

The Older Adult Driver With Cognitive Impairment "It's a Very Frustrating Life"

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The Patient's Story

Mr W is a 92-year-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 that Mr W drive. Mr W has obstructive sleep apnea, hypertension treated with lifestyle modification, treated vitamin B₁₂ deficiency, mild chronic anemia, restless legs 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 driving practices. He could independently perform all basic activities of daily living (ADL) and instrumental ADL, and he could walk a quarter mile without difficulty. His MMSE score 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 and recommended assessment at a driving evaluation clinic.

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

PERSPECTIVES

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 require effort. It's a very*

Although automobiles remain the transportation of choice for many older adults, late-life cognitive impairment and dementia often impair the ability to drive safely. However, there is no commonly used 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 on by patients, their families, other health professionals, and often their state's Department of Motor Vehicles to assess their patients' fitness to drive and to make recommendations about driving privileges. This article describes the challenges of driving with cognitive impairment for both the patient and caregiver, summarizes the literature on dementia and driving, discusses evidence-based assessment of fitness to drive, and addresses important ethical and legal issues. It also describes the role of physician assessment, referral for neuropsychological testing, screening for functional ability, tools to assess dementia severity, driving evaluation clinics, and Department of Motor Vehicles referrals that may assist with evaluation. Lastly, it discusses mobility counseling (eg, exploration of transportation alternatives), because 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 patients' social connectedness and quality of life while meeting their psychological and medical needs and maintaining personal and public safety.

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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.*

METHODS

We searched MEDLINE for cognitive domains, specific psychometric tests, and driving outcomes with limits of human and English language, including studies in peer-reviewed journals between 1994 and September 10, 2009, that included search terms for driving outcomes (eg, *automobile driving, computer simulation, road tests* (text word), *automobile driver examination*, and *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 outpatients with dementia. Studies were not limited by country, but information presented herein regarding legal requirements and resources is specific to the United States.

Epidemiology

Mild cognitive impairment is a syndrome defined by abnormal function in a specific cognitive domain (eg, memory, language) as found in psychometric testing, without impairment in daily activities.² Preliminary studies indicate there may be impairment in driving skills in MCI,^{3,4} but more evidence is needed to inform driving recommendations. In contrast, dementia includes impairment in memory plus at least 1 additional cognitive domain sufficient to cause significant impairment in social functioning, occupational functioning, or both. Approximately 4% of current drivers older than 75 years have a dementia,⁵ and many of these continue to drive well into the disease process.⁶ In a study in which older adults were administered a well-validated brief cognitive screen to detect dementia, nearly 20% of those older than 80 years failed the screen.⁷

Dementia and Driving Outcomes

Evidence from motor vehicle crash studies suggests that drivers with a dementia have at least a 2-fold greater risk of crashes compared with cognitively intact older adults, but this increased risk is not found in all studies (TABLE 1). Variability is related to definitions of crashes (self-reported vs state-recorded), settings (tertiary referral centers vs license renewal settings), and referral bias. Overall, the risk of a crash for the driver with Alzheimer disease appears to increase with the duration of driving after disease onset.

In driving simulation studies, drivers with Alzheimer disease consistently perform more poorly than do drivers without dementia¹⁷ and 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.¹⁸ In analyses of vehicle maneuvers related to simulated crashes, inattention and either slow or inappropriate responses were

major factors leading to crashes.¹⁹ Simulators are a research tool, and the relation of performance in simulation studies to driving fitness and accident risk has not been rigorously studied.

Performance-based road tests are another measure of driving competency. Whereas most studies report pass/fail rates, some studies have reported that drivers with dementia have particular difficulties with lane checking and changing,²⁰ merging, turning left, signaling to park,¹⁶ and following a route.²¹ Pooled data from 2 longitudinal studies involving 134 drivers with dementia^{16,22} show that 88% of drivers with very mild dementia (Clinical Dementia Rating [CDR]=0.5; see the eTable available at <http://www.jama.com> for scoring) and 69% of drivers with mild dementia (CDR=1.0) were 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.

