Chapter

5

Testing

Margaret S. Russell, Esq., and Dr. Robert Ouauo

Too often, when criminal defense lawyers read forensic evaluations, we skim over the numbers, percentages, and calculations in the testing section, and skip ahead to the bottom-line conclusion. After all, standardized testing involves numbers—the very thing many of us hoped to avoid by going to law school.

Yet testing, as well as other forms of assessments, is vitally important when exploring whether an accused suffers from dementia. This chapter by attorney Margaret Russell and Dr. Robert Ouaou emphasizes that such individuals should not merely be screened for dementia, but also that they should undergo a full clinical evaluation that may include medical testing, neuropsychological testing, brain scans, and genetic testing. The chapter also reviews a variety of tests within each of these categories. The authors conclude the chapter by providing a series of sample direct and cross-examination questions regarding testing instruments.

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Testing

The number of older adults in the United States is rising, as is the incidence of dementia. As a result, older adults are more likely to come into contact with the justice system, and individuals with dementia are appearing in courts at an unprecedented rate. One out of every eight Americans 65 years or older has diminished mental capacity, as well as one out of every four over age 75, and one out of every two over age 85. Recognition and diagnosis of dementia could impact all phases of criminal litigation.

In criminal practice, dementia is raised in conjunction with a defendant's competency or to prove that a defendant is not guilty by reason of mental defect. It may also come into play in the selection of witnesses, the assessment of victims' claims, and sentencing considerations. Due to cost and/or time concerns, dementia is often raised and diagnosed in error after quick screening procedures, rather than a full multifactorial investigation. As a result, legal practitioners must understand the basis of dementia diagnosis and be diligent in probing the methods used to diagnose and establish dementia in a court of law.

Dementia Diagnosis and Its Pitfalls

As our population ages, cognitive screening tools have been used to detect cognitive impairment with increasing frequency. Mental health screening became a reimbursable benefit under the 2010 Patient Protection and Affordable Care Act. As a result, there has been an increase in quick tests for dementia. But attorneys and expert witnesses must be clear about the differences between a cognitive screening test and a full clinical evaluation to diagnose dementia. This especially applies in the context of sentencing proceedings, in which the diagnosis is critical to establishing a downward trajectory in cognitive function. All attorneys should better understand the purpose, strengths, and limitations of cognitive screening tests versus comprehensive evaluations as they impact their practice and their litigation tactics.

A dementia evaluation in the world outside of criminal litigation entails a comprehensive work-up that consists of a multidisciplinary approach. The evaluation can involve professionals with specialties in neurology, psychiatry, neuropsychology, and neuroradiology. A neurologist or other referring physician collects and analyzes data on a patient from mental status examinations, medical history, blood work, prescriptions, and examination of the

patient in person. This should be accompanied by data gathered from a full battery of neuropsychological testing, including tests of intelligence, learning, memory, attention, concentration, language, processing speed, executive functions, and mood. (*See* Chapter 3, Restoration.) An evaluation of dementia in the legal context may warrant an assessment of malingering or symptom validity, which has been shown to be difficult to accurately assess in patients with dementia. However, there are studies that have shown that tests of effect can be used effectively but with increased misclassification (Teichner & Wagner, 2004).

Another aspect that is used to assist in diagnosis includes neuroimaging of the brain through an MRI, PET, SPECT, or CAT scan. Genetic studies can confirm the presence of risk factors. This multifactorial method of diagnosis is much less likely to give inaccurate results. It can also serve to inform an attorney of other causes of cognitive and behavioral decline that might mimic dementia but could be curable, such as brain tumors, psychiatric disorders, traumatic brain injuries, over-medication, delirium and temporary memory loss due to illness, infection, or injury. (*See* Chapter 6, Neuroimaging.)

