CHAPTER 3 SCREENING AND ASSESSMENT OF FUNCTIONAL ABILITIES FOR DRIVING

Key Points

- An assessment of underlying functional abilities important for safe driving (e.g., vision, cognition, motor) should determine the need for further evaluation and subsequent intervention, and/or for a more specialized driving evaluation.
- Significant functional impairment may necessitate cessation of driving with assistance in developing a plan for alternative methods of transportation.
- Older adults with visual and/or physical impairments have a greater potential for continuing safe driving than those with cognitive impairment, since adaptive equipment and compensatory strategies are available.
- No single assessment can accurately predict fitness to drive; an array of assessment tools should be used to determine risk in older adults.
- The Clinical Assessment of Driving Related Skills (CADReS) is a toolbox of evidence-based practical, office-based functional assessment tools in the key areas of vision, cognition, and motor/sensory function related to driving.
- Self-report or self-assessment has not been shown to be an adequate measure of fitness-to-drive largely because of the overlearned skill set of driving combined with the intense desire to remain driving independently.

Mr. Phillips (introduced in previous chapters) has been accompanied to the clinic by his son, who is in the examination room with him. Mr. Phillips tells you that he is a safe driver. You request and obtain permission to interview the son, who voices his concern. Four months ago, Mr. Phillips was involved in a minor car crash, which was his fault. He has also had several near-crashes in the past 2 years. He has never been lost while driving.

In discussing Mr. Phillips' transportation options, you learn that he drove himself to this appointment. Driving is Mr. Phillips' main mode of transportation, and he drives almost every day. Although Mr. Phillips is certain—and his son confirms—that family members and neighbors would be willing to drive him wherever he needs to go, he has never asked for rides. "Why should I ask for rides when I can just drive myself? Besides, I don't want to impose on my family or friends."

Increasing longevity in the U.S. population means that, because of comorbid conditions, many older adults may outlive their ability to drive safely. Men are projected to live approximately 6 years and women 10 years longer than their ability to drive.[1] This chapter focuses on the functional abilities needed for driving. It is important to distinguish between screening older

adults for functional disability that may impair driving and conducting a more detailed assessment that identifies at-risk drivers who may benefit from intervention strategies. The goal is to optimize the ability of older adults to continue to drive safely for as long as possible.

The clinical team may detect problems that (1) allow early intervention and may prevent disability and prolong driving ability, (2) identify impairments that can be remediated, (3) identify strategies to compensate for a medical condition, and (4) plan for the timely transition to alternative means of transportation.

Primary prevention addresses issues to prevent the loss of driving ability and includes starting the conversation about transitions and planning for driving retirement. This is helpful for all older adults, especially those with chronic medical conditions that may eventually affect driving (e.g., diabetes, dementia, Parkinson disease). For example, when counseling an older adult with diabetes, in addition to explaining how to manage blood sugar levels, it may be helpful to explain how to help minimize peripheral nerve damage to prolong the ability to drive independently. This potentially is a highly motivating and important way to optimize adherence.

Chapter 2 outlined what factors or "red flags" to observe if driving is of concern to the older adult, caregiver, or clinical team member. This chapter goes beyond the initial screening process for those older adults recognized to have a possible safety risk who need further exploration of their fitness to drive.

Secondary prevention attempts to remediate any loss of driving skills that have already occurred as well as to prevent further loss of driving ability.

Screening Versus Assessment

Screening

Screening for unsafe driving requires the use of simple tools to identify the possibility of risk. The goal is to identify all older adults drivers who might be "at risk" of unsafe driving, with the understanding that some individuals who are not at risk will also be incorrectly identified.

Assessment

Assessment requires more in-depth evaluation to distinguish between individuals who are truly at risk and those who are not. It is important to note that screening and assessment tool scores do not by themselves predict crash risk for many reasons, including the relatively low occurrence of crashes and because older adults are often low-risk individuals compared to the general population. It is the clinical skill, expertise, and reasoning of the health care provider during assessment of the older adult that allows a judgment about probable driving outcome.

The Transportation Research Board Committee for Safe Mobility for Older Persons[2] has developed definitions for screening, assessment, and evaluation (Table 3.1).

Table 3.1 Screening, Assessment, and Evaluation Terminology

Term	Definition
Road test	An examination of driving maneuvers and knowledge of rules of the road performed in a motor vehicle on a public highway or street
Driving test	An examination including specified driving maneuvers performed in a motor vehicle
Evaluation	Obtaining and interpreting data to document results and inform an individualized mobility plan
Assessment	Use of specific measurements, tools, or instruments during the evaluation process
Screening	Obtaining and reviewing data to determine the need for evaluation
Self-screening	An individual obtains and reviews his or her own data to determine the need for evaluation
Proxy screening	An individual obtains and reviews data to determine the need for evaluation for another person
Evaluator screening	A professional skilled in a specific screening tool obtains and reviews data to determine the need for evaluation of a specific individual
Driving assessment	Use of an on-road test to measure and qualify driving skills and abilities, which may be triggered by a screening outcome that indicates increased risk of driving impairment or crash involvement
Driving evaluation	Obtaining and interpreting data and documenting results to inform an individualized mobility plan based on an individual's driving abilities and/or potential to be an independent driver, or inform a determination of fitness to drive
Clinical driving evaluation	Obtaining and interpreting data and documenting results to determine fitness to drive through assessment of sensory/perceptual, cognitive, and/or psychomotor functional abilities using specific tools or instruments
Comprehensive driving evaluation	A complete evaluation of an individual's driving knowledge, skills, and abilities that includes (1) medical and driving history; (2) clinical assessment of sensory/perceptual, cognitive, or psychomotor functional abilities; (3) on-road assessment, as appropriate; (4) an outcome summary; and (5) recommendations for an inclusive mobility plan, including transportation options

Multiple assessment tools are used for screening and assessment of driving.[3] However, except for on-road assessment, there is no single tool at present that should be used to determine fitness to drive.[4-9] Older adults have typically been driving for 30 to 50 years and may have overlearned skills and abilities that compensate for deficits detected with office-based tools. Computer-based screening or assessment tools for someone who may not use technology frequently may result in test failure because of lack of familiarity with the technology rather than because of deficits in driving ability.