Dementias other than Alzheimer disease may negatively affect driving fitness. In a prospective road test study of controls and patients with Alzheimer disease, vascular dementia, and diabetes, driving performance errors were comparable between those with Alzheimer disease vs vascular dementia.¹¹ This suggests that degree of cognitive impairment rather than type of dementia is the more important determinant of risk. Disinhibited and agitated behaviors in patients with frontotemporal dementia have been shown to cause hazardous driving,²³ perhaps to an even greater extent than behaviors typically exhibited by drivers with Alzheimer disease. 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 [Department of Motor Vehicles] 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 visuospatial 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.*

Our approach to evaluating older adults with cognitive impairment or dementia, based on available evidence presented subsequently, is described in the FIGURE. The initial efforts focus on confirming a diagnosis, evaluating the

individual for reversible causes of cognitive decline, rating dementia severity, determining if the patient is still driving, and identifying comorbid conditions. Next steps in the evaluation process include querying about impairments in traffic skills that could be attributed to dementia (BOX 1), assessing functional status, and evaluating specific cognitive domains (eg, visuospatial skills, executive function) by psychometric testing. Lastly, consultation with other health professionals is considered to obtain further opinions on fitness to drive and to provide counseling for transportation alternatives.

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 degen-

erative dementia—eg, even the initial stages of Alzheimer disease—the physician should begin the conversation about the inevitability of eventual driving cessation. This conversation, including planning for transportation alternatives (discussed below), should occur early in the disease process. In our practice, we have found that repeating the message to the patient and caregiver may reduce the possibility of resistance or noncompliance with future directives.

PHYSICIAN EVALUATION, FUNCTIONAL ASSESSMENT, AND RATING 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*

Table 1. Published Motor Vehicle Crash Rates in Samples of Older Drivers With and Without Cognitive Impairment

Source	Location	Dementia		Ascertainment Method	Mean (SD)		MVCs/Driver, Mean (SD)	
		Severity ^a	No.		MMSE Score	Age	Per Year	Per 1000 Miles
Friedland et al, ⁸ 1988	Bethesda, MD	No dementia	20	Questionnaire	NA	NA	0.02	NA
		Mild	30	Questionnaire	19.9 (6.3)	67.8 (11.0)	0.09 ^b	NA
Dubinsky et al, ⁹ 1992	Kansas City, KS	No dementia	98	Questionnaire	29.4 (0.8)	64.6 (9.4)	0.06 (0.24)	0.014 (0.044)
		Moderate	19	Questionnaire	17.3 (7.1)	71.3 (8.3)	0.11 (0.35)	0.263 (0.741) ^b
Drachman and Swearer ¹⁰ 1993	United States (7 national regions)	No dementia	83	Questionnaire	NA	72.1 (8.0)	0.04	NA
		Mild to severe	83	Questionnaire	NA	70.1 (8.5)	0.09 ^b	NA
Fitten et al, ¹¹ 1995	Los Angeles, CA	No dementia	24	Interview + state records	29.2 (0.5)	71.8 (6.8)	NA	0.028
		Mild	13	Interview + state records	23.2 (2.6)	70.7 (7.4)	NA	0.214 ^c
Tuokko et al, ¹² 1995	Vancouver, BC, Canada	No dementia	249	State records/ insurance claims	NA	62-69	0.06	NA
		Cognitively impaired no dementia	84	State records/ insurance claims	NA	62.5 (10.5)	0.14	NA
		Mild	165	State records/ insurance claims	NA	69.2 (7.3)	0.15 ^b	NA
Trope et al, ¹³ 1996	Ann Arbor, MI	No dementia	715	State records	NA	70.8 (7.8)	0.08	NA
		Mild to moderate	143	State records	14.8 (6.4)	70.9 (7.7)	0.08	NA
Carr et al, ¹⁴ 2000	St Louis, MO	No dementia	58	State records	NA	77.0 (8.6)	0.07	0.091
		Very mild	34	State records	NA	73.7 (7.0)	0.06	0.097
		Mild	29	State records	NA	74.2 (7.8)	0.04	0.110
Zuin et al, ¹⁵ 2002	Mendoza, Argentina	No dementia	31	Questionnaire	28.5 (1.6)	60.8 (10.3)	0.02	NA
		Dementia	56	Questionnaire	18.5 (6.0)	71.8 (8.1)	NA	NA
Grace et al, ¹⁶ 2005	Pawtucket, RI	No dementia	44	Questionnaire + state records	29.1 (1.1)	73.5 (9.1)	0.04	0.005
		Very mild to mild	84	Questionnaire + state records	24.1 (3.6)	75.7 (7.0)	0.06	0.017 ^b

