Chapter 3

Formally Assess Function

Mr. Phillips (whom you met in Chapter 2) has been accompanied to the clinic by his son, who is in the exam room with him. Mr. Phillips tells you that he is a safe driver, but his son voices concern. Four months ago, Mr. Phillips was involved in a minor car crash, in which he was found to be at fault. He has also had several near-misses in the past two years. However, he has never gotten lost while driving.

In discussing Mr. Phillips' transportation options, you learn that he drove himself to his appointment, as he usually does. 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 around?" he asks.

In the *Physician's Plan for Older Drivers' Safety* (PPODS), the next step to managing Mr. Phillips' driving safety is a formal assessment of the functions related to driving. Specific information in Mr. Phillips' driving history—namely, the crash and near-misses—further support the need for assessment.

In this chapter, we discuss the functions related to driving and present a test battery, the *Assessment of Driving-Related Skills* (ADReS). Each test in ADReS assesses a key area of function.

How do you suggest assessment to your patient?

Your patient may feel defensive about being assessed and may even refuse assessment for fear of being told that he/she can no longer drive. After all, driving is not only the primary form of transportation for most Americans, but it also represents freedom and independence.

In suggesting assessment to your patient, it is best to use direct language. Reassure your patient that you have his/her safety in mind and emphasize the fact that you would like to help him/her drive safely for as long as possible. If your patient expresses fear that you will "take away the driver's license," you may find it helpful to reassure him/her that you do not have the legal authority to take away anyone's license. Explain that you may recommend retirement from driving if needed and refer him/her to the Department of Motor Vehicles (DMV), but you cannot take away anyone's license.

Here is an example of how you could suggest assessment to Mr. Phillips:

"Mr. Phillips, I'm concerned about your safety when you drive. Your son tells me that you were in a car crash recently and that you've had several near-misses in the past two years. I'd like us to talk about some simple tests we can do – such as having you walk down the hall while I time you. These will help us decide what we can do to help you drive more safely."

"This is how it works: Based on what we've discussed about your health and how well you do on these tasks, we'll do our best to fix anything that needs to be fixed. For example, if you're not seeing as well as you should, then we'll do what we can to improve your vision. If there's something we can't fix, then I'll refer you to a Driver Rehabilitation Specialist. He or she can go out on the road with you to watch you drive, then recommend ways to make your driving safer. Our goal is to keep you on the road safely for as long as possible."

What if your patient refuses assessment?

Despite your best efforts, your patient may refuse ADReS. If this occurs, you have several options:

- Encourage your patient to take the self-assessment (*Am I a Safe Driver?*) found in Appendix B. This may help raise your patient's level of awareness and make him/her more open to ADReS.
- Counsel your patient on the *Successful Aging Tips* and *Tips for Safe Driving*, both found in Appendix B. These may help raise your patient's level of awareness and encourage safe driving habits.
- In the patient's chart, document your concern regarding his/her driving ability and support this with relevant information from the patient's presentation, medical history, medications, and driving history. Document the patient's refusal for further assessment, along with any counseling you have provided. Not only will this remind you to follow up at the next visit, but it could potentially protect you in the event of a lawsuit. (A detailed medicolegal discussion can be found in Chapter 7.)
- Follow up at the patient's next appointment: Did he/she take the self-assessment? Has he/she put any of the Tips into practice? Does the patient have any questions or concerns? Would he/she like to undergo ADReS?
- If the patient's family members are concerned about the patient's driving safety, you can give them a copy of *How to Help the Older Driver,* found in Appendix B. Enlist their aid in creating a transportation plan for the patient and encouraging the patient to undergo ADReS.

- If you are urgently concerned about your patient's driving safety, you may wish to forego ADReS and refer your patient directly to a Driver Rehabilitation Specialist (see Chapter 5) or to your state driver licensing agency for a focused driving assessment. Depending on your state's reporting laws, you may be legally responsible for reporting "unsafe" drivers to the licensing agency. (A detailed discussion of the physician's legal responsibilities and a reference list of reporting laws can be found in Chapters 7 and 8, respectively.)

Assessment of Driving-Related Skills (ADReS)

The three key functions for safe driving are (1) vision, (2) cognition, and (3) motor function. ADReS assesses these three functions to help you identify specific areas of concern.

Please note that ADReS does ***not*** predict crash risk! Many researchers are working to create an easy-to-use test battery that predicts crash risk; however, further research is needed before this can be achieved. Until physicians are able to test their patients ***directly*** for crash risk, they can test them ***indirectly*** by assessing the functions that are necessary for safe driving. Any impairment in these functions may increase the patient's risk for crash.

