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THE OLDER ADULT DRIVER WITH COGNITIVE IMPAIRMENT:

“It’s a Very Frustrating Life”

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Abstract

Although automobiles remain the transportation of choice for older adults, late life cognitive impairment and dementia often impair the ability to drive safely. There is, however, no commonly utilized method of assessing dementia severity in relation to driving, no consensus on the assessment of older drivers with cognitive impairment, and no gold standard for determining driving fitness. Yet, clinicians are called upon by patients, their families, other health professionals, and often the Department of Motor Vehicles (DMV) to assess their patients' fitness-to-drive and to make recommendations about driving privileges. Using the case of Mr W, we describe the challenges of driving with cognitive impairment for both the patient and caregiver, summarize the literature on dementia and driving, discuss evidenced-based assessment of fitness-to-drive, and address important ethical and legal issues. We describe the role of physician assessment, referral to neuropsychology, functional screens, dementia severity tools, driving evaluation clinics, and DMV referrals that may assist with evaluation. Finally, we discuss mobility counseling (eg, exploration of transportation alternatives) since health professionals need to address this important issue for older adults who lose the ability to drive. The application of a comprehensive, interdisciplinary approach to the older driver with cognitive impairment will have the best opportunity to enhance our patients' social connectedness and quality of life, while meeting their psychological and medical needs and maintaining personal and public safety.

The Patient's Story

Mr W is 92-years-old retired college professor who lives at home with his wife, in an upscale suburban neighborhood that offers little public transportation. Although his wife can operate a motor vehicle, she prefers Mr. W to drive. Mr W has obstructive sleep apnea, hypertension treated with lifestyle modification, treated vitamin B₁₂ deficiency, mild chronic anemia, restless leg syndrome, osteoporosis, edema, and a history of prostate cancer. His only medication is vitamin B₁₂.

About 8 years ago, the patient reported mild forgetfulness to his geriatrician, Dr D. In 2004, Mr W reported that he had lost his way while driving to a familiar museum, had difficulty recalling details of his personal art collection, and had fallen a few times. His score on the Mini-Mental State Examination (MMSE)¹ was 30/30.

In January 2009, he reported that his memory loss troubled him and that driving had become more difficult. He had no driving violations, and neither he nor his wife reported unsafe

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Other Sources: See website resources for more information.

driving practices. He could independently perform all basic activities of daily living (ADLs) and instrumental activities of daily living (IADLs), and walked a quarter mile without difficulty. The MMSE was now 29/30. Neuropsychological testing was consistent with “mild cognitive impairment” (MCI). Dr D thought the MCI might be due to early Alzheimer disease (AD) and recommended assessment at a driving evaluation clinic.

Perspectives

Mr W and his wife, and Dr D were interviewed by a *Care of the Aging Patient* editor in May 2009.

Mr W I can't remember where I put things, or what is the best route to take to get from here to there. ... Things that ... I've done automatically, all of a sudden requires effort. It's a very frustrating life... I don't expect to get permanently lost anywhere. ... I think I'm a safe driver.

Mr W's wife We see lots of new places in the city we've never seen before.

Introduction

In this article we present an evidenced-based approach to the evaluation, assessment, and counseling of older drivers with cognitive impairment (Figure). We define and describe 2 levels of cognitive disorder in older adults: MCI and dementia. We review studies that have examined functional abilities and traffic skills in drivers with dementia, identify co-morbidities that can further reduce driving competence, examine options for driving evaluation, and finally, discuss key aspects of mobility counseling to inform patients of transportation alternatives.

Methods

We searched Medline for cognitive domains, specific psychometric tests, and driving outcomes. Key search terms incorporated limits of “human” and “English language.” We included studies published in English in peer-reviewed journals between 1994 and September 10, 2009 that included participants who had Alzheimer disease or dementia as diagnosed by standardized cognitive tests and were studied with standard driving outcomes measures, eg, on-road driving assessment, simulator, or crash data. The search terms utilized included: driving outcomes, eg, “automobile driving,” “computer simulation,” “road tests” (text word), “automobile driver examination,” “accidents--traffic”; and participant characteristics eg, “cognitive impairment,” “dementia,” “Alzheimer's disease,” “frontal lobe syndromes,” and “Lewy body disease.” Our data synthesis and recommendations were also informed by our clinical experience caring for dementia patients in the outpatient setting.

Epidemiology

Mild cognitive impairment (MCI) is a syndrome defined by abnormal function in a specific cognitive domain (eg, memory, language), deviation from the norm on a standardized psychometric test related to the specific cognitive domain, and the absence of impairment in daily activities.² Preliminary studies indicate there may be impairment in driving skills in MCI.^{3,4} However, more evidence from research studies is needed on MCI to inform recommendations in regards to monitoring or assessing driving skills.

In contrast, dementia is manifested by the onset of impairment in memory, requires the presence of impairment in at least 1 additional cognitive domain, and those deficit(s) cause significant impairment in social and/or occupational functioning. Approximately 4% of current drivers over age 75 years have a dementia,⁵ and many of these continue to drive well

into the disease process.⁶ In a study where older adults were administered a well-validated brief cognitive screen to detect dementia, nearly 20% of those over age 80 years failed.⁷

Dementia and Driving Outcomes

Studies examining crash rates in drivers with dementia compared with controls are summarized in Table 1. Evidence from motor vehicle crash studies suggests that drivers with a dementia have at least a 2-fold greater risk of crashes compared to cognitively intact older adults, but this increased risk is not found in all studies. The variability in findings can be explained in part by the definitions of crashes (self-report vs. state recorded), settings (tertiary referral centers vs. license renewal settings) and referral bias. Overall, the risk of a crash for AD appears to increase with the duration of driving after disease onset.