Clinical team members may perform screening, assessment, and clinical driving evaluation, which may then permit health care and community interventions. Team members can then determine whether to refer the older adult to a driver rehabilitation specialist for a comprehensive driving evaluation or whether to facilitate a decision about cessation of driving.

Health care providers are in the best position to determine if the at-risk older adult requires a referral to another health care provider (e.g., ophthalmologist, occupational therapist, driver rehabilitation specialist) for an evaluation for a specific deficit. Although cut-off scores might be provided, it is important to remember that the assessment tools discussed below demonstrate only the presence of a problem, not its cause.

Clinical team members must function within their scope of practice and use clinical judgment regardless of test scores to make decisions about fitness-to-drive of older adults. All available information, including driving and medical history, should be considered. The specific tools discussed here were selected for their applicability and feasibility in an office setting, along with their correlates with impaired driving outcomes, but they cannot cover every important function needed for driving.

Broaching the Issue of a Driving Screening or Assessment With the Older Adult

The primary message should be one of concern and assistance, balancing the older adult's or caregiver's concern about the safety of the older adult and/or the public and the older adult's need for transportation. Care should be taken to avoid an adversarial position, because this may prompt an unproductive reaction of defensiveness. The conversation should begin with a commitment to explore all reasonable options for keeping the older adult mobile in his or her community. Points to emphasize include that screening and assessment are necessary to identify ways to help the older adult continue to drive safely as long as possible, and that current technology, roadways, and rehabilitation offer many helpful interventions to do so. If the older adult expresses fear that the clinical team will "take away my driver's license," it may be helpful to offer reassurance that only the State licensing agency has that type of legal authority (see Chapter 7).

"Mr. Phillips, I'm concerned about how your condition is affecting your driving. Your son tells me that you were recently in a car crash and that you've had several near-crashes in the past 2 years. Although you have managed your medical condition, I believe it may have progressed to the point that it may be affecting your driving skills and ability. I am going to ask you to do a few simple tests that can measure functional abilities needed for safe driving, such as walking down the hall while I time you. This will help us find out if there are areas we need to look into further.

"Based on your health condition and the results of the tests, we'll do our best to treat or reverse any problems we find. For example, if you're not seeing as well as you should, we'll see what we can do to improve your vision. If you have difficulty turning your head, a referral to a physical therapist may be in order. If there's something we can't improve, then we may consult a driving rehabilitation specialist to explore all possible solutions. This type of specialist, typically an occupational therapist, will offer you further testing and then go out on the road with you to see how you're driving. The driving rehabilitation specialist can develop a plan that will include, if at all possible and safe, recommendations, strategies, and maybe adaptive equipment for you to consider. Whenever possible, the driving rehabilitation specialist will recommend ways to make your driving safer. Our goal is to keep you on the road for as long as you are safe to drive."

Functional Areas Assessed for Driving

Three key functional areas are considered as the foundation for fitness to drive: vision, cognition, and motor/somatosensory function. Any impairment in these areas has the potential to increase the older adult's risk of being involved in a crash. Once these areas are assessed, the health care provider can determine if more information is required in one or all areas or if referral to a specific specialist for further evaluation or intervention is needed (e.g., ophthalmologist, neuropsychologist, driver rehabilitation specialist).

Vision

A vision assessment includes assessment of visual acuity, visual fields, and contrast sensitivity.

Vision is the primary sense used in driving and is responsible for most of the driving-related sensory input.[10] In most States, vision testing is required to obtain a driver's license. Several States also require vision testing at the time of license renewal. For information on these laws, see Chapter 8.

Visual Acuity: Visual acuity commonly declines with age, although no consensus exists on the rate of decline or decade of onset. Decline in acuity is related to physiologic changes of the eye that occur with age and the increased incidence of diseases such as cataracts, glaucoma, diabetic retinopathy, and age-related macular degeneration (ARMD).[11] Although distance visual acuity appears to be crucial to many driving-related tasks, declines in near visual acuity may be

associated with difficulty seeing/reading maps or gauges and controls inside the vehicle.

Most research studies show that visual acuity is not linked to crash risk,[8, 12-14] which may be because of the variability in visual requirements by State licensing agencies. There is some evidence that visual screening laws are associated with decreased motor vehicle crash fatality rates.[15] Cataracts are another major concern associated with vision and driving. The gradual development of cataracts results in a slow change in vision, which the older adult may not recognize. Identification and removal of cataracts can effectively improve driving safety.[16-18]

General visual acuity can be easily measured in the office setting using readily available tools such as a Snellen chart www.provisu.ch/Age/Snellenchart_en.pdf). Near visual acuity can be assessed by the Rosenbaum pocket chart and there are several free apps available for smartphones. Some States license low-vision drivers; in this case, driver rehabilitation programs may offer specialized services that include the training and provision of specially designed adaptive devices. For the cognitively intact driver, these specialized programs may offer options for continued driving.

Visual Field: Visual fields may decline as a result of natural aging changes such as ptosis, a drooping of the eyelid most commonly found in the older population. Most visual field cuts, however, are the consequence of medical conditions such as glaucoma, optic neuritis, detached retina, and stroke/traumatic brain injury. Drivers with loss of peripheral vision may have trouble noticing traffic signs or cars and pedestrians about to cross their path. The evidence examining the relationship between visual field loss and driving performance is still evolving,[19] Visual fields are measured through confrontation testing.

Contrast Sensitivity: Older adults require about three times more contrast than young adults to distinguish a target against its background. Low light levels exacerbate this deficit. Thus, older adult drivers may have problems distinguishing cars or pedestrians against the driving background; this may be much worse at night or during storms.[20] Impairment should be addressed by offering strategies that include avoiding driving during dawn and dusk hours, in foggy conditions, or during storms. Because impaired contrast sensitivity is a valid predictor of crash risk among older adult drivers,[19] it could be included in routine eye examinations by primary care providers. Contrast sensitivity can be evaluated with specially printed cards. More research is needed to produce standardized, validated cut-off points for contrast sensitivity and the level at which impairment results in decreased driving safety. These tests are rarely performed outside ophthalmology practice settings.