Abbreviation: MMSE, Mini-Mental State Examination; MVC, motor vehicle crash; NA, not available.

^a See eTable for definition of dementia severity (Clinical Dementia Rating scores).

^b $P < .05$, comparing patients with dementia with control patients without dementia.

^c Motor vehicle crash plus moving violations; significance not assessed.

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 patients with dementia report wanting physicians to assist and provide guidance in this area.²⁵

Physicians' ability to predict driving ability was assessed in 6 clinicians with varying levels of experience and expertise in dementia care; these clinicians were asked to predict road test performance in 50 drivers with dementia based on examination of driving behaviors and clinical records (demographics; driving exposure and experience; history of accidents and violations; physical, eye, and neurologic examinations; neuropsychological tests). Interrater reliability and accuracy were modest, with accuracy ranging from 62% to 78%. The most accurate were clinicians specially trained in dementia assessment, not necessarily those with the most years of clinical experience.²⁶ The CDR has been recommended for clinical use to determine fitness to drive.²⁴ Instrumental ADL may serve as a proxy for driving ability. In 1 study, among drivers with reduction of at least 30% in their total instrumental ADL score, 75% were regarded by their caregivers as unable to drive safely.²⁷

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 2), as confirmed by studies of road testing at varying levels of dementia severity.³⁸ However, experts debate whether drivers with mild dementia should be allowed to drive and under what circumstances or restrictions.