In *driving simulation studies*, drivers with AD consistently perform more poorly than do non-demented controls,⁸ are more likely to drive off the road, drive more slowly than the speed limit, apply less brake pressure when trying to stop, and make slower left turns.⁹ Studies from the National Advanced Driving Simulator at the University of Iowa analyzed vehicle maneuvers related to simulated crashes and demonstrated that inattention and either slow or inappropriate responses were major factors leading to accidents.¹⁰ Simulators are still best viewed as a research tool and not as a sole determinant of driving fitness.

Performance-based road tests are another measure of driving competency. Most of these studies report on qualitative outcomes (eg, “pass/fail” rates) in comparison to controls, but some studies have used point systems or quantitative outcomes.^{11, 12} Demented drivers have particular difficulties with lane checking and changing,¹³ merging, left turns, signaling to park,¹⁴ and route following.¹⁵

The Clinical Dementia Rating (CDR), a global measure of dementia severity, uses a semi-structured interview and exam to rate the severity of the dementia.¹⁶ Pooled data from 2 longitudinal studies involving 134 drivers with dementia^{17,12} show that 88% of drivers with very mild dementia (CDR = 0.5) and 69% of drivers with mild dementia (CDR = 1.0) are still able to pass a formal road test. Moreover, the median time to cessation of driving for those with very mild dementia was 2 years, and for those with mild dementia, 1 year.

The majority of studies on dementia and driving have focused on AD, however other degenerative dementias are not uncommon, and may negatively impact driving fitness. In a prospective road test study of controls and mixed medical disorder patients with AD, vascular dementia, and diabetes, driving performance errors were comparable between AD and vascular dementia patients.¹⁸ This suggests that degree of cognitive impairment rather than dementia diagnosis is the more important determinant of risk. Disinhibited and agitated behaviors in patients with frontotemporal dementia have been shown to cause hazardous driving,¹⁹ perhaps to an even greater extent than behaviors typically exhibited by drivers with AD. Prominent visuoperceptual and attention deficits, as well as the common occurrence of visual hallucinations and fluctuating levels of alertness may raise significant concerns about driving safety for patients with Lewy body dementia.

Approaches to Evaluating Driving Safety

Mr W I've driven around with my wife, who is supervising my driving to be sure that I'm behaving in a reasonable fashion. I've gone to the DMV and gotten the book of driving rules so I can pass the written exam without any trouble.

Mr W's wife I find my husband to be a very good driver. His reaction time appears to me to be very good. He obeys the law. He doesn't speed. He's alert... He's going to pass any test they're going to give him.

Dr D The first stage is just recognizing general cognitive impairment, whether it's a memory problem, judgment problem, or visual-spatial problem. Once I do that medical assessment, the next step is to try to sort out whether or not these deficits may be affecting someone's ability to drive.

The clinical opinion of a primary care physician or subspecialist, evidence of a recent crash, new onset of impaired driving behaviors noted by caregivers, functional impairment as measured in key cognitive domains, impairment in performance-based evaluations such as road tests, and difficulty with simulator scenarios have all been used in various settings to risk stratify or assess fitness-to-drive in individuals with a dementing illness. These issues will be discussed in subsequent sections.

Our approach to evaluating older adults with cognitive impairment or dementia is described in the Figure. The initial efforts focus on confirming a diagnosis, evaluating the individual for reversible causes for cognitive decline, rating dementia severity, determining if the patient is still driving, and identifying co-morbidities. Next steps in the evaluation process include queries about impairments in traffic skills that could be attributed to dementia (Box 1), the assessment of functional status, and evaluating specific cognitive domains (eg visuospatial skills, executive function) by psychometric testing. Finally, consultation with other health professionals to obtain further opinions on fitness-to-drive and/or provide counseling for transportation alternatives is considered.

Although many demented individuals have difficulty in actual driving situations, most patients early in the course of dementia are still able to pass a driving performance test. Therefore, a diagnosis of dementia should not be the sole justification for the revocation of a driver's license. However, if a patient has degenerative dementia—eg, even in the initial stages of AD—the physician should begin the conversation about the inevitability of future driving cessation. This conversation, including planning for transportation alternatives (discussed below), should occur early in the diagnosis. We have found that in our practice, when the repeating the message to the patient and caregiver may reduce the possibility of resistance or noncompliance with future directives.

Physician Evaluation, Functional Assessment, and the Rating of Dementia Severity

Dr D This loss, whether it's ... because of cognitive ability or [whether] someone's had a disabling stroke or [whether someone] has such severe arthritis that they literally can't turn their neck rapidly enough to safely scan their environment, is unlikely to affect just this single functional domain ... it would be foolhardy to look at this in isolation. Unfortunately, I don't know of any tool that has been validated to [assess driving competency in the office]. I use my own mental checklist.

From a practical standpoint, the assessment and opinion of the primary care physician or subspecialist may be the only evaluation available or acceptable to the patient, caregiver, or community. Caregivers of demented patients, when queried, want their physicians to assist and provide guidance in this area.²⁰

In the office setting, physicians have been studied systematically to assess their accuracy in predicting driving ability in a sample of older adults. In one study, six clinicians with varying levels of experience and expertise in dementia care were asked to predict road test performance in 50 drivers with dementia, based on their examination of driving behaviors and clinical records (demographics; driving exposure and experience; history of accidents and violations; physical, eye, and neurologic examinations; neuropsychological tests). Inter-rater reliability and accuracy (percentage of correct positive and negative classifications) were modest, with accuracy ranging from 62-78%. The most accurate were clinicians

specially trained in dementia assessment, not necessarily those with the most years of clinical experience.²¹

The CDR, as noted above, has been shown to stratify driving risk in 2 large-scale longitudinal studies and has been recommended for clinical use to determine fitness to drive.²² Instrumental Activities of Daily Living (IADLs) are a global measure of dementia severity often used in clinical practice that may serve as a proxy for driving ability. In 1 study, among drivers with reduction of at least 30% in their total IADL score, 75% were regarded by their caregivers as unable to drive safely.²³ We offer a summary of the descriptive elements of the CDR that combine both cognitive and functional domains based on the level of dementia severity in Table 2.