Beware of Cognitive Screening Tests Used in Isolation

Cognitive screening is common in primary care and community settings, but it may be difficult for a lawyer to differentiate between screening instruments and full-scale tests. Some of the most commonly used screening tests include the Mini-Mental State Examination (MMSE) (1975) and the Montreal Cognitive Assessment (MoCA) (2005). Others screening tests that an attorney might encounter include the Cambridge Cognitive Examination (1995), CogState (2001), MiniCog (2000), Neurobehavioral Cognitive Status Examination (1987), NeuroTrax/BrainCare (2003), Six Item Screener (2002), Rapid Cognitive Screen (Malmstrom et al., 2015), St. Louis University Mental Status (Feliciano et al., 2013), and CNS Vital Signs (Gualtieri & Johnson, 2006).

Cognitive screening measures are sometimes used to identify treatable or reversible causes of cognitive impairment, but they are merely screening tools and do not provide definitive answers. There are several advantages for practitioners to using screening tools. Many are in a computerized format that is easy and inexpensive to administer. Cognitive

testing contributes to higher rates of detection of dementia in older adults in primary care settings compared to informal observation alone. Screening tests can also establish a baseline measure to determine change in clinical status over time. Increased use of these screening tests is likely related to ease of patient and doctor accessibility, automation of interpretive guidelines and cutoffs, and reduced administration time and cost.

But cognitive screening tests are not in and of themselves diagnostic because they can include vast false-positive and false-negative results and do not include normative data demographic factors like age, ethnicity, race, education, and gender. Important information is routinely omitted when screening tests are administered by support staff or when they are self-administered. Critical non-neurologic factors in performance may not be considered, such as premorbid abilities and reading level, adequate attention and motivation, medication effects, and psychiatric status. Finally, significant limitations exist when screening tools lack adequate classification accuracy. The potential for harm related to false-positive screening test results or over-diagnosis is significant. Psychological distress stemming from false positive screening results is well documented in medicine. False positives and false negatives have no place in the determination of competency to stand trial, testify, or be executed.

Studies comparing the accuracy of the most commonly used cognitive screening tests (i.e., MMSE and MoCA) illustrate that these two screening tests have low sensitivity. *The use of these tests alone will miss a large proportion of individuals with true cognitive impairment.* For example, Chan (2014) found that 78 percent of stroke patients deemed cognitively intact by the MoCA, actually demonstrated cognitive impairment in one or more cognitive domains. Further, a high percentage (59 percent) who scored perfectly on the MoCA was found to be cognitively impaired on comparable neuropsychological assessment. A separate study of patients with brain tumors also found that the MMSE and MoCA were lacking in sensitivity and missed many individuals with true cognitive impairment. The MMSE was particularly low in sensitivity, detecting only 19 percent of individuals with cognitive impairment.

Sensitivity to detect cognitive impairment was better with the MoCA, but it still only reached 62 percent. Although the MMSE was highly specific (94 percent), the MoCA misclassified 44 percent of individuals as impaired when they were not. Misclassification is likely further magnified when relying on individual cognitive domains of the MoCA, that is,

scores on individual cognitive domains from the MoCA were poor predictors of actual impairment in corresponding areas on comprehensive neuropsychological testing (Moafmashhadi & Koski, 2012). Inaccurate classification of screening measures is likely due to restricted range of scores, ceiling effects, and failure to measure relevant areas of cognitive functioning, such as intellectual functioning, processing speed, and visual memory. The MMSE and the MoCA are highlighted here as examples of commonly used cognitive screening measures. A systematic review of the many available cognitive screening measures is beyond the scope of this chapter; however, it is likely that similar classification issues arise with other cognitive screening tests. In summary, screening tests provide information about whether a person might have a diagnosis or a condition; they typically are not sufficient to diagnose a condition or determine the clinical status of a patient. The classification accuracy of a screening test will depend on many factors, and there are limitations when using screening tests alone.

A comprehensive multifactorial diagnosis includes the following: evaluation by a medical doctor (neurologist, general practitioner, or psychiatrist), neuropsychological testing, scans, and genetic testing. The next sections will explain each of these kinds of testing. At the end of the chapter, we include sample direct and cross-examination questions you might pose to experts.