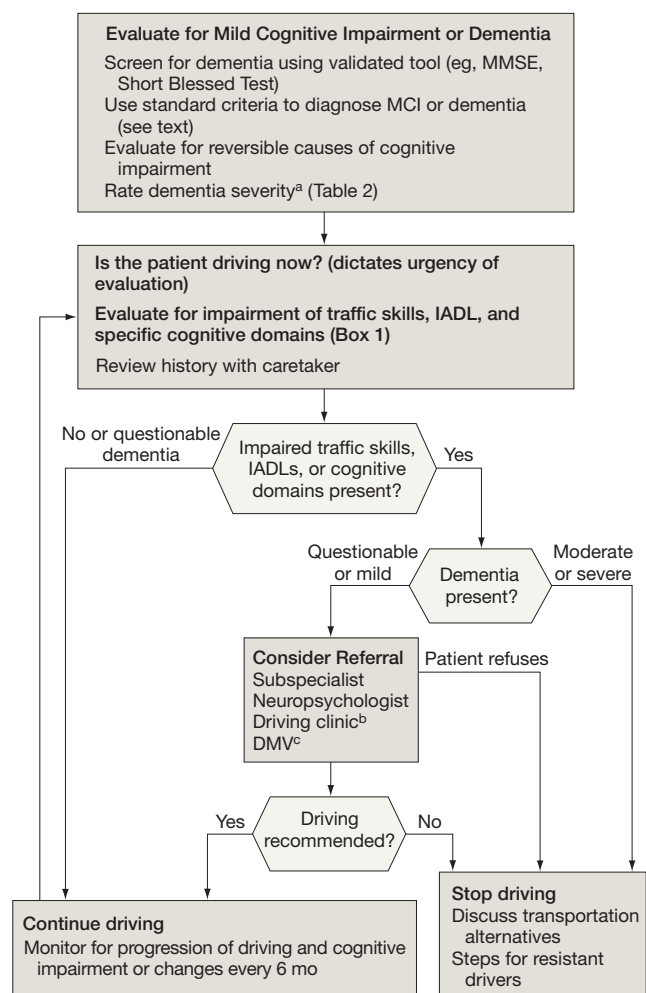
Comorbid Conditions and Medications

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.*

The influence of multiple medical illnesses or comorbid conditions on further impairment of driving ability in patients with dementia has not been well studied but should be considered when evaluating driving competency.^{33,35,39} 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, chronic obstructive pulmonary disease), neurologic diseases (eg, MCI, dementia, Parkinson disease), psy-

chiatric diseases (eg, depression, psychosis), metabolic diseases (eg, hypoglycemia), and musculoskeletal diseases (eg, cervical spine arthritis). Adverse effects of various medications⁴⁰ including sedating agents in the drug classes anti-convulsants, antihistamines, antipsychotics, tricyclic antidepressants, bowel/bladder antispasmodics, benzodiazepines, muscle relaxants, and barbiturates have been associated with impaired driving, and these should be avoided or minimized when operating a motor vehicle.⁴¹ Surgical correction of cataracts, treating obstructive sleep apnea, and removing sedating medications are examples of interventions that evidence potential to improve driving safety with older adults in our practices.

Figure. Approach to Evaluating Older Adults With Cognitive Impairment or Dementia



DMV indicates Department of Motor Vehicles; IADL, instrumental activities of daily living; MCI, mild cognitive impairment; MMSE, Mini-Mental State Examination.

^a Dementia severity rating. See Table 2. For more information, see Dubinsky et al.²⁴

^b Performance-based driving evaluation recommended, if available.

^c Department of Motor Vehicles referral for refractory or high-risk situations.

Box 1. Assessing Patients for Driving Safety**History: Questions for Caregivers**

Has the patient had any motor vehicle crashes?
 Has the patient had any "near misses"?
 Has the patient had any tickets?
 Has the patient been pulled over by police?
 Have you noticed a change in the patient's driving behaviors from baseline? Since the last examination?
 Has the patient had difficulty staying in a lane?
 Does the patient have difficulty following the rules of the road?
 Do other drivers honk at the patient?
 Are there scratches on the vehicle?
 Has the patient gotten lost in familiar areas?
 Is the patient vigilant in scanning for vehicles/pedestrians?

Physical Examination: Assessment for Comorbid 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

Driving Habits/Traffic Skills

Mr W and his wife are confident of his driving ability, but many patients with cognitive impairment do not have insight into their driving abilities, and many caregivers express concerns about the driver with cognitive impairment. Studies of the validity and accuracy of informant reports show mixed results.⁴² With specific questioning, family members may be a good source of information about abnormal driving behaviors.³⁵ Box 1 summarizes questions about traffic skills and important aspects of the 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 the MMSE for estimating driving impairment have been mixed.⁴³ 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.⁴⁴

A 2004 meta-analysis of neuropsychological tests and driving performance concluded that tests of visuospatial skills are the most relevant predictors of driving impairment.⁴⁵ More recently, decreased performance on visuo-motor and executive function tests such as trailmaking and maze completion^{46,47} has been associated with driving impairment in older adults with dementia. The Assessment of Driving-Related Skills battery to risk-stratify older adults³⁵ includes testing visual fields by confrontation and visual acuity using the Snellen eye chart, as well as adapting 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 Assessment of Driving-Related Skills battery have been studied in older adults,⁴⁸ and the Trails B test and the Rapid Pace Walk have been associated with a prospective increased risk of an at-fault crash,⁴⁹ but 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 drivers with dementia. A dementia education program suggested that some physicians may be willing to adopt such driving tests.⁵⁰ Encouraging studies have been published on the association of other cognitive tests (eg, Useful Field of View and selected and/or divided attention and visual closure tasks) with prospective at-fault crash rates in community samples,⁵¹ which presumably also include older adults with dementia or MCI.