National Guidelines and Physician Practice

Consensus among national medical, transportation, and elder advocacy societies is that drivers with moderately severe dementia should not drive (Table 3), as confirmed by studies of road testing at varying levels of dementia severity.²⁴ There is still debate among experts on whether drivers with mild dementia should be allowed to drive and under what circumstances or restrictions, although recent literature does indicate that some patients with mild dementia may be able to pass a performance-based road test.

Co-morbidities and Medications

Mr W's wife We are aware of the fact that this memory loss, a large part of it, came with dosing with psychoactive drugs and lack of sleep. We are in the process of remedying the apnea. We think, from experiences we have had, that once he catches up on his sleep, things are going to be improved.

This observation from Mr W's wife underlies the importance of identifying and/or treating reversible causes of cognitive decline. The influence of multiple medical illnesses or co-morbidities on further impairing driving ability in patients with dementia has not been well studied, but should be considered when evaluating driving competency. Two publications in the past decade summarize the extensive literature on medical conditions and driving impairment,^{25,26} and recently the AMA published an update in this area in their guide on older drivers.²⁷

Medical conditions associated with impaired driving ability include: diseases affecting vision (eg, cataracts, diabetic retinopathy, macular degeneration, glaucoma), cardiovascular diseases (eg, angina pectoris), respiratory diseases (eg, sleep apnea, COPD), neurologic diseases (eg, mild cognitive impairment, dementia, Parkinson disease), psychiatric diseases (eg, depression, psychosis), metabolic diseases (eg, hypoglycemia), and musculoskeletal diseases (eg, cervical spine arthritis). Side effects of various medications²⁸ have been associated with impaired driving and these should be avoided or minimized when operating a motor vehicle. These medications include sedating agents in the following classes of drugs: anti-convulsants, antihistamines, antipsychotics, tricyclic antidepressants, bowel/bladder antispasmodics, benzodiazepines, muscle relaxants, and barbiturates.²⁹ Focus on co-morbidities should include conditions that are chronic and irreversible and those that are amenable to interventions. Surgical correction of cataracts, treating obstructive sleep apnea, and removing sedating medications are examples of interventions that have shown potential to improve driving safety with our older adults.

Driving Habits/Traffic Skills

Mr W and his wife are confident of his driving ability. Many patients with cognitive impairment do not have insight into their driving abilities. Unlike Mrs. W, many caregivers

do express concerns about the driver with cognitive impairment. Studies of the validity and accuracy of informant reports show mixed results.³⁰ With specific questioning family members may be a good source of information about abnormal driving behaviors.³¹ Specifically, the physician may ask family members about crashes, citations, close calls, following the rules of the road, and whether the patient becomes lost while driving in familiar area. We routinely obtain information on the development of new onset impaired traffic skills in our older adults with the dementia, but acknowledge the dearth of evidence that has studied these changes as a predictor of unsafe driving.

Box 1 summarizes questions about traffic skills and important aspects of the past medical and social history that may help to assess at-risk driving behavior and conditions or medications that may further reduce driving capacity.

Psychometric Tests

The MMSE was not designed to assess driving capacity. Studies regarding the utility of global cognitive measures like MMSE for estimating driving impairment have been mixed.³² Although the MMSE may correlate with degree of driving impairment on road tests and history of crashes, it does not appear to predict future involvement in crashes, and valid cutoff scores have not been defined.³³

In 2004, a meta-analysis of neuropsychological tests of driving performance in patients with dementia concluded that tests of visuospatial skills are the most relevant predictors of driving impairment.³⁴ More recently, visuomotor and executive function tests such as trailmaking and maze completion^{35,36} have been associated with driving impairment in older adults with dementia. The American Medical Association (AMA) recommends that physicians adopt the Assessment of Driving-Related Skills (ADReS) battery to risk stratify older adults as to their driving abilities.²⁷ This battery includes testing visual fields by confrontation, visual acuity by the Snellen eye chart, adopting the Clock Drawing Task, Trails B (a test of visuospatial and psychomotor speed), muscle strength, and neck and extremity range of motion. Individual test characteristics of the ADReS battery have been studied in older adults³⁷ and the Trails B test and the Rapid Pace Walk have been associated with a prospective increased risk of an at-fault crash.³⁸ Data from one AMA-based dementia education program suggests that some physicians may be willing to adopt such tests.³⁹ However, to our knowledge, the test battery as a whole has not been validated using driving outcomes either in primary care practice settings or in samples of demented drivers. Encouraging studies have been published on the association of other cognitive tests (eg UFOV/selected and/or divided attention and visual closure tasks) with prospective at-fault crash rates in community samples,⁴⁰ that presumably also include older adults with dementia or MCI.

Table 4 summarizes published predictive values of some psychometric tests in determining the ability to pass a road test in older adults with dementia. Unfortunately, detailed information on the sensitivity, specificity, and classification accuracy of psychometric tests are lacking in most studies.⁴¹ Overall, most traffic safety experts conclude that psychometric tests may serve to identify drivers at-risk, but should not be the sole determinants in deciding to continue or revoke driving privileges.³³

Communication and Counseling

Dr D We talked about it in a couple of different ways. ... In fact, I think part of him almost welcomed it ... I got the sense that at some level he wasn't sure that he should still be driving.