Several other visual functions are important in driving (light adaptation, accommodation, dynamic visual acuity, color perception), but office-based measures that can be used for screening and assessment are neither easily available nor linked to crash risk. Therefore, they are not discussed here.

Cognition

Cognitive assessment includes functional assessments of memory, visual perception/processing, attention, executive function, language, and insight.

Driving requires timely visual and cognitive processing to make appropriate decisions in a dynamic and complex environment. The best assessment tools integrate several cognitive processes (e.g., divided attention and visual processing) to test high-level cognitive processes, such as executive functioning.[21] At the clinical team level of screening, specific cognitive abilities and skills can be assessed for deficits indicative of risk. Because these functions are the building blocks of more complex abilities, if an older adult has a significant issue with any basic cognitive skills, it will likely affect driving.

Memory: To drive safely, drivers need to remember their destination, how to navigate to the destination, how to operate the vehicle, and to obey traffic rules and regulations.[22] In addition, drivers must be able to retain certain information while simultaneously processing other information, using the skill of working memory. Working memory (and the other cognitive skills to which it contributes) tends to decline with age.[23]

Visual Perception/Processing: Visual perception and processing as well as visuospatial skills are necessary for drivers to organize visual stimuli into recognizable forms and understand where they exist in space. Without these skills, drivers would be unable to recognize another vehicle and determine its distance ahead to maintain speed, slow, or stop in relation to that vehicle. In general, visual processing may slow[20] and complex visuospatial skills may decline with age, while visual perception remains stable.[24]

Attention: Because of the dynamic and changing environment, demands on attention can be significant, especially in areas of high traffic or during rush hour traffic. Drivers must possess selective attention (i.e., the ability to prioritize stimuli and focus on only the most important) to attend to critical stimuli (e.g., traffic lights, other vehicles, pedestrians) without being distracted by irrelevant ones (e.g., billboards, city sights). In addition, drivers must possess divided attention to focus on the multiple stimuli required by most driving tasks. For example, the driver must be able to attend to vehicles surrounding him or her while changing lanes for a turn, maintaining a safe speed, and activating the turn signal in the correct direction.

Attentional functioning may decline with age,[25] with divided attention showing more pronounced changes than selective attention.[26] However, regardless of age, the divided attention from using cell phones is clearly a significant safety risk. Older adults should be advised to avoid using cell phones while driving because of the possibility of decreased working memory and attention reserves.

Executive Function: Executive function is an umbrella term that refers to the coordination of several cognitive subprocesses to achieve a particular goal.[27] Executive function acts as a supervisor of all cognitive processes[28] and includes initiation of a task, problem solving, planning, sequencing, flexibility in thinking, and impulsivity. Executive skills allow drivers to make the decision to stop at a red light or when the light is green if a pedestrian is in the path of the vehicle. Although the capacity for this kind of logical analysis tends to decline with age,[26] it is with brain injury that the problems with executive functions become more evident in driving. Because of the overlearned ability of driving, many drivers with executive function deficits can drive familiar routes without a problem. However, if an unexpected event occurs (e.g., a child running onto the street, a familiar road is closed because of construction), older adult drivers with poor executive functioning may put themselves or others at risk.

Insight: Insight is the awareness that a person has about himself or herself, including abilities and limitations. It is important to determine the older adult's understanding of how his or her physical and/or mental limitations may affect fitness to drive. For example, the individual with glaucoma should understand and agree that he or she should refrain from driving at night but may drive without significant risk during daylight and non-rush hours. Individuals with dementia may not have adequate insight, believing they are fit to drive when they are not.

Motor and Somatosensory Function

Motor and somatosensory function assessment includes functional assessments of functional range of motion, proprioception, and endurance.

Driving requires motor and somatosensory abilities. Driver rehabilitation excels at the prescription of and training in the use of strategies, devices, or vehicle modifications to compensate for a wide range of physical and somatosensory impairments. Because of improvements in technology (e.g., antilock braking systems, power seats, power steering, keyless ignition, traction control systems, backing cameras), driving has become much less physically demanding. Thus, physically frail older adults may not have limitations in continuing to operate a motor vehicle. The amount of muscle strength and range of motion necessary to physically operate a vehicle has decreased, although basic motor skills and abilities are still needed.

Endurance: Before the act of driving, motor abilities are needed to enter the car safely and fasten the seat belt. The natural process of aging may involve a decline in muscle strength and endurance, flexibility, and joint stability. In addition, osteoarthritis and other musculoskeletal problems are common in older adults. Individuals who suffer pain and limitations from these conditions may not only experience direct effects on their driving ability but also decrease their physical activity, causing further decline in motor function. Fatigue can be an issue for older adults who are driving a long distance, have undiagnosed sleep apnea, or advanced functional loss from severe end organ disease.

Functional Range of Motion: Drivers must be able to steer, use the accelerator and brake pedals, and use the primary and secondary controls of the vehicle (e.g., turn signal, headlights, wipers, climate controls). Range of motion in the neck is essential so that the driver can turn his or her head quickly to check the blind spot; however, resources are available to compensate for this functional limitation (e.g., backing cameras, fisheye mirrors, panoramic mirrors). Although muscle strength is less of an issue with newer vehicles, older adult drivers should have functional range of motion that permits reaching for pedals and the steering wheel with little or no pain.

Proprioception: Drivers must have the ability to know whether their foot is on the brake or accelerator pedal. The underlying issues with "pedal confusion" are not clear. For older adult drivers, the problem may possibly be with proprioception. It would be easy for a driver to become confused if he or she had to "look" to see where his or her foot was in order to drive. Clearly, older adult drivers with sensory issues such as diabetic neuropathy would benefit from a test of leg and foot proprioception.