TABLE 3 summarizes published predictive values of some psychometric tests in determining the ability to pass a road test in older adults with dementia. However, detailed information on the sensitivity, specificity, and classification accuracy of psychometric tests are lacking in most studies.⁵⁵ 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.⁴⁸

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 effect 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.⁵⁶ 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 avoid multitasking (eg, using cell phones) while driving. From an ethical, policy, and legal standpoint, physicians should remind the patient and their caregiver that they may have a responsibility to notify the DMV, their insurers, or both

as to the presence of a dementia and its potential to affect 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” 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 assess your dementia 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

Table 2. Expert Recommendations of Professional Societies and Consensus Meetings

Expert Group	Driving Cessation Recommended	Specialized or Detailed Assessment Recommended	Other Recommendations
International Consensus Conference, ²⁸ 1994	Moderate to severe dementia	Mild dementia: consider specialized assessment of driving competence	
American Psychiatric Association: practice guideline, ²⁹ 1997	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 Association, American Geriatric Society, ³⁰ 1997	Advanced dementia	Patients with a history of traffic mishaps or more significant spatial and executive dysfunction	
Canadian Consensus Conference on Dementia, ³¹ 1999			Patients with Alzheimer disease should plan early for eventual cessation of driving Physicians should advocate for the establishment of and access to affordable, validated performance-based driving assessments
American Association of Automotive Medicine/ National Highway Transportation Safety Association Consensus meeting: Guidelines for Physicians, ³² 2000		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 of and access to affordable, validated, and performance-based driving assessments
American Academy of Neurology: practice parameter, ³³ 2000 (currently under revision)	Mild dementia (CDR ≥ 1) (standard)	Questionable or very mild dementia (CDR = 0.5): referral for a driving performance evaluation by a qualified examiner (guideline)	Reassess every 6 mo (standard)
Alzheimer Association: position statement, ³⁴ 2001	When the individual poses a serious risk to self or others	If there is concern that an individual with Alzheimer disease has impaired driving ability and the person would like to continue driving: perform a formal assessment of driving	A diagnosis of Alzheimer disease 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, ³⁵ 2009		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 “nondriving” status; copilots should never be recommended to unsafe drivers as a means to continue driving
American Association of Geriatric Psychiatry: position statement, ³⁶ 2006	Strongly consider for all patients with Alzheimer disease, 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 6 mo
Canadian Medical Association: CMA Driver’s Guide, ³⁷ 2006	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 reevaluated and possibly retested every 6-12 mo

Abbreviation: CDR, Clinical Dementia Rating.

Table 3. Ability of Neuropsychological Tests and Test Batteries to Predict Performance on Road Tests^a

Test(s)	Sample ^b	Sensitivity	Specificity	Accuracy, % Correctly Classified
Computerized mazes ⁴⁷	Normal + Alzheimer disease (CDR = 0.5-1)	NA	NA	68.6
Computerized mazes + Hopkins Verbal Learning + age ⁸¹	Normal + Alzheimer disease (CDR = 0.5-1)	NA	NA	81.0
Maze navigation ⁵⁰	Normal + Alzheimer disease (CDR = 0.5)	NA	NA	80.0
Maze task ⁸²	MCI + mild Alzheimer disease	77.8	82.4	77.4
Driving scenes of Neuropsychological Assessment Battery ⁵³	Normal + Alzheimer disease (CDR = 0.5)	NA	NA	66.0
Eight-test battery ⁵⁴	Mixed dementia	80.0	61.5	76.2

Abbreviations: CDR, Clinical Dementia Rating; MCI, mild cognitive impairment; NA, not available.

^a Outcome measure for all studies was performance on road test.

^b A CDR score of 0.5 indicates questionable or very mild dementia; a CDR score of 1.0 indicates mild dementia. See eTable for definitions.

have been adopted with modest success in our clinical practices.