The tests in ADReS were selected from among the many available functional tests based on their ease of use, availability, amount of time required for completion, and quality of information provided by the patient's test performance. The individual tests in ADReS have been validated as measures of their particular function and in some cases have been studied with relation to driving.

The tests are presented in this chapter, beside a discussion of the key functions for driving. There is an accompanying score sheet at the end of this chapter that you can photocopy and place in the patient's chart. On the score sheet, the tests are presented in the recommended order of execution. Current Procedural Terminology (CPT®) codes for components of ADReS can be found in Appendix A, and the score sheet can serve as documentation for these codes.

To perform ADReS, you will need a Snellen chart, tape to mark distances on the floor, a stopwatch, and a pencil. There are two paper-and-pencil tests in ADReS, one of which requires a pre-printed form. This is included at the end of this chapter.

Vision

Vision is the primary sense utilized in driving, and it is responsible for 95% of driving-related inputs.[1] In every state, candidates are required to undergo vision testing in order to obtain a driver's license. Many states also require vision testing at the time of license renewal.

Aspects of vision that are important for safe driving and can be readily assessed by a physician include:

- Visual acuity
- Visual fields

Numerous studies indicate that visual acuity declines between early and late adulthood, although there is no consensus 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, and macular degeneration.[2] While far visual acuity is crucial to many driving-related tasks, declines in near visual acuity may be associated with difficulty seeing and reading maps, gauges, or controls inside the vehicle. In ADReS, far visual acuity is measured with a Snellen chart.

Visual fields may decline as a result of the natural aging process and medical conditions such as glaucoma, retinitis pigmentosa, and strokes. In addition, upper visual fields may be obstructed by ptosis, which is more common in the older population. Drivers with loss of peripheral vision may have trouble noticing traffic signs or cars and pedestrians that are about to cross their path. Although earlier studies examining the relationship between visual field loss and driving performance were equivocal, more recent studies have demonstrated significant relationships.[3] In ADReS, visual fields are measured through confrontation testing.

Aspects of vision that are important for safe driving but are not included in ADReS are:

- Contrast sensitivity: Older adults require about three times more contrast than young adults to distinguish targets against a background. This deficit in contrast sensitivity is further exacerbated by low light levels. Thus, older drivers may have problems distinguishing cars or pedestrians against background scenery, and this problem tends to be much worse at night or during storms.[4] While contrast sensitivity has been found to be a valid predictor of crash risk among older drivers,[3] most vision care specialists are not familiar with measures of contrast sensitivity, nor is it routinely measured in eye exams. Further research must be performed to produce standardized, validated cut-off points for contrast sensitivity, and further work must be done to introduce this concept to the vision care specialties.

- Accommodation to changes in illumination: Older adults require more time than young adults to adjust to abrupt changes in light or darkness. As a result, older drivers often report difficulties dealing with the sudden onset of bright lights, such as the headlights from an oncoming car. Glare may also play a role in their visual difficulties.[4]

Cognition

Driving is a complex activity that requires a variety of high-level cognitive skills. Among the cognitive skills needed for driving are:

- Memory
- Visual perception, visual processing, and visuospatial skills
- Selective and divided attention
- Executive skills

Both crystallized memory and working memory are necessary for driving. Not only must drivers remember how to operate their vehicle and what signs and signals mean, they must also remember their current destination and how to get there.[6] In addition, drivers must be able to retain certain information while simultaneously processing other information—a skill called working memory. Working memory (and the other cognitive skills in which it plays a role) tends to decline with age, while crystallized memory remains relatively intact across the life span. It is unclear at present whether age-related memory impairments reflect only preclinical forms of age-related diseases or whether these occur independently of disease processes.[7]

Visual perception, visual processing, and visuospatial skills are necessary for the driver to organize visual stimuli into recognizable forms and know where they exist in space. Without these skills, the driver would (for example) be unable to distinguish a stop sign and determine its distance from the car. In general, visual

Assessment of Driving–Related Skills (ADReS)

The 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.

With the chart hanging on a wall, the patient is instructed to stand 20 feet away. Wearing his/her usual glasses or contact lenses, the patient reads the smallest line possible with both eyes open. The patient's visual acuity is based on the lowest full row that he/she successfully reads. For example, if the best the patient can see is 20/40, then his/her acuity is 20/40 OU (oculus uterque). This process can be repeated for each eye individually (right eye: OD or oculus dexter; left eye: OS or oculus sinister).