Given the negative impact that occurs when older adults stop driving and the lack of viable public transportation resources, physicians should encourage ongoing driving when appropriate and plan a reassessment within a limited time frame. Physician advice is one of the more frequently cited reasons that a patient stops driving. Although the conversation between Dr D and Mr W went smoothly, patients may become irate, angry, or defensive. However, physicians can focus on other important areas of driving safety to put the issue in context. As with all patients, physicians should remind patients with cognitive impairment and their caregivers to use seat belts, refrain from ingesting any alcohol before operating a motor vehicle, and to avoid multitasking while driving (eg, using cell phones). From an ethical, policy, and legal standpoint, physicians should remind the patient and their caregiver that they may have a responsibility to notify the Department of Motor Vehicles and/or their insurers as to the presence of a dementia and its potential to impact driving safety.

If the patient becomes angry when told by the physician that he or she should no longer be driving, the physician should allow time for “ventilation” and/or dissipation of anger. Communication about this issue must be done in a sensitive and respectful manner. Comments such as, “we can agree to disagree” or “let’s follow you over time and see how the new medication works” may defuse a potentially emotional situation. Suggestions for managing the recalcitrant driver who the physician believes should stop driving appear in Box 2. To our knowledge, these types of interventions have not been systematically studied, but have been adopted with modest success in our clinical practices.

Family members may try to compensate by having a non-impaired driver serve as “co-pilots.” There is some evidence suggesting that the crash rate of demented patients is lower with another person in the car,⁴² however data are insufficient to support this practice as a compensation mechanism for demented drivers. In addition, some clinicians may be tempted to recommend limiting trips or driving only under safe conditions, such as avoiding rush hour, in climate weather, driving during the day, or limiting trip time and/or distance. Restricted licenses have been associated with reduced crash risk.⁴³ However, many older adults are already restricting or limiting their driving, and it is doubtful that a patient with dementia could retain such instructions.

Finally, there is a wealth of educational curricula geared to health professionals, such as the AMA’s Older Driver Project.³⁶ Two recent education interventions for health professionals were positively associated with increased comfort in discussing driving with patients with dementia, reporting unsafe drivers, or adopting tools that might be of use in the assessment process.^{39,44}

Referral

Dr D There are various services in the area that are typically staffed by a physical therapist or an occupational therapist, where they conduct ... driving evaluations and driving simulations that I just don’t have the ability to do here in the office. We can get objective information about their relative strengths and weaknesses and I can make a determination about the next step. [Mr W] is in the process of having this preliminary evaluation done by the (driving rehabilitation) therapist. I fear that they’re going to tell me that he should stop driving. I suspect the next step will be reporting him to the Department of Motor Vehicles.

In the absence of a gold standard or consensus for determining driving competency, Dr D, like many clinicians, may request assistance from a driving clinic or refer to other subspecialists in the community (eg, geriatricians, psychiatrists, neurologists, neuropsychologist).

A Driver Rehabilitation Specialist (DRS) evaluates, develops, and implements driving services for individuals with disabilities. DRSs are often occupational therapists with additional training in driver evaluation, vehicle modification, and rehabilitation, but may also be trained in physical therapy and psychology. Occupational therapy practice guidelines for these evaluations have been published.⁴⁵ However, a recent review of practices across the US and Canada indicates that although the same domains are generally assessed, specific assessments vary significantly across programs and few have adopted standardized tools.⁴⁶

A typical driving evaluation may last several hours and often includes off-road tests of vision, cognition, and motor skills. The on-road assessment is typically performed in a driver rehabilitation vehicle equipped with a dual set of brakes. The driving evaluation usually costs \$350-\$500 and is generally not covered by insurance. Clinicians who are interested in this service can contact the occupational therapy departments in local hospitals or rehabilitation centers or the ADED directory (see, online Web resources).

We recommend a performance-based road test for demented drivers with a) caregiver observation of new impairments in traffic skills, b) prominent impairments in key cognitive domains (eg, attention, executive function, visuospatial skills), or c) the presence of a mild dementia (CDR=1). Private or university-based driving clinics are not available to everyone across the country, but every state Department of Motor Vehicles conducts performance-based road tests.

Some clinicians may be reluctant to refer their patients for road testing, since this procedure is rarely standardized and the data supporting their use may be limited. However, the ability to demonstrate proficiency behind the wheel in traffic is a practical method of evaluation, is the defacto method adopted by all 50 states to evaluate novice and medically impaired patients, and evidence is gathering that those that pass these tests have acceptable prospective crash rates.

Development of uniform standards for road testing and simulators may improve outcomes.⁴⁷ A recent review concluded there was simply no evidence to demonstrate the benefit of driving evaluations with respect to the preservation of mobility or a reduction in crashes.⁴⁸ However, more recent studies are encouraging. For example, in a longitudinal study based at an academic medical center, crash rates for drivers with dementia declined to the levels of healthy control drivers during a period of 3 years when evaluated with road tests every 6 months.¹² The costs of such detailed surveillance as repeat road testing may be prohibitive, however, and it is unknown whether community-based road testing programs would produce similar results.

Mobility Counseling

Dr D One of the disadvantages of living in this community is that public transportation is... basically nonexistent, so realistically, people live [by driving] their cars.

Mr W [It] would be a catastrophe if [my license is taken away]. [Without] access to an automobile, we'd either have to hire a full-time chauffeur, which we can't afford to do, or simply sell the house and move someplace else.

This concern about the lack of driving alternatives and the fear of losing social connectivity expressed by Dr D and Mr W is universal. Driving cessation has been associated with a decrease in social integration,⁴⁹ decreased out-of-home activities,^{50, 51} an increase in depressive symptoms in the elderly,⁵² anxiety symptoms,⁵³ and an increased risk of nursing home placement.⁵⁴ Planning for driving retirement should occur for all older adults before their mobility situation becomes urgent.⁵⁵ Referral to a social worker may assist with

identifying community transportation needs. Many organizations are available to assist clinicians, patients and families with these issues (see web resources).