Family members may try to compensate by having a non-impaired driver serve as a “copilot.” Some evidence suggests that the crash rate for patients with dementia is lower with another person in the car⁵⁷; however, data are insufficient to support this practice as a compensation mechanism for such drivers. In addition, some clinicians may be tempted to recommend limiting trips or driving only under safe conditions, eg, avoiding rush hour; avoiding inclement weather; driving during the day; or limiting trip time, distance, or both. Restricted licenses have been associated with reduced crash risk.⁵⁸ However, many older adults are already restricting or limiting their driving, and it is doubtful that a patient with dementia could retain such instructions.

A wealth of educational curricula is geared to health professionals.⁵⁹ Two 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.^{58,60}

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 [driver 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 [DMV].*

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, neuropsychologists).

A Driver Rehabilitation Specialist evaluates, develops, and implements driving services for individuals with disabilities. These specialists are often occupational therapists with additional training in driver evaluation, vehicle modification, and rehabilitation, but they also may be trained in physical therapy and psychology. Occupational therapy practice guidelines for these evaluations have been published.⁶¹ However, a 2006 review of practices across the United States and Canada indicates that although the same domains are generally assessed, specific assessments vary significantly across programs, and few have adopted standardized tools.⁶²

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 to \$500 and is generally not covered by insurance. Clinicians interested in this service can contact the occupational therapy departments in local hospitals or rehabilitation centers or the Association for Driver Rehabilitation Specialists directory (Resources, available at <http://www.jama.com>).

We recommend a performance-based road test for drivers with dementia and with (1) caregiver observation of new impairments in traffic skills, (2) prominent impairments in key cognitive domains (eg, attention, executive function, visuospatial skills), or (3) mild dementia (CDR=1). Private or university-based driving clinics are not available to everyone across the country, but every state DMV conducts performance-based road tests.

Some clinicians may be reluctant to refer their patients for road testing, because these procedures are 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 and the de facto method adopted by all 50 states to evaluate novice and medically impaired patients.

Development of uniform standards for road testing and simulators may improve outcomes.⁶³ A 2009 Cochrane re-

view concluded there was no evidence to demonstrate the benefit of driving evaluations with respect to the preservation of mobility or a reduction in crashes.⁶⁴ However, some relatively 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 these drivers were evaluated with road tests every 6 months.¹⁶ The costs of detailed surveillance such 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 were 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 decreased social integration,⁶⁵ decreased out-of-home activities,^{66,67} increased depressive symptoms in elderly individuals,⁶⁸ anxiety symptoms,³⁵ and increased risk of nursing home placement.⁶⁹ Planning for driving retirement should occur for all older adults before their mobility situation becomes urgent.⁷⁰ A social worker may assist with identifying community transportation needs. Many organizations are available to assist clinicians, patients, and families with these issues (Resources).

THE PHYSICIAN'S LEGAL AND ETHICAL OBLIGATIONS

Many physicians are uncertain of their legal responsibility to report unsafe drivers to the state.⁷¹ Web resources for state requirements include the American Medical Association Guide and the Insurance Institute of Highway Safety (Resources). 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, and referral of patients for road test evaluation is an option that should be considered in some situations. State Departments of Motor Vehicles or Departments of Revenue often use the road test as the final or major arbiter to determine licensing. Many authorities recognize the performance-based road test as the de facto standard. 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.⁷² Thus, referrals in some states may reflect more of a delicensing process.

Box 2. Steps Family Members Can Take to Ensure That a Resistant Patient With Dementia 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" in 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 vehicle for "repairs" but arrange for its removal.

Remove the vehicle by loaning, selling to third party, or donating to charity.

Disable the vehicle.

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.

The American Medical Association's Code of Medical Ethics on impaired drivers and their physicians 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 [DMV]."⁷³ Obviously, it is preferred that referrals to the DMV be made 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 online or at DMV examiner offices. Development of specific policies regarding reporting should be vetted by legal counsel. Policies and laws can vary by state or province.⁷⁴ In states with voluntary reporting laws, we recommend formal referral to the DMV for patients who refuse to stop driving or for those patients deemed at very high risk for a crash, injury, or both.