For individuals who cannot read, the chart can be reversed to the tumbling 'E' side. The patient is asked to point in the direction that the letter 'E' faces (up, down, right, or left).

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

Far visual acuity can also be measured using various other charts, such as the Snellen Chart for a 10 foot distance or the Sloan Low Vision Letter Chart for 6 meters (20 feet).[5]

Near visual acuity can be tested with commercially available charts, and should be considered whenever a patient complains of difficulty seeing or reading maps, gauges or controls within the vehicle.

The Snellen E Chart is available from Prevent Blindness America for $13.50 plus shipping and handling. To order, call 1 800 331-2020.

Visual Fields by Confrontation Testing

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

The examiner then holds up a random number of fingers in each of the four quadrants, and asks the patient to state the 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/she has a visual field deficit.

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

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Trail-Making Test, Part B

This test of general cognitive function also 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. (Please see Chapter 4 for further discussion.)

Part B involves connecting, in alternating order, encircled numbers (1-12) and encircled letters (A-L) randomly arranged on a page. This test is scored by overall time 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 patient, stating, "Now I will give you a paper and pencil. On the paper are the numbers 1 through 12 and the letters A through L, 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 12. I'll time how fast you can do this. Are you ready? Go." The examiner records time-to-complete.[5]

The Trail-Making Test, Part B can be found at the end of this chapter.

Clock Drawing Test

Depending on the method of administration and scoring, the clock drawing test (CDT) may assess a patient's long-term memory, short-term memory, visual perception, visuospatial skills, selective attention, and executive skills. Preliminary research indicates an association between specific scoring elements of the clock drawing test and poor driving performance.[12] (Please see Chapter 4 for further discussion.)

In this form of the CDT, the examiner gives the patient 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 patient should be given a reasonable amount of time to complete the drawing. The examiner scores the test by examining the drawing for each of eight specific elements.[12, 13]

The eight elements of the Freund Clock Scoring for Driving Competency can be found on the ADReS Score Sheet at the end of this chapter.

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processing may slow[4] and complex visuospatial skills may decline with age, while visual perception remains stable.[8]

When driving, many demands are made on a driver's attention. In particular, drivers must possess selective attention—the ability to prioritize stimuli and focus on only the most important—in order to attend to urgent stimuli (such as traffic signs) while not being distracted by irrelevant ones (such as roadside ads). In addition, drivers must possess divided attention in order to focus on the multiple stimuli involved in most driving tasks. Attentional functioning may decline with age,[9] with divided attention showing more pronounced changes than selective attention.[10]

Executive skills are required to analyze driving-related stimuli and formulate appropriate driving decisions. Executive skills allow a driver to appropriately make the decision to stop at a red light, or stop at a green light if a pedestrian is in the path of the vehicle. The capacity for this kind of logical analysis tends to decline with age.[8]

While age itself may be associated with certain types of cognitive decline, medical conditions (such as dementia) and medications common in the older population have a large impact on cognition as well. The fact that crashes involving older drivers commonly occur in complex situations in which there is a risk of cognitive overload suggests that cognitive limitations play a large role in crash causation.[11]

In ADReS, cognition is measured through the Trail-Making Test, Part B (only) and the Clock Drawing Test, Freund Clock Scoring for Driving Competency.

Motor Function

Driving is a physical activity that requires motor abilities such as:

- Muscle strength and endurance
- Range of motion of the extremities, trunk, and neck
- Proprioception[14]

Motor abilities are necessary for operating vehicle controls appropriately and consistently and turning to view traffic. Even before driving, motor abilities are needed to enter the car safely and fasten the seatbelt. The natural process of aging may involve a decline in muscle strength, muscle endurance, flexibility, and joint stability. (Whether proprioception changes appreciably with age has not been solidly established.[14]) Furthermore, osteoarthritis and other musculoskeletal problems are common in the elderly. Patients 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.

In ADReS, motor function is measured through the rapid pace walk, manual test of range of motion, and manual test of motor strength.

ADReS Score Sheet

When administering ADReS, you may find it helpful to use the ADReS Score Sheet at the end of this chapter. This form may be photocopied, filled out, and placed in the patient's chart. The ADReS Score Sheet presents the tests in the simplest order of administration and provides space for recording test results.

Current Procedural Terminology (CPT®) codes for components of ADReS can be found in Appendix A. The ADReS Score Sheet can serve as documentation for these codes.