The Physician's Legal and Ethical Obligations

Many physicians are uncertain of their legal responsibility to report unsafe drivers to the state⁵⁶ As Dr D noted, his state requires mandatory reporting of patients with diagnosed dementia, but this mandate represents the minority view across US jurisdictions. Most states have voluntary reporting, where referral is an option, but one that should be considered in some situations. The Departments of Motor Vehicles or Revenue in all states often use the road test as the final or major arbitrator to determine licensing. Many authorities recognize the performance-based road test as the *de facto* standard.⁵⁷ However, a recent study reporting licensing outcomes in Missouri noted that very few (<4%) older adults referred for fitness-to-drive evaluations (40% of whom had a dementing illness) were able to retain their license.⁵⁸ Thus, referrals in some states may reflect more of a delicensing process.

The AMA's policy states, "in situations where clear evidence of substantial driving impairment implies a strong threat to patient and public safety, and where the physician's advice to discontinue driving privileges is ignored, it is desirable and ethical to notify the Department of Motor Vehicles."⁵⁹ Obviously, it is preferred that referrals to DMV be done with the patient's knowledge, and that the report be documented in the medical record. However, many primary care physicians, fearing the deterioration of a long-standing relationship with their patient, may be reluctant to be this forthcoming. If a physician decides to report an unsafe driver, most states will accept a formal letter. Specific forms may be available on-line or at the DMV examiner offices. Development of specific policies regarding reporting should be vetted by legal counsel. Policies and laws can vary by state or province.⁶⁰ In states with voluntary reporting laws, we recommend formal referral to the DMV for refractory cases or for those patients deemed to be at a very high risk for a crash and/or injury.

Studies are needed to compare the benefits and costs of mandatory reporting to state DMVs with voluntary reporting. Although increased age is associated with a higher proportion of cognitively impaired drivers, mandatory age-based driver testing has not been shown to decrease crash rates.⁶¹ Decision analysis studies have not consistently revealed the benefits of systematically screening and evaluating demented drivers.⁶² Clearly, more studies are needed in this area of the benefits and risks of screening for cognitively impaired older adults.

Future research on assistive technologies, such as user-friendly global position system (GPS) devices may assist with geographic orientation. Crash warning systems need to be developed to maximize independent living for people with mild cognitive impairment. Preliminary data supports the beneficial effects of cholinesterase inhibitors on driving simulation tasks in demented individuals,⁶³ as well as cognitive stimulation,⁶⁴ and exercise interventions directed at driving-related cognitive abilities in older adults.⁶⁵ Additional studies are needed on these types of interventions, their potential impact on cognitive domains, and their ability to prolong safe driving. As the baby boom generation comes of age there will be a pressing need to develop comprehensive alternative transportation systems for our older and cognitively impaired drivers.

Box 1

Assessing Patients for Driving Safety

History: Ask Caregivers

Have they had any motor vehicle accidents?

Have they had any “near misses”?

Have they had any tickets?

Have they been pulled over by police?

Have you noticed a change in driving behaviors from baseline? Since last exam?

Have they had difficulty staying in your lane?

Do they have difficulty following the rules of the road?

Do other drivers honk at them?

Are there scratches on the car?

Have they gotten lost in familiar areas?

Are they vigilant in scanning for vehicles/pedestrians?

Physical Examination: Assessment for co-morbid conditions that can further reduce capacity

Visual: cataracts, diabetic retinopathy, macular degeneration, glaucoma

Cognitive: sleep apnea, multiple sclerosis, Parkinson disease, psychiatric disease, diabetes

Motor: degenerative joint disease, muscle weakness, neuropathy

Medication Review: Assessment for sedating agents

Antihistamines

Antipsychotics

Tricyclic antidepressants

Bowel/bladder antispasmodics

Benzodiazepines

Muscle relaxants

Barbiturates

Functional Assessment: Assessment of Instrumental Activities of Daily Living

Food Preparation

Finances

Telephone

Medications

Shopping

Housekeeping

Laundry

Box 2**Steps Family Members can Take to Ensure that a Resistant Demented Patient no Longer Drives****Approaches involving physician**

- Ask physician to “prescribe” driving cessation orally and in writing
- Ask physician to use medical conditions other than dementia as the reason to stop driving (eg, vision too impaired, reaction time too slow)
- Use a contract (see At the Crossroads guide in Web Resources)

Vehicle-related approaches

- Hide/file down or replace the car keys with keys that will not start the vehicle
- Do not repair the car/or send car for “repairs” but arrange for its removal
- Remove the car by loaning, selling to third party, or donating vehicle to charity
- Disable the car

Financial and legal tactics

- Ask family lawyer to discuss financial and legal implications of crash or injury to patient, family or third party
- Refer to the Department of Motor Vehicles

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Web Resources on Dementia and Driving**Caregiver and Patient Resources**

Association for Driver Rehabilitation Specialists (ADED)

The ADED Web page describes warning signs of driving with a link to the directory on locating a driving specialist.

<http://www.driver-ed.org/i4a/pages/index.cfm?pageid=104>

American Occupational Therapy Association (AOTA)

Information on occupational therapists and their role in driving assessment and rehabilitation.

<http://www1.aota.org/olderdriver/>

Alzheimer's Association

The national association's Web site on driving and dementia with links to educational information. Local chapter websites will often list available driving clinics in the area.

http://www.alz.org/safetycenter/we_can_help_safety_driving.asp

Family Caregiver Alliance

1) Fact sheet on Dementia and Driving

<http://lacrc.usc.edu/damcms/sitegroups/SiteGroup1/files/fact-sheets/Non%20DMH/Dementia%20and%20Driving.pdf>

2) A review of the myriad of caregiver issues related to this topic.

http://www.caregiver.org/caregiver/jsp/content_node.jsp?nodeid=432

3) Dementia and Driving and the California State Law

http://www.caregiver.org/caregiver/jsp/content_node.jsp?nodeid=433

Lennox and Addington Dementia Network

Dementia and Driving-Family and Caregiver Information.

http://www.providencecare.ca/objects/rte/File/Health_Professionals/drivinganddementia_patient.pdf

MayoClinic.com

Caregiver site on when to stop driving.