Refusal of Assessment

Older adult drivers and their caregivers may express fear, resistance, or refusal to participate in screening or assessment of functional abilities. The three most common reasons are the older adult's belief that he or she is a good driver, there is fear the outcome may put the older adult's license at risk, and/or the older adult and/or caregiver has impaired insight. Caregivers may have conflicting priorities when trying to balance their respect for the older driver's wishes, level of risk, and the caregiver burden that cessation of driving can create, including responsibility in time or money for transporting the older adult to appointments and activities.

In these situations, it may be helpful to assure the older adult that the concern and focus is on prevention and optimizing driving ability and not on removing the ability to drive. Health care providers, considering clinical observations and using best judgment, may decide there is cause for concern but not an immediate risk. The goal might be to initiate a conversation with the older adult and ideally with the caregiver about driving safety. It will be important to discuss, with permission, the medical condition(s) of the older adult and the potential impact these can have on driving safety. The first steps may focus on increasing self-awareness and a shared understanding of driving risk for self and others. In addition, providers should ensure that the older adult understands that the goal is to work together to find solutions for him or her to continue driving if at all possible. It is well established that most older adults, regardless of age, intend to continue driving until they decide "I have become an unsafe driver."[29] Older adults who live in rural communities may realize they are at risk but do not feel they have any other option. Focusing on counseling and referral on alternative transportation options first may allow older adults to consider assessment at a later point in time.

For some older adults, it may be evident that further evaluation is necessary. In these cases, professional ethics should be used to guide the decision. Maybe the clinical team member can

work with the older adult to follow a course of stopping driving now until "we better understand your situation, gain the information required through evaluation, and then determine the appropriate plan of care." This message is about safety and support, both offering the older adult and the family time to consider the consequences and prepare them for next steps. If the older adult appears to have deficits in the functional areas and he or she or caregivers report problems in other complex tasks (e.g., finances, cooking, shopping), referral to an occupational therapist may be more appropriate. As a service usually covered by medical insurance plans, a full assessment of underlying functions as well as other complex tasks can lead to interventions that may improve function before a specialized assessment of driving.

Alternatively, if the older adult appears to have problems only in regard to driving, and not with other areas of daily living, a referral to a driver rehabilitation specialist is prudent (see Chapter 5). The driver rehabilitation specialist will conduct a comprehensive driving evaluation that includes a complete clinical assessment covering the areas of vision, perception, cognition, and motor as well as an on-road assessment, if warranted.

Some older adults will absolutely refuse to consider evaluation and are intent on continuing to drive. For these individuals, insight into deficits may be a problem. A discussion with a caregiver may offer more information as well as provide additional support for pursuing an evaluation. Actions should be guided by professional ethics, and it may be necessary to report the older adult to the appropriate driving licensing agency (see Chapters 7 and 8).

Self-Assessment Tools

Many self-screening and caregiver rating tools are available to assist in building awareness of the changes associated with aging as well as the symptoms of conditions that affect driving. Following up with the older driver after use of these tools may improve their willingness to be formally assessed by the clinical team. Regardless, it is important to understand that use of these tools do not replace screening performed by professionals.

- *Am I a Safe Driver?* (a one-page handout, see Appendix B)
- The *Driving Decisions Workbook,* developed by the University of Michigan Transportation Research Institute, is a free self-assessment tool with evidence that the workbook scores are positively correlated with on-road driving scores and several clinical tests of functional ability. Both online and print versions are available. Individualized feedback is provided to respondents based on how they answer questions. The workbook can be downloaded at http://deepblue.lib.umich.edu/bitstream/handle/2027.42/1321/94135.0001.001.pdf?sequence=2&isAllowed=y.
- The *Fitness to Drive Screening Measure,* developed by the University of Florida, is a free web-based tool for caregivers of older adults to identify at-risk older drivers. The user needs to have driven with the driver in the last 3 months and then rates the driver on 54

driving skills. A rating profile of the driver is available and includes a classification of the driver into one of three categories (at-risk driver, routine driver, or accomplished driver) with recommendations given as follow-up steps. Research has shown that feedback from the web site correlates positively with driving risk. This tool is available at http://fitnesstodrive.phhp.ufl.edu/.

- The *SAFER Driving Survey*, developed at the University of Michigan Transportation Research Institute, is a web-based tool (available at http://um-saferdriving.org) that asks users about the severity of health concerns they are experiencing due to medical conditions and medications. The website then calculates the effects of these health concerns on critical driving skills and gives users individualized feedback on (1) how their driving may be declining, (2) what to do to continue driving safely given these declines, and (3) possible recommendations for more in-depth assessment. Research has shown that feedback from the web site correlates positively with on-road driving scores and an assessment from an occupational therapist. Users also report that the site is easy to use, the information is helpful, and that they discovered declines in themselves of which they were not previously aware.[30]

- *Roadwise Review* is an online assessment (available at www.aaafoundation.org/-roadwise-review-online; CD also available) from the American Automobile Association that instructs older adults in real time on the completion of several tests of important functional abilities for driving. It then provides feedback on the presence of impairment. Roadwise Review requires the older adult to use a computer and presence of an assistant during the assessment.

Clinical Team Assessment Tools

Assessments range from simple paper and pencil tools performed by clinicians in their offices to complex assessments that may be only in the scope of practice of neuropsychologist (e.g., Rey Figure) or driver rehabilitation specialist (e.g., comprehensive driving evaluation with on-road assessment).

For the clinical team member who is screening or assessing an older driver, the following summary describes a toolbox of practical, office-based functional assessment tools in the major areas of vision, cognition, and motor/sensory function related to driving, the Clinical Assessment of Driving Related Skills (CADReS). Clinical team members should choose the tool in each area that best fits the practice setting in which they care for older adults and document their encounters.

In the case of cognitive assessments, it is not always necessary to do all the tests. Depending on the outcome of the easiest tests, it may be unnecessary to progress further.