Studies are needed to compare the benefits and costs of mandatory reporting vs 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.⁷⁵ Decision analysis studies have not consistently shown benefits of systematically screening and evaluating drivers with dement-

tia.⁷⁶ Clearly, more studies are needed of the benefits and risks of screening for cognitively impaired older adults.

Future research on assistive technologies such as user-friendly global positioning system devices may assist with geographic orientation. Crash warning systems need to be developed to maximize independent living for individuals with MCI. Preliminary data support the beneficial effects of cholinesterase inhibitors on driving simulation tasks in individuals with dementia⁷⁷ as well as of cognitive stimulation⁷⁸ and exercise interventions directed at driving-related cognitive abilities in older adults.⁷⁹ Additional studies are needed on these types of interventions, their potential effects 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 older and cognitively impaired drivers.

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Web Resources on Dementia and Driving

CAREGIVER AND PATIENT RESOURCES

Association for Driver Rehabilitation Specialists (ADED)

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

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

American Occupational Therapy Association (AOTA)

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

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

Alzheimer's Association

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

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

Family Caregiver Alliance

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

Fact Sheet: Dementia and Driving.

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

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

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

A discussion of driving and dementia and the California state law.

Lennox and Addington Dementia Network

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

Driving and Dementia: A Guide for Patients and Families.

MayoClinic.com

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

A caregiver site on when patients should stop driving.

National Association of Social Workers

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

Locate a social worker near you.

The Caregiver Project

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

Alzheimer's Disease, Dementia, and Driving. This site catalogs and provides links to other topical Web sites.

The Hartford Financial Services Group

<http://www.thehartford.com/alzheimers/FamilyConversationsAboutAlzheimer'sDisease,DementiaandDriving>

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

We Need to Talk.

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

At the Crossroads.

WebMD

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

Dementia and driving video for caregivers.

PHYSICIAN RESOURCES

Candrive Alzheimer Knowledge Exchange Web Site

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

Selected links on dementia and driving.

<http://www.candrive.ca/en/resources/physician-resources/19-driving-toolkit.html>

Driving and Dementia Toolkit.

American Family Physician

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

Dementia and driving handout for the physician's office.

American Medical Association (AMA)

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

Physician's Guide to Assessing and Counseling Older Drivers (Dementia and Driving, p 47).

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

State Licensing Requirements and Reporting Laws (last updated 2004).

California Department of Motor Vehicles

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

Discussion of the California law and dementia severity.

Insurance Institute for Highway Safety (IIHS)

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

A Web site on older driver laws, by state, for driver licensing; updated every 6 months.

Neurology

<http://www.neurology.org/cgi/reprint/70/14/e45>

When Should Patients With Alzheimer Disease Stop Driving? (Erten-Lyons D. 2008;70[14]:e45).

Neuropsychiatry Reviews

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

Driving with Dementia—What Is the Physician's Role? (discussion of the physician's role in this process).

Psychiatry Weekly

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

Psychogeriatrics: Advanced Age, Dementia, and Driving (discussion of the physician's role, ethics, and communication issues).

SGIM Annual Meeting 2009

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

A discussion and review of tools that

may assist in assessing older drivers (see Driving Risk Assessment, pp 17-19).

VA Government Pamphlet

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

Handout: Driving & Dementia

TRANSPORTATION ALTERNATIVES

National Association of Area Agencies on Aging

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

Assists in finding local resources for aging in your community.

American Public Transportation Association (APTA)

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

Helps locate a local transportation provider in your community.

American Administration on Aging (AOA)

<http://www.eldercare.gov>

Eldercare Locator: Assists in finding older adult resources in your community.

Community Transportation Association (CTAA)

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

Information on transportation in the United States.

ITNAmerica

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

Novel older adult transportation system that provides rides to seniors 24 hours a day, 7 days a week.

National Center on Senior Transportation

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

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

Seniors on the Move Inc

<http://www.seniorsonthemoveinc.com>

Assists older adults with relocation to another community.