<http://www.mayoclinic.com/health/alzheimers/HO00046>

National Association of Social Workers

Locate a social worker near you.

<http://www.socialworkers.org/>

The Caregiver Project

Alzheimer's Disease, Dementia and Driving

This Web site catalogs and links to other topical Web sites.

<http://www.quickbrochures.net/alzheimers/alzheimers-driving.htm>

The Hartford

Insurance company Web site with links to the brochure, “At the Crossroads” and “We Need to Talk”

<http://www.thehartford.com/alzheimers/>

<http://www.thehartford.com/talkwitholderdrivers/>

WebMD

Dementia and Driving Video for caregivers.

<http://www.webmd.com/video/driving-and-dementia>

Physician Resources

Alzheimer's Knowledge Exchange Web site

Selected links on dementia and driving

<http://www.candrive.ca/en/resources/physician-resources/43-driving-and-dementia.html>

American Family Physician

Dementia and Driving Handout for the Office

<http://www.aafp.org/afp/20060315/1035ph.html>

American Medical Association (AMA)

Physician's Guide to Assessing and Counseling Older Drivers

Dementia and Driving, p. 47

<http://www.ama-assn.org/ama1/pub/upload/mm/433/chapter4.pdf>

and State Licensing and Reporting Laws (last updated 2004)

<http://www.ama-assn.org/ama1/pub/upload/mm/433/chapter8.pdf>

California Department of Motor Vehicles

Discussion of the California Law and Dementia Severity

<http://www.dmv.ca.gov/dl/driversafety/dementia.htm>

Dementia and Driving Toolkit: The Dementia Network of Ottawa

A toolkit for clinicians that evaluation and counsel older drivers.

http://docs.google.com/gview?a=v&q=cache:sU_gDWuJOa0J:www.cma.ca/multimedia/CMA/Content/Images/Inside_cma/WhatWePublish/Drivers_Guide/AppendixD_e.pdf+dementia+and+driving+toolkit&hl=en&gl=us

Insurance Institute for Highway Safety (IIHS)

An website on older driver laws for driver licensing that is updated every six months.

<http://www.iihs.org/laws/olderdrivers.aspx>

Neurology

When should patients with Alzheimer's stop driving by Deniz Erten-Lyons

<http://www.neurology.org/cgi/reprint/70/14/e45?maxtoshow=&HITS=10&hits=10&RESULTFORMAT=&fulltext=driving+and+dementia&searchid=1&FIRSTINDEX=10&sortspec=relevance&resourcetype=HWCIT>

NeuroPsychiatry

Driving with Dementia-What is the Physician's Role?

A discussion of the physician's role in this process.

http://www.neuropsychiatryreviews.com/may02/npr_may02_demdrivers.html

Psychiatry Weekly

Psychogeriatrics: Advanced Age, Dementia and Driving

A discussion of the physician role, ethics, and communication issues

<http://www.psychiatryweekly.com/asp/article/articledetail.aspx?articleid=984>

SGIM Annual Meeting 2009

Driving Risk Assessment, p 17, 18, 19

A discussion and review of tools that may assist in assessing older drivers.

http://www.sgim.org/userfiles/file/WE03_Kao_Helen_201345.pdf

Talking to Seniors and Their Family about Dementia and Driving

Educational Pamphlet, by Mark Rappaport, 2007

<http://docs.google.com/gview?a=v&q=cache:8BVwrfgpLOWJ:www.rgpc.ca/best/GiiC%2520Resources/GiiC/pdfs/5%2520Talking%2520to%2520seniors%2520about%2520driving.pdf+rappoport+dementia+driving&hl=en&gl=us>

VA Government Pamphlet

Dementia and Driving Handout

http://www1.va.gov/vhapublications/ViewPublication.asp?pub_ID=1162

Transportation Alternatives

Agency on Aging

Assists in finding local resources for aging in the community.

<http://www.n4a.org/>

American Public Transportation Association (APTA)

Locate a local transportation provider in your community.

<http://www.publictransportation.org/systems/>

American Administration on Aging (AOA)

Eldercare locator

Assists in finding older adult resources in your community.

www.eldercare.gov

Community Transportation Association (CTAA)

Information on transportation in the United States.

<http://www.ctaa.org/ntrc/>

ITNAmerica

Novel older adult transportation system that provides 24-7 rides to seniors.

<http://www.itnamerica.org/>

National Center on Senior Transportation

A Web site that provides links to many transportation agencies. Available summer of 2010, will be the Person-Centered Mobility Preparedness Inventory (PCMPI).

http://seniortransportation.easterseals.com/site/PageServer?pagename=NCST2_trans_care

Seniors on the MOVE

Assists older adults with relocation to another community.