General

- Driving history: A brief driving history can be useful as an initial screen to identify the older adult's perception of his or her driving as well that of a caregiver if available. Recent traffic violations, crashes (including unreported), or near misses are all red flags for concern (see Chapter 2). The *Driving Habits Questionnaire* is available[31] but is lengthy. A modified version is available in Appendix C.
- IADLs questionnaire: A checklist of other IADLs can also be used as an initial screen to identify if the older adult is having difficulties with other complex tasks of daily living. As an IADL, driving uses underlying functions (e.g., visual processing, executive functioning, memory), similar to financial management, shopping, or cooking. If the older adult is having difficulty with those tasks, further screening or assessment is warranted. A report from a caregiver may also be helpful when the older adult appears to have cognitive impairment.
- Medication change: Certain medications clearly affect driving, and new or changing doses may affect assessment findings, perhaps triggering red flags that are temporary.

Vision

- Visual acuity: Measured by vision charts, visual acuity should be measured because it is the legal criteria for most State licensing agencies. The Snellen chart is described below and provided in Appendix C.
- Visual fields: Using a uniform manner of testing as described below, visual fields can be assessed.
- Contrast sensitivity: Many charts are commercially available (e.g., Pelli-Robson contrast sensitivity chart) to test the ability to perceive objects in contrast to the environment.

Cognitive

- Montreal Cognitive Assessment (MoCA [www.mocatest.org/]): The MoCA is a brief cognitive test designed to assist health care professionals in detecting mild cognitive impairment. It may be administered by anyone, but the results should only be interpreted by an individual with expertise in the cognitive field.[32] It rates cognitive performance, is available in multiple languages, and has been validated for adults 55 to 85 years old. It tests memory, attention, language, abstract, recall, orientation, as well as visuospatial skills by incorporating a shorter Trails B and a clock-making task.
- Trails B: This test of general cognitive function also specifically assesses working memory, visual processing, visuospatial skills, selective and divided attention, and psychomotor coordination. Numerous studies have demonstrated an association between poor performance on the Trail-Making Test Part B and poor driving performance[33] (see below for directions and form). Neuropsychologists often recommend giving the Trails A test (connecting just numbers) before giving the Trails B

test. The rationale is two-fold: The Trails A provides an appropriate warm-up to Trails B, and allows the older adult some practice on a simpler concept, and, in many of the driving studies that validated Trails B, the Trails A was given first.

- Clock-Drawing Test: This test may assess long-term memory, short-term memory, visual perception, visuospatial skills, selective attention, abstract thinking, and executive skills. Preliminary research indicates an association between specific scoring elements of the clock-drawing test and poor driving performance.[34]
- Maze test: There are several versions of maze testing, including online versions. Depending on the type of test, it assesses visual perception, visuospatial skills, abstract thinking, and executive skills. The Snellgrove maze[35] is a one-page cognitive screen for driving competence that was validated with older adults with mild cognitive impairment or early dementia.

Motor/Sensory

- Rapid Pace Walk and Get Up and Go: These tests are measures of lower limb strength, endurance, range of motion, and balance. The Rapid Pace Walk has been linked with driving outcomes,[9,36] whereas Get Up and Go[37] has been more closely linked with falls and future disability and long term care placement. Because falls have been associated with poor driving outcomes, either of these tests would be appropriate measures for assessing overall motor abilities. For directions, see below.
- Range of Motion: Performing a functional range of motion test is important for examining if and how the motor vehicle can be adapted to meet limitations of the older adult. Mirrors and education/training can accommodate limitations of the neck. Limitations in any of the extremities can be accommodated by adaptive equipment recommended by driver rehabilitation specialists. For directions for a functional range of motion test, see below.

The Evolution of Computer-Based Tools

Three computer-based assessment tools are commercially available. The cost of these tools is presently not covered by most insurance products. In general, more research is needed on these computer-based assessments before they can be used as tools for making licensing decisions. The use of interactive driving simulators is also being studied, with emerging evidence supportive for their use as a potential assessment tool.

- Useful Field of View: This is the most widely studied instrument for detection of impairment in processing speed, divided attention, and selective attention that has been moderately correlated with crash risk in older adult drivers. The strongest evidence is for the Subtest 2, which tests processing speed,[9,14,35,38] but not all studies supported the predictive validity of this instrument.[8,39] This assessment tool is available for purchase (information is available on the Visual Awareness web site (www.visualawareness.com/Pages/whatis.html).[40] Cost, time, and ability to bill, as well

as limited studies in a primary care setting, might be potential barriers to utilization.

- Driving Health Inventory (DHI).[41] This computerized set of tests that assess key functional abilities for driving was developed using data from individual assessments in the Maryland Pilot Older Driver Study. It is intended for use by health care professionals to assess older adults,[36] but individual users may download single-use licenses for personal use. Because each component was studied separately and the older adults studied were a low-risk general population low risk, there is not strong evidence for the DHI as a whole, linking the final version of the DHI with fitness to drive. The DHI did appear to discriminate between drivers with a history of a crash and those without crashes in a small cohort of drivers. In addition, this battery of tests appears feasible and acceptable to older drivers as a screen for functional impairments.[39] This assessment tool is available for purchase (information is available on the DrivingHealth website http://drivinghealth.com/screeningassessment.html). Again, cost, time, and ability to bill are potential barriers to utilization.
- DriveABLE: This assessment is only of cognitive abilities for driving; it is computer-based and electronically scored (available at www.driveable.com/). Based on the performance of the older adult, results are generated from a computer algorithm that returns a score between 1 and 99 and reflects the "Predicted Probability of Failing an On-Road Evaluation," with 1 being least likely and 99 being most likely to fail. The computer program designates upper and lower areas of risk. The developers of the program maintain that computer knowledge or familiarity with a computer does not affect performance and that the computer presentation of the tasks enables precision measurements and objectivity and removes testing bias. However, there is minimal independent research evidence using DriveABLE that supports the claims of predicting driving risk accurately and this approach does not provide the clinician with information which can be used to identify clinical solutions for potential problems. Older adults who score in the middle of the range may require further evaluation such as on-road assessment, reliance on caregiver information, recent driving history, or further in-office testing.