Medical Testing

A variety of laboratory tests might be used to help diagnose dementia or rule out other conditions. These tests can include hypertension, cholesterol, blood count, drug and alcohol toxicology screens, cerebrospinal fluid analysis (spinal tap), and analysis of thyroid functions. Other tests that might improve the accuracy of a dementia diagnosis include tests for kidney, liver, or blood glucose problems; B12 level; and tests for HIV and syphilis – infections known to cause dementia. In the context of one's personal and medical history, the overall cognitive profile and pattern of relative strengths and weaknesses can help determine the presence of cognitive dysfunction and which brain systems may be implicated. At a minimum, a mental health evaluation of competence to proceed should include a review of the defendant's history, current functioning, and understanding of the impending execution and the reasons for it.

Neuropsychological Testing

There is considerable clinical as well as biological variability that occurs in different dementing illnesses. Neuropsychological testing can be an important part of the differential diagnostic process in dementia. Standardized tests offer an opportunity to detect subtle cognitive abnormalities and differentiate dementia from normal aging. Neuropsychological examinations can also help differentiate dementia syndromes such as Alzheimer's disease from cognitive impairment associated with psychiatric disorders, such as depression. Additionally, neuropsychological testing is more sensitive to identifying dementia disorders than cognitive screening. Regardless, even with the most sophisticated evaluations, it will not be clear in many individuals' first examination whether a small degree of cognitive impairment represents a change consistent with dementia, so follow-up examinations are commonly needed to track progression.

There is a vast difference between simple cognitive screening tests like the MMSE and MoCA and a brief focused neuropsychological assessment battery, such as the Repeatable Battery for the Assessment of Neuropsychological Status (Randolph, Tierney, Mohr, & Chase, 1998). The use of brief focused neuropsychological batteries is not routine and is determined by patient characteristics and referral questions. Brief neuropsychological assessments may be multidimensional or single-domain, and unlike screening tests may be appropriately used in dementia diagnosis in many cases.

A standardized neuropsychological assessment is the "gold standard" that should be used to assess whether an individual has experienced significant cognitive decline in one or more domains of cognitive functioning as a result of dementia. While there is no "standard" test battery used to evaluate suspected dementia, a neuropsychological test battery should include measures designed to better understand cognitive functioning related to orientation, intelligence, attention, information processing speed, motor speed, executive functions (i.e., reasoning, judgment, mental flexibility, decision-making, and inhibitory control), learning, memory, language expression, language comprehension, and visual-spatial processing. Emotional functioning should also be examined as part of a standard neuropsychological assessment of dementia. These symptoms include depression, anxiety, irritability, agitation, visual and auditory hallucinations, delusional thinking, and apathy.

Performance validity tests (PVTs) are employed to ensure that the derived test results are valid and reliable measurements of the examinee's actual cognitive abilities and that a test subject is not malingering. While PVTs are well studied and widely employed by neuropsychologists in a variety of contexts, they can be problematic in the evaluation of dementia due to unacceptably high false positive rates (i.e., an inaccurate conclusion that test performance is not valid; Dean et al., 2009). Interpretation of PVT failure must be made cautiously, based on measures deemed to be appropriate for use in dementia populations, and within the broader functional context (Slick et al., 1999; Boone, 2007). Because malingering is more problematic in dementia diagnosis than in the diagnosis of other mental health conditions, legal practitioners should proceed with extreme caution when there are allegations that a defendant or witness is "faking" cognitive decline.

Because different dementia-causing syndromes involve dysfunction of specific brain regions, the neuropsychological test results can be used to help determine possible causes of cognitive decline. There are two essential resources for understanding comprehensive information related to appropriate use, validity, and reliability of a major tests in use: a Compendium of Neuropsychological Tests (2006) and Standards for Educational and Psychological Testing (2014). These are excellent resources to consult in concert with an expert in preparing for depositions and trial when testing for dementia is at issue.