Rapid Pace Walk

This is a measure of lower limb strength, endurance, range of motion, balance, and gross proprioception. A 10-foot path is marked on the floor with tape. The subject is asked to walk the 10-foot path, turn around, and walk back to the starting point *as quickly as possible.* If the patient normally walks with a walker or cane, he/she may use it during this test. The total walking distance is 20 feet.

The examiner begins timing the patient when he/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 patient to walk 10 feet and back.[5] In addition, the examiner should indicate on the scoring sheet whether the patient used a walker or cane.

Manual Test of Range of Motion

The examiner tests the patient's range of motion by asking the patient to perform the requested motions bilaterally:

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

The examiner scores the test by choosing the appropriate description of test performance: (1) Within normal limits; or (2) Not within normal limits: Good range of motion with excessive hesitation/pain or very limited range of motion.

Manual Test of Motor Strength

The examiner tests the patient's motor strength by manually flexing/extending the patient's limbs, and asking the patient to resist the examiner's movements. The examiner should test bilateral—

- Shoulder adduction, abduction and flexion
- Wrist flexion and extension
- Hand-grip strength
- Hip flexion and extension
- Ankle dorsiflexion and plantar flexion[15]

Motor strength should be recorded on a scale of 0-5, as stated below:

Grade	*Definition*
5/5	Normal strength: movement against gravity with full resistance
4/5	Movement against gravity and some resistance
3/5	Movement against gravity only
2/5	Movement with gravity eliminated
1/5	Visible/palpable muscle contraction, but no movement
0/5	No contraction[16]

Strength that is slightly less than grade 5/5 but still greater than 4/5 may be recorded as 5-/5. Similarly, strength that is slightly greater than 4/5 but still less than 5/5 may be recorded as 4+/5. This applies to all other grades of strength as well.

Although you may administer the tests in the order that you prefer, we recommend the following order:

- Visual fields by confrontation testing
- Snellen E chart—If your office has a long hallway, hang the chart at the end of the hallway and mark a 20-foot distance on the floor with tape. Have the patient stand at the tape.
- Rapid pace walk—You will also need to mark a 10-foot distance on the floor. With the patient already standing at the 20-foot mark, have him/her walk to the 10-foot mark, then back.
- Manual test of range of motion—This is performed once the patient has returned to the exam room.
- Manual test of motor strength
- Trail-Making Test, Part B
- Clock Drawing Test—Ask the patient to turn over the Trail-Making Test sheet and draw a clock on the blank side.

A discussion of these tests' efficacy, scoring, and recommended interventions based on performance is included in the next chapter.

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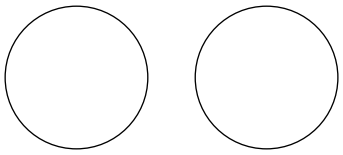
ADReS Score Sheet

Patient's Name: _____ **Date:** _____

1. **Visual fields:** Shade in any areas of deficit.



Patient's R L

2. **Visual acuity:** _____ OU
   Was the patient wearing corrective lenses? If yes, please specify: _____

3. **Rapid pace walk:** _____ seconds
   Was this performed with a walker or cane? If yes, please specify: _____

4. **Range of motion:** Specify 'Within Normal Limits' or 'Not WNL.' If not WNL, describe.

	Right	**Left**
Neck rotation		
Finger curl		
Shoulder and elbow flexion		
Ankle plantar flexion		
Ankle dorsiflexion		

Notes:

5. **Motor strength:** Provide a score on a scale of 0-5.

	Right	**Left**
Shoulder adduction		
Shoulder abduction		
Shoulder flexion		
Wrist flexion		
Wrist extension		
Hand grip		
Hip flexion		
Hip extension		
Ankle dorsiflexion		
Ankle plantar flexion		

Patient's Name: _____ **Date:** _____

6. **Trail-Making Test, Part B:** _____ seconds

7. **Clock drawing test:** Please check 'yes' or 'no' to the following criteria.

	Yes	No
All 12 hours are placed in correct numeric order, starting with 12 at the top		
Only the numbers 1-12 are included (no duplicates, omissions, or foreign marks)		
The numbers are drawn inside the clock circle		
The numbers are spaced equally or nearly equally from each other		
The numbers are spaced equally or nearly equally from the edge of the circle		
One clock hand correctly points to two o'clock		
The other hand correctly points to eleven o'clock		
There are only two clock hands		

Trail-Making Test, Part B

Patient's Name: _____ **Date:** _____