<http://www.seniorsonthemoveinc.com/>

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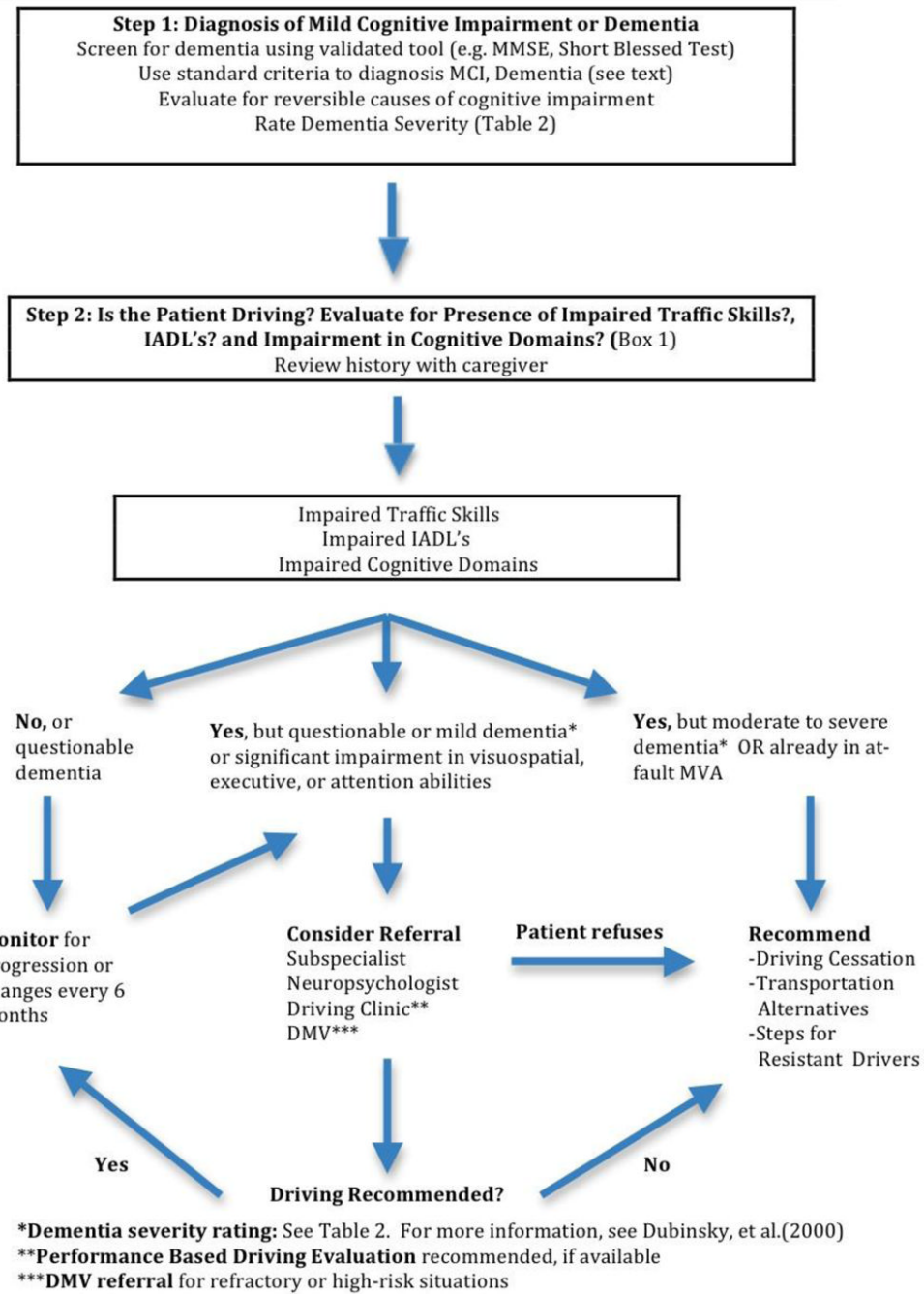


Figure.
 Evidence-Based Approach to the Assessment of Older Adult Drivers with Cognitive Impairment/Dementia

Table 1
Published Motor Vehicle Crash Rates in Samples of Older Normal and Older Cognitively Impaired Drivers

Dementia severity (N)	Locale	Ascertainment method	Mean MMSE (S.D.)	Mean age (S.D.)	MVA/driver/Year (S.D.)	MVA/driver/1,000 miles (S.D.)
Normal (98) ⁶⁶	Kansas City, KS	Questionnaire	29.4 ± 0.8	64.6 ± 9.4	.06 (.24)	.014 (.044)
Moderate dementia (19)	Kansas City, KS	Questionnaire	17.3 ± 7.1	71.3 ± 8.3	.11 (.35)	.263 (.741) *
Normal (44) ¹²	Pawtucket, RI	Questionnaire + state records	29.1 ± 1.1	73.5 ± 9.1	.04	.005
Very mild- mild dementia, CDR 0.5-1 (84)	Pawtucket, RI	Questionnaire + state records	24.1 ± 3.6	75.7 ± 7.0	.06	.017 *
Normal (58) ⁶⁷	St. Louis, MO	State records	NA	77.0 ± 8.6	.07	.091
Very mild dementia CDR .5 (34)	St. Louis, MO	State records	NA	73.7 ± 7.0	.06	.097
Mild dementia CDR 1 (29)	St. Louis, MO	State records	NA	74.2 ± 7.8	.04	.110
Normal (24) ⁶⁸	Los Angeles, CA	Interview + state records	29.2 ± 0.5	71.8 ± 6.8	NA	.028
Mild dementia (13)	Los Angeles, CA	Interview + state records	23.2 ± 2.6	70.7 ± 7.4	NA	.214 **
Normal (249) ⁶⁹	Vancouver, BC, Canada	State records/insurance claims	NA	62-69	.06	NA
Cognitively impaired not demented (84)	Vancouver, BC, Canada	State records/insurance claims	NA	62.5 ± 10.5	.14	NA
Mild dementia (165)	Vancouver, BC, Canada	State records/insurance claims	NA	69.2 ± 7.3	.15 *	NA
Normal (715) ⁷⁰	Ann Arbor, MI	State records	NA	70.8 ± 7.8	.08	NA
Mild to moderate	Ann Arbor, MI	State records	14.8 ± 6.4	70.9 ± 7.7	.08	NA