Brain Scans

Brain scans may be used to identify strokes, tumors, or other conditions that can cause dementia. Degeneration of the brain's cortex (outer layer) or "cortical atrophy," common in many forms of dementia, can be visible on a brain scan. The brain cortex normally appears wrinkled, with ridges (called gyri) and grooves (called sulci) in brain tissue. In individuals with cortical atrophy, the progressive loss of neurons causes the ridges to become thinner and the grooves to grow wider. As brain cells die, the ventricles (or fluid-filled cavities in the middle of the brain) expand to fill the available space, becoming much larger than normal. Brain scans identify these changes in the brain's structure that suggest Alzheimer's disease and other types of dementia.

The most common types of brain scans are computed tomographic (CT) scans and magnetic resonance imaging (MRI). Doctors frequently request CT or MRI brain scans to assist in dementia diagnosis. CT scans, which use X-rays to detect brain structures, can show evidence of brain atrophy, strokes, changes to the blood vessels, and other problems such as excess fluid or blood in the brain (known as hydrocephalus and subdural hematomas). MRI scans use magnetic fields and focused radio waves to detect hydrogen atoms in tissues within the brain. MRIs can detect the same problems as CT scans, but they are better for identifying certain conditions, such as brain atrophy and damage from small strokes.

Doctors also may use electroencephalograms (EEGs) to detect seizures that occur with some forms of dementia. In an EEG, electrodes are placed on the scalp over several parts of the brain in order to detect and record patterns of electrical activity. These patterns of electrical activity can indicate cognitive dysfunction in the brain. Many patients with moderate to severe dementia have abnormal EEGs. An EEG may also be used to detect seizures, which occur in about 10 percent of Alzheimer's disease patients as well as in patients with many other disorders.

Other types of brain scans allow researchers to watch the brain as it functions. Functional brain scans include functional MRI (fMRI), single photon-emission computed tomography (SPECT), positron emission tomography (PET), and magnetoencephalography (MEG). fMRI uses radio waves and a strong magnetic field to measure the metabolic changes that take place in active parts of the brain. SPECT shows the distribution of blood in the brain, which generally increases with brain activity. PET scans can detect changes in glucose metabolism, presence of amyloid proteins, oxygen metabolism, and blood flow, all of which can reveal abnormalities of brain function. MEG shows the electromagnetic fields produced by the brain's neuronal activity. Abnormalities in brain function revealed by these more novel methods of imaging will be increasingly used in the future. (*See* Chapter 6, Neuroimaging.)

Genetic Testing

Research on genetic predispositions of dementia is rapidly developing. It has been established that there is a link between the APOE allele and its variants and both increased and decreased risk of developing Alzheimer's

disease. (***See*** Liu et al., Apolipoprotein E and Alzheimer Disease: Risk, Mechanisms, and Therapy (2013)). Genetic testing in dementia diagnosis is both novel and rapidly developing.

Conclusion

As the population of the United States ages, dementia will increasingly become an important variable in competency and insanity determinations, sentencing proceedings, and the criminal justice system. Cost and time concerns favor quick but inaccurate screening procedures that are not precise enough for use in the courtroom. Instead, a full multifactorial diagnosis, including medical, neurological, and neuropsychological evaluation, scans, and even genetic testing, should be used to diagnose and establish dementia in a criminal court of law.

Sample Questions for Direct Exam of an Expert General Practitioner, Psychiatrist, or Neurologist

Start with qualifying the expert witness by education, practice area, board certifications, and number of evaluations done in other cases.

What is your training in dementia?

Do you have a clinical practice that treats/evaluates dementia patients?

If so, how many dementia patients do you see? Or have ever treated/evaluated?

Did you evaluate Client X for cognitive problems or dementia?

What is dementia?

What are the different types of dementia?

How are they different?

Is there a cure for dementia?

What current treatment is available for dementia?

How is it generally diagnosed?

I'm going to ask you some questions about the evaluation of Client X.