Assessment Tool Performance Instructions

Snellen E chart

The Snellen chart is used to test far visual acuity. The standard chart measures 9" x 23" and is printed on a durable, tear-resistant latex sheet, with eyelets for easy hanging. Letters are printed on one side, and tumbling "E" symbols are printed on the reverse.

This test is best performed in a hallway with good lighting. Tape can be used to mark a distance of 20 feet.

With the chart hanging on a wall, the older adult is instructed to stand 20 feet away. Wearing his or her usual glasses or contact lenses, the individual reads the smallest line possible with both eyes open. Visual acuity is based on the lowest full row that he or she successfully reads, and the process is repeated for each eye individually. However, if the best the individual can see in either eye is 20/40, then his or her acuity is considered to be 20/40 in both eyes.

Far visual acuity can also be measured using another chart per the clinician's preference, such as the Snellen chart for a 10-foot distance or the Sloan low-vision letter chart for 6 meters (20 feet).[42]

Near visual acuity can be tested with commercially available charts and should be considered whenever an older adult complains of difficulty seeing/reading maps or gauges and controls within the vehicle. This can be checked using a Rosenbaum pocket chart.

Some limitations have been noted in testing using the Snellen chart. These include, but are not limited to, the different number of letters per line, different spacing between lines, the specific use of letters, and the spacing between letters.[43] A trend in the field of eye care has been to use a newer chart called the Early Treatment Diabetic Retinopathy Study (ETDRS) that in some studies of eye diseases appears to be more accurate.[44] The ETDRS chart improves on the Snellen test by having a similar number of letters per line and standard spacing between the letters.

Visual Fields

The examiner sits or stands 3 feet in front of the patient, at the individual's eye level. The patient is asked to close his or her right eye, while the examiner closes his or her left eye. Each fixes on the other's nose.

The examiner then holds up a hand in each visual field simultaneously, with a random number (usually one or two) of fingers in each of the four quadrants, and asks the patient to state the total number of fingers. With the fingers held slightly closer to the examiner, the patient has a wider field of view than the examiner. Provided that the examiner's visual fields are within normal limits, if the examiner can see the fingers, then the patient should be able to see them unless he or she has a visual field defect.

The process is repeated for the other eye (patient's left eye and examiner's right eye closed). The examiner indicates any visual field defects by shading in the area of defect on a visual field representation.

Rapid Pace Walk

A 10-foot path is marked on the floor with tape. The individual is asked to walk the 10-foot path, turn around, and walk back to the starting point as quickly as possible. If the older adult normally walks with a walker or cane, he or she may use it during this test. The total walking distance is 20 feet.

The examiner begins timing the individual when he or she picks up the first foot, and stops timing when the last foot crosses the finish mark. This test is scored by the total number of seconds it takes for the older adult to walk 10 feet and back.[42]

In addition, the examiner should indicate on the scoring sheet whether the older adult used a walker or cane. Scores longer than 9 seconds are associated with an increased risk of at-fault motor vehicle tasks.[33]

Get Up and Go

Instructions[37]

Ask the patient to perform the following series of maneuvers.

1. Sit comfortably in a straight-backed chair.
2. Rise from the chair.
3. Stand still momentarily.
4. Walk a short distance (approximately 10 feet/3 meters).
5. Turn around.
6. Walk back to the chair.
7. Turn around.
8. Sit down in the chair.

Scoring

Observe the patient's movements for any deviation from a confident, normal performance. Use the following scale.

1 = Normal
2 = Very slightly abnormal
3 = Mildly abnormal
4 = Moderately abnormal
5 = Severely abnormal

"Normal" indicates that the patient gave no evidence of being at risk of falling during the test or at any other time. "Severely abnormal" indicates that the patient appeared at risk of falling during the test. Intermediate grades reflect the presence of any of the following as indicators of the possibility of falling: undue slowness, hesitancy, abnormal movements of the trunk or upper limbs, staggering, or stumbling.

A patient with a score of 3 or more on the Get Up and Go Test is at risk of falling.

Functional Range of Motion

To test the functional range of motion for an older adult, ask him or her to perform the below listed motions bilaterally.

- Neck rotation: "Look over your shoulder like you're backing up or parking. Now do the same thing for the other side."
- Shoulder and elbow flexion: "Pretend you're holding a steering wheel. Now pretend to make a wide right turn, then a wide left turn."
- Finger curl: "Make a fist with both of your hands."
- Ankle plantar flexion: "Pretend you're stepping on the gas pedal. Now do the same for the other foot."
- Ankle dorsiflexion: "Point your toes toward your body."

The test is scored by evaluating the motion as either within normal limits or not within normal limits. The latter means that range of motion is done with excessive hesitation, pain, or very limited range of motion.

Maze Test

The Maze Test was developed as a pencil and paper test of attention, visuoconstructional ability, and executive functions of planning and foresight. The participants compete a simple demonstration maze first in order to establish the rule set, then complete the Maze Task. Performance is measured in time (in seconds), using a stop watch, and the total number of errors. Errors are determined by the number of times the participant enters a dead-end or fails to stay in the lines. Time to administer is 1–4 minutes. The Maze Test is in Appendix C; it should be printed on an 8 × 11" paper with the Maze Test at least 5.5" square and the practice 4.5".

The Maze Test is placed in front of the participant, and the examiner states, "I'm going to time you as you find the route from the start to the exit of the maze. Put your pen here at the start (point to the start). Here is the exit of the maze (point to the exit). Draw a line representing the route from the start to the exit of the maze. Don't run into any dead ends (point to a dead end) or cross any solid lines (point to a solid line). Go!" The instructions can be repeated, and the administrator should correct any rule breaks. There is a limit of 3 minutes for the Maze Test. If the maze has not been completed in this time, discontinue.

