations must take account of the entire clinical profile. Multiple conditions can lead to failure on any individual task. For example, poor performance on a task of verbal memory may result from a memory disorder or aphasia, requiring neuropsychological consultation to find an answer.

In all cases, a well-done initial bedside examination will allow for a more focused and efficient subsequent evaluation and, if desired, the evaluation of response to recovery and/or treatment. PN