What is your medical specialty?

What does a psychiatrist/neurologist/general practitioner do?

What did you do to evaluate client X?

Did you meet with client X?

Where/when/how/how long?

How did client X present?

What symptoms of dementia did you see?

Next, I want to focus on the objective testing that you did on client X.

What testing did you do?

Were any of these tests mere screening tests?

Did you give any tests for symptom validity, or tests that have embedded measures of effort in testing?

Was client X giving full effort in testing?

What other factors contributed to your diagnosis?

Did you interview any collateral sources such as family members or friends?

What did you learn from them?

Did you order any scans, such an MRI or PET scan?

Why or why not?

Next, I'd like to talk about other experts you may have relied on in making your diagnosis.

Were other experts were involved in diagnosing client X?

You reviewed their findings or conferred with them?

What were their specialties?

Did you rely on any of the [neuropsych/radiology/other specialty] testing in reaching your conclusions?

Did you rely on any scans such as MRIs, PET, SPECT, or CAT scans?

Did you review the conclusions of a radiologist or neuroradiologist who reviewed the scans?

What type of dementia does client X have?

What is your diagnosis of client X to a reasonable degree of scientific certainty?

Direct Exam of a Psychologist or Neuropsychologist

Start with qualifying the expert witness by education, practice area, board certifications, and number of evaluations done in other cases.

What is your training in dementia?

Do you have a clinical practice that treats/evaluates dementia patients?

If so, how many dementia patients do you see? Or have ever treated/evaluated?

Did you evaluate client X for cognitive problems or dementia?

What is dementia?

What are the different types of dementia?

How are they different?

Is there a cure for dementia?

How is it generally diagnosed?

I'm going to ask you some questions about the evaluation of client X.

What is your psychological specialty?

What does a psychologist/neuropsychologist do?

What did you do to evaluate client X?

Did you meet with client X?

Where/when/how/how long?

How did client X present?

What symptoms of dementia did you see?

I'd like to ask you questions about the objective testing you did in your diagnosis.

Why is objective testing important in the diagnosis of dementia?

What objective testing did you do?

Were any of these tests mere screening tests?

What full scale test did you do for intelligence?

What did the tests results show?

What testing did you do for learning and memory?

What did the tests results show?

What testing did you do for attention and concentration?

What did the test results show?

What tests of processing speed?

What tests of executive function did you do?

Did you give any tests for symptom validity, or tests that have embedded measures of effort in testing?

Was client X giving full effort in testing?

What other factors contributed to your diagnosis?

Did you interview any collateral sources such as family members or friends?

What did you learn from them?

Did you suggest scans, such an MRI or PET scan?

Why or why not?

Next, I'd like to talk about other experts you may have relied on in making your diagnosis.

Were other experts involved in diagnosing client X?

You reviewed their findings or conferred with them?

What were their specialties?

Did you rely on any of the [psychiatric/neurology/psychiatry/radiology/other specialty] testing in reaching your conclusions?

Did you rely on any scans such as MRIs, PET, SPECT, or CAT scans?

Did you review the conclusions of a radiologist or neuroradiologist who reviewed the scans?

What is your diagnosis of client X to a reasonable degree of scientific certainty?

Sample Cross-Exam Questions for ANY Opining Expert

Let's discuss your method of diagnosis:

Your training in dementia is limited to [insert limitations]?

You do not have a clinical practice that treats/evaluates dementia patients, do you?

[If there is a clinical practice - cross on number of patients with dementia vs. other conditions and how many dementia patients evaluated]

You reviewed client X's medical records in this case, right?

There are other medical causes of cognitive decline, right?

Some of these causes could be reversible?

Such as medications?

Brain tumors?

Thyroid disease?

Liver disease?

Brain injuries?

But you didn't evaluate client X for these conditions?

Let's discuss your examination of client X.

You conducted number of interviews, comprising X amount of time with client X?

You found client X to be cooperative in your exam?

You did no interviews with family and friends?