Montreal Cognitive Assessment (MoCA)

The MoCA is designed as a rapid screening tool that measures attention and concentration, executive functions, memory, language, visuoconstructional skills, conceptual thinking, calculations, and orientation. Time to administrator is about 10 minutes.

The highest possible score is 30, with a score of 26 or above considered normal. One point should be added for individuals with 12 years or fewer of formal education. A score of 18 or less should raise concerns about driving safety.

The original version and directions are in Appendix C.

Trail-Making Test, Part B

This test of general cognitive function specifically assesses working memory, visual processing, visuospatial skills, selective and divided attention, and psychomotor coordination. In addition, numerous studies have demonstrated an association between poor performance on the Trail-Making Test, Part B, and poor driving performance.[36]

Part B involves connecting, in alternating order, encircled numbers (1–13) and encircled letters (A–L) randomly arranged on a page. This test is scored by overall time (seconds) required to complete the connections accurately. The examiner points out and corrects mistakes as they occur; the effect of mistakes, then, is to increase the time required to complete the test. This test usually takes 3–4 minutes to administer.

The examiner administers the test to the individual, stating, "Now I will give you a paper and pencil. The numbers 1 through 13 and the letters A through L are scattered across the page. Starting with 1, draw a line to A, then to 2, then to B, and so on, alternating back and forth between numbers and letters until you finish with the number 13. I'll time how fast you can do this. Are you ready? Go." The examiner records the time to complete.[42]

Clock-Drawing Test

In this form of the clock-drawing test, the examiner gives the individual a pencil and a blank sheet of paper and says, "I would like you to draw a clock on this sheet of paper. Please draw the face of the clock, put in all the numbers, and set the time to ten minutes after eleven." This is not a timed test, but the individual should be given a reasonable amount of time to complete the drawing. The examiner scores the test by examining the drawing for each of seven specific elements found on the CADReS score sheet (see Appendix C for score sheet).

Test Sequence

Although these tests may be administered in any order, the following sequence is recommended: (Note that the MoCA incorporates the Trail-Making Part B, and Clock Drawing).

1. Visual fields by confrontation testing
2. Snellen E Chart
3. Rapid Pace Walk and/or Get Up and Go
4. Functional Range of Motion
5. Maze Test
6. Montreal Cognitive Assessment (MoCA)
7. Trail-Making Test, Part A and then Part B
8. Clock-Drawing Test

For a discussion of scoring these tests and recommended interventions based on performance, see Chapter 4.

References

1. Foley, D. J., Heimovitz, H. K., Guralnik, J. M., & Brock, D. B. (2002, August). Driving life expectancy of persons aged 70 years and older in the United States. *American Journal of Public Health, 92*, 8, 1282-9.

2. Transportation Research Board. (in press). A Taxonomy and Terms for Stakeholders in Senior Mobility. Washington, DC: Author.

3. Dickerson, A. E. (2013). Driving assessment tools used by driver rehabilitation specialists: survey of use and implications for practice. *American Journal of Occupational Therapy*, 67, 564–573.

4. Dickerson, A. E., Brown, D., Ridenour, C. (2014). The predictive validity of screening and assessment tools for driving: a systematic review. *American Journal of Occupational Therapy, 68*, 670–680.

5. Bédard, M., & Dickerson, A. E. National Highway Traffic Safety Administration, & American Occupational Therapy Association. (2014). Consensus statements for screening and assessment tools. *Occupational Therapy Health Care, 28*(2), 127–131. doi: 10.3109/07380577.2014.903017.

6. Bédard, M., Weaver, B., Darzins, P., & Porter, M. M. (2008). Predicting driving performance in older adults: We are not there yet! *Traffic Injury Prevention, 9*(4), 336–341.

7. Baldock, M.R. J., Mathias J., McLean J., & Berndt, A. (2007). Visual attention as a predictor of on-road driving performance of older drivers. *Australian Journal of Psychology, 59*, 159–168.

8. Carr, D. B., Barco P. P., Wallendorf, M., J., et al. (2011). Predicting road test performance in drivers with dementia. *Journal of the American Geriatrics Society, 59*, 2112–2117.

9. Classen, S., Witter D. P., Lanford D. N., Okun, M. S., Rodriguez, R. L., Romrell, J., …, Fernandez, H. H. (2011). Usefulness of screening tools for predicting driving performance in people with Parkinson's disease. *American Journal of Occupational Therapy*, *65*, 579–588.

10. Shinar, D., & Schieber, F. (1991). Visual requirements for safety and mobility of older drivers. *Human Factors, 33*(5), 507–519.

11. Carr, D. B. (1993). Assessing older drivers for physical and cognitive impairment. *Geriatrics*, *48*(5), 46–51.

12. Munro, C. A., Jefferys, J., Gower, E. W., Munoz, B. E., Lyketsos, C. G., Keay, L., … Bandeen-Roche, K. (2010). Predictors of lane-change errors in older drivers. *Journal of the American Geriatrics Society, 58*, 457–464.

13. Uc, E. Y., Rizzo. M., Johnson, A., . M., Dastrup, E., Anderson, S. W., & Dawson, J. D. (2009). Road safety in drivers with Parkinson disease. *Neurology, 73*, 2112–2119.

14. Wood, J. M., Anstey, K., J., Kerr, G. K., Lacherez, P. F., & Lord, S. (2008). A multidomain approach for predicting older driver safety under in-traffic road conditions. *Journal of the American Geriatrics Society, 56*, 986–993.

15. McGwin, G. Jr., Sarrels, S. A., Griffin, R., Owsley, C., & Rue, L. W. 3rd. (2008, November). The impact of a vision screening law on older driver fatality rates. *Archives of Ophthalmology*, *126*(11), 1544-7

16. Mennemeyer, S. T., Owsley, C., & McGwin, G. Jr. (2013). Reducing older driver motor vehicle collisions via earlier cataract surgery. *Accident Analysis & Prevention, 61*, 203–211.

17. Wood, J. M., & Carberry, T. P. (2006). Bilateral cataract surgery and driving performance. *British Journal of Ophthalmology*, *90*(10), 1277-1280.