Dementia severity (N)	Locale	Ascertainment method	Mean MMSE (S.D.)	Mean age (S.D.)	MVA/driver/Year (S.D.)	MVA/driver/1,000 miles (S.D.)
dementia (143)						
Normal (83) ⁷¹	Seven national regions	Questionnaire	NA	72.1 ± 8.0	.04	NA
Mild to severe dementia (83)	Seven national regions	Questionnaire	NA	70.1 ± 8.5	.09*	NA
Normal (20) ⁷²	Bethesda, MD	Questionnaire	NA	NA	.02	NA
Mild dementia (30)	Bethesda, MD	Questionnaire	19.9±6.3	67.8±11.0	.09*	NA
Normal (31) ⁷³	Mendoza Argentina	Questionnaire	28.5±1.6	60.8±10.3	.02	NA
Dementia (56)	Mendoza Argentina	Questionnaire	18.5±6.0	71.8±8.1	.NA	NA

* $p < .05$, comparing dementia patients to controls

** MVA + moving violations; significance not assessed

Table 2Clinical Description of Dementia Severity Levels^{16*}

Clinical Measure of Dementia Severity	No Dementia (CDR=0)	Questionable or Very Mild Dementia (CDR=0.5)	Mild Dementia (CDR=1.0)	Moderate Dementia (CDR=2.0)
Cognition	No memory loss or inconsistent memory loss Fully oriented Judgment intact	Consistent slight forgetfulness Slight difficulty with orientation or judgment	Memory loss interferes with everyday activities Geographic disorientation Moderate impairment in judgment	Moderate memory loss Severe difficulty with time relationships and judgment
Functional Assessment	Function intact Personal care intact	Slight impairment in community activities or home activities Personal care intact	Mild but definite impairment of community or home activities Needs prompting for personal care	No longer independent in activities Only simple chores preserved Needs assistance in personal effects

* Clinical Dementia Rating training available at; <http://alzheimer.wustl.edu/cdr/default.htm>

Table 3

Expert Recommendations of Professional Societies and Consensus Meetings

Expert Group	Driving Cessation Recommended	Specialized or Detailed Assessment Recommended	Other Recommendations
The 1994 International Consensus Conference, 1994 ⁷⁴	Moderate to severe dementia	Mild dementia: consider specialized assessment of driving competence.	
American Psychiatric Association: Practice guideline, 1997 ⁷⁵	Moderate to severe impairment Mild dementia plus significant deficits in judgment, spatial function, or history of at-fault motor vehicle		Patients with milder impairment should be urged to consider giving up driving.
American Association of Geriatric Psychiatry, Alzheimer's Association, American Geriatric Society, 1997 ⁷⁶	Advanced dementia	Patients with a history of traffic mishaps or more significant spatial and executive dysfunction	
Canadian Consensus Conference on Dementia, 1999 ⁷⁷			Patients with AD should plan early for eventual cessation of driving. Physicians should advocate for the establishment and access to affordable, validated performance-based driving assessments.
American Association of Automotive Medicine/ National Highway Transportation Safety Association Consensus meeting: Guidelines for physicians, 2000 ⁷⁸		All patients: Based on focused medical assessments, physicians should encourage early planning for eventual cessation of driving in persons with dementia.	Physicians should advocate establishment and access to affordable, validated, and performance-based driving assessments.
American Academy of Neurology: Practice parameter, 2000 ²² (currently under revision)	Mild dementia defined as Clinical Dementia Rating (CDR) = 1 or greater (Standard)	Questionable or very mild dementia defined as CDR = 0.5: referral for a driving performance evaluation by a qualified examiner (Guideline)	Reassess every 6 months (Standard)
Alzheimer's Association: Position statement, 2001 ⁷⁹	When the individual poses a serious risk to self or others.	If there is concern that an individual with AD has impaired driving ability, and the person would like to continue driving: perform a formal assessment of driving.	A diagnosis of AD is not, on its own, a sufficient reason to withdraw driving privileges. The determining factor should be an individual's driving ability.
American Medical Association: Physician's Guide to Assessing and Counseling Older Drivers, 2003 ⁸⁰		All patients: office-based measures to guide recommendation for driving cessation or performance-based assessment	With early diagnosis, plan early for a smooth transition from "driving" to "non-driving" status. Co-pilots should never be recommended to unsafe drivers as a means to continue driving.
American Association of Geriatric Psychiatry: Position statement, 2006 ⁸¹	Strongly consider for all patients with AD, even in mild dementia.	Those with very earliest manifestations of dementia: refer for driving performance evaluation by a qualified examiner	Reassess dementia severity and appropriateness of continued driving every six months.

Expert Group	Driving Cessation Recommended	Specialized or Detailed Assessment Recommended	Other Recommendations
Canadian Medical Association: Driver's guide, 2006 ⁸²	Moderate-to-severe dementia	Mild dementia: comprehensive off-road and on-road test at a specialized driving center	Patients deemed fit to drive should be re-evaluated and possibly retested every 6 to 12 months.

Table 4
 Predictive Values of Neuropsychological Tests and Test Batteries for Road Test Performance

Test(s)	Sample	Outcome measure	Sensitivity	Specificity	Accuracy (% Correctly Classified)
Computerized mazes ⁸³	Normal + AD (CDR .5-1)	Road test	NA	NA	68.6
Computerized mazes+ Hopkins Verbal Learning+Age ⁸³	Normal + AD (CDR .5-1)	Road test	NA	NA	81.0
Maze Navigation ³⁵	Normal + AD (CDR .5)	Road test	NA	NA	80.0
Maze Task ⁸⁴	MCI + mild AD	Road test	77.8	82.4	77.4
Driving Scenes of Neuropsychological Assessment Battery ⁸⁵	Normal + AD (CDR .5)	Road test	NA	NA	66.0
Eight test battery ⁸⁶	Mixed dementia	Road test	80.0	61.5	76.2

NA: Not Available