So what signs of functional impairment did you see?

You didn't have brains scans, like an MRI or CAT scan completed to differentiate problems associated with a stroke or a brain tumor ?

No consultations with other professionals, such as psychiatrists, neuropsychologists, neurologists, or radiologists?

No genetic testing?

No follow-up interviews with client X?

I want to ask you some questions on screening tests for dementia.

You didn't consider the results of the Mini-Mental State Examination test (MMSE) [or the Montreal Cognitive Assessment (MOCA)] in your diagnosis, did you?

It's a screening test, right?

A screening test only reveals if a person MIGHT have a disease or condition, right?

Screening tests aren't made to be used as the ONLY factor in diagnosis?

The MMSE/MOCA is fast and cheap?

It can be administered by support staff?

Or administered without a licensed professional all together?

Which means that used alone, the MMSE and the MOCA screening test can have vast false positive and false negative results?

Both the MMSE and the MOCA are known to lack sensitivity and specificity, and a formal diagnosis of dementia requires a more comprehensive assessment?

Let's discuss the medical testing you did to evaluate client X for dementia.

You didn't do medical testing, including for high blood pressure?

You didn't do testing for HIV?

You didn't test for blood sugar problems?

Thyroid functioning?

You didn't review client X's current prescriptions?

And high blood pressure, HIV, blood sugar variations, and improper prescription medication can all cause cognitive problems that are not related to dementia, right?

You didn't have a psychiatric or psychological evaluation to distinguish Client X's symptoms from depression or bi-polar disorder?

Client X did not complete a standardized neuropsychological assessment?

But you did not seek this important information in finalizing your diagnosis of Client X?

Let's discuss IQ tests of client X.

The Weschler Intelligence Scale, 4th Edition, and the Stanford-Binet, 5th Edition, are the "gold standard" in IQ testing?

But you used a mere screening test for IQ such as the [TONI, KBIT]?

A screening test is not as accurate as a full-scale IQ test, right?

You are not a neuropsychologist?

You have no training in neuropsychological assessment?

You have not done coursework in interpretation of IQ tests?

You are not trained to administer IQ tests?

I want to ask you some questions about medical causes of cognitive decline.

In your diagnosis, it's a standard operating procedure to exclude a medical cause for symptoms before investigating a psychiatric cause?

In short, medical trumps psychiatric, right?

You never evaluated client X for head injury or brain damage?

You never did a psychiatric work up of client X ?

You never consulted with a neuropsychologist or ordered brain scans in your diagnosis?

You never considered other causes of failing memory aside from dementia?

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Robert Ouaou is a psychologist with a specialty in forensic neuropsychology and the president of Naples Neuropsychology in Naples, Florida. Dr. Ouaou received a degree in psychology from Temple University in 1990 and his PhD from Palo Alto University in 1999. He is an esteemed member of the National Academy of Neuropsychology, the International Neuropsychological Society, the American Academy of Clinical Neuropsychology, the American Psychological Association, and the American Association on Intellectual and Developmental Disabilities. From 2009 to 2012, he served as the vice chair of the Board of Directors and Medical Advisory Committee of the Alzheimer's Association of Florida. Dr. Ouaou has published extensively in the areas of substance abuse, neurocognitive impairment, and forensic psychology. He can be reached through the website www.naplesneuro.com.

Margaret S. Russell is an accomplished trial lawyer with experience in complex criminal and death penalty litigation currently employed at the Sixth Circuit Office of the Public Defender in Pinellas County, Florida. Ms. Russell grew up in Cleveland, Ohio, attended Haverford College, and graduated magna cum laude from Case Western Reserve University School of Law in 1993. After clerking for the Honorable Lesley Brooks Wells in the Northern District of Ohio, she worked in private practice at Hahn, Loeser & Parks, then joined Florida's Capital Collateral Regional Counsel, applying her passion to end the death penalty in state and federal post-conviction matters. She can be reached at margaretrussell@co.pinellas.fl.us.

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