18. Owsley, C., McGwin, G. Jr., Sloane, M., Wells, J., Stalvey, B. T., & Gauthreaux, S. (2002). Impact of cataract surgery on motor vehicle crash involvement by older adults. *Journal of the American Medical Association*, *288*(7), 841-289.

19. Dobbs, B. M. (2002, February). Medical Conditions and Driving: Current Knowledge. (NHTSA Contract Number DTNH22-94-G-05297) . Barrington, IL: Association for the Advancement of Automotive Medicine.

20. Owsley, C., & Ball, K. (1993). Assessing visual function in the older driver. *Clinics in Geriatric Medicine, 9*(2), 389–401.

21. Classen, S., Dickerson, A. E., & Justiss, M. (2012). Occupational Therapy Driving Evaluation: Using Evidence-Based Screening and Assessment Tools. In: M. J. Maguire & E. Schold Davis (eds.), Driving and Community Mobility: Occupational Therapy Strategies Across the Lifespan. Bethesda, MD: AOTA Press.

22. Colsher, P. L., & Wallace, R. B. (1993). Geriatric assessment and driver functioning. *Clinics in Geriatric Medicine, 9*(2), 365–375.

23. Goetz, C. G. (1999). Textbook of Clinical Neurology, 1st ed. Philadelphia: W. B. Saunders Company.

24. Beers, M. H., & Berkow, R. (eds). (2000). Aging and mental health. In: *The Merck Manual of Geriatrics*. Whitehouse Station, NJ: Merck & Co., Inc.

25. Hartley, A. A. (1992). Attention. In F. I. M. Craik & T. A. Salthouse (eds). The Handbook of Aging and Cognition. Hillsdale, NJ: Erlbaum.

26. Madden D. J., Turkington T. G., Provenzale, J. M., Hawk, T. C., Hoffman, J. M., & Coleman, R. E. (1997). Selective and divided visual attention: age-related changes in regional cerebral blood flow measured by H215O PET. *Human Brain Mapping, 5*, 389–409.

27. Elliot, R. (2003). Executive functioning and their disorders. *British Medical Bulletin, 65*, 49–59.

28. Barkley, R. A. (2012). Executive Functions: What They Are, How They Work, and Why They Evolved. New York: Guilford Publications, Inc.

29. D'Ambrosio, L. A., Coughlin, J. F., Pratt, M. R., & Mohyde, M. (2012). The continuing and growing importance of mobility. In: J. Coughlin & L. A. D'Ambrosio, (eds.), Aging America and Transportation: Personal Choices and Public Policy. New York: Springer Publishing Co.

30. Eby, D. W., Molnar, L. J., Shope J. T., & Dellinger, A. M. (2007). Development and pilot testing of an assessment battery for older drivers. *Journal of Safety Research, 38*,535–543.

31. Owsley, C., Stalvey, B., Wells, J., & Sloane, M. E. (1999). Older drivers and cataracts: Driving habits and crash risk. *The Journals of Gerontology, Series A: Biological Science and Medical Science, 54A*, M203–M211.

32. Nasredinne, Z. (2007). Frequently Asked Questions. (Web page). Retrieved from the MOCA web site at www.mocatest.org/faq/

33. Staplin, L., Gish, K., . W., & Wagner, E., K. (2003). MaryPODS revisited: updated crash analysis and implications for screening program implementation. *Journal of Safety Research, 34*, 389–397

34. Freund, B., Gravenstein, S., & Ferris, R. (2002). Use of the clock drawing test as a screen for driving competency in older adults. Presented at the American Geriatrics Society Annual Meeting, Washington, DC, May 9, 2002.

35. Snellgrove, C. A. (2005). Cognitive screening for the safe driving competence of older people with mild cognitive impairment or early dementia. Canberra, AU: Australian Transport Safety Bureau.

36. Edwards, J. D., Leonard, K., . M., Lunsman, M., Dodson, J., Bradley, S., Myers, C. A., & Hubble, B. (2008). Acceptability and validity of older driver screening with the Driving Health Inventory. *Accident Analysis & Prevention, 40*, 1157–1163.

37. Mathias, S., Nayak, U. S. L., & Isaacs, B. (1986). Balance in elderly patients: the "get-up and go" test. *Archives of Physical Medicine and Rehabilitation, 67*, 387-389.

38. Classen, S., McCarthy D. P., Shechtman, O., Awadzi, K. D., Lanford, D. N., Okun, M. S., ... Fernandez, H. H. (2009). Useful field of view as a reliable screening measure of driving performance in people with Parkinson's disease: results of a pilot study. *Traffic Injury Prevention, 10*, 593–598.

39. Weaver, B., Bédard. M., McAuliffe, J., & Parkkari, M. (2009). Using the Attention Network Test to predict driving test scores. *Accident Analysis & Prevention, 41*, 76–83.

40. Visual Awareness Research Group, Inc. What Is UFOV? A Breakthrough In Cognitive Assessment and Rehabilitation (Web page). Retrieved from the Visual Awareness website at www.visualawareness.com/Pages/whatis.html

41. TransAnalytics Health & Safety Services. (2015). [Driving Health Inventory] and UFOV (Web page). Retrieved from the TransAnalytics website at http://drivinghealth.com/screeningassessment.html

42. Staplin, L., Lococo, K. H., Stewart J., & Decina, L. E. (1999, April). Safe Mobility for Older People Notebook (Report No. DOT HS 808 853). Washington, DC: National Highway Traffic Safety Administration.

43. VectorVision. (2015). ETDRS Acuity (Web page). Retrieved from the VectorVision website at www.vectorvision.com/html/educationETDRSAcuity.html

44. Falkenstein, I. A., Cochran, D. E., Azen, S. P., Dustin, L., Tammewar, A.M., Kozak, I., & Freeman, W. R. Comparison of visual acuity in macular degeneration patients measured with Snellen and early treatment diabetic retinopathy study charts. *Ophthalmology*, *115*(2), 319–323.