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Driving and Dementia: A Review of the Literature

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Abstract

The purpose of this article is to review the literature on the ability of individuals with dementia to drive an automobile. Based on a review of the literature, several factors were identified that may be useful in differentiating between people with dementia who presently remain safe drivers from those who have progressed to impaired driving. These factors include disease duration and severity, sex, patient self-assessment, family assessment, neuropsychological measures, findings on road evaluations, and driving simulator testing. The approach of the physician to driving and dementia is addressed, including in-office screening, referral for on-road driving assessments, and the potential for physician reporting to state agencies.

Keywords

dementia; driving; competence; impairment

With the increasing age of the American population, the proportion of older drivers on the road is also rising.¹ Given that age is the most significant risk factor for developing dementia, it is apparent that large numbers of licensed drivers in North America are demented or are likely to become demented. Studies have shown that the driver with dementia is at increased risk to cause traffic accidents.^{2–5} Friedland and coworkers found a 47% prevalence rate of crashes among 30 persons with Alzheimer's disease (AD) compared to 10% of 20 age-matched controls in a retrospective survey over 5 years.⁶ Overall, there is probably a 2- to 8-fold greater risk of crashes for elderly drivers with mild to moderate dementia compared to those not demented.⁷ A recent longitudinal study of drivers with dementia confirmed the decline of on-road driving abilities, particularly on aspects of the driving exam requiring more complex abilities such as awareness of driving environment and decision making.⁸

Thus, among those who continue to drive, dementia is a well-recognized, age-related risk factor for hazardous driving. A number of editorials and review articles have addressed the issue of driving and dementia.^{9–27} There is evidence to suggest, however, that not all persons with dementia are incompetent drivers, particularly in the very early stages.^{28–32} Given this evidence, it is particularly important to determine the most important cognitive or functional factors that contribute to driving impairment among those with dementia.

The purpose of this review is to update previous findings, focusing specifically on identifying the known factors that may differentiate hazardous from nonhazardous drivers with dementia. Separating those people with dementia who are currently at risk for impaired driving from those who are not yet at risk is crucial to maintain personal autonomy of the individual with dementia while also maintaining public safety. We will review multiple potential discriminators for driving impairment in dementia, including disease duration and severity, sex, patient self-assessment, family assessment, neuropsychological measures, findings on road evaluations, and driving simulator testing. Finally, within the context of these findings, the approach of the physician will be addressed as well as future directions for research.

METHOD

To identify relevant articles, the authors completed a search of MEDLINE using keywords such as *driving, dementia, Alzheimer's disease, competence, physician, neuropsychology, and cognitive*. Further relevant articles were identified by locating previously unidentified references mentioned in some of the articles that were found based on the MEDLINE search. A systematic review was written covering all articles that had direct relevance to drivers with dementia or cognitive impairment.

HOW CAN WE IDENTIFY THOSE WITH DEMENTIA AT GREATEST RISK?

Disease Duration and Severity

Characteristics of an individual's dementia, such as disease duration and severity, have been associated with driving impairment. For example, in a very thorough examination of this issue, Drachman and collaborators³³ questioned 130 Alzheimer's disease (AD) patient caregivers and 112 age-matched controls. The patients had an overall mean annual crash rate of 0.091, compared with 0.040 for controls. In particular, the risk was found to rise above acceptable control rates beyond the third year of the disease. The maximum crash rate was comparable to the rate seen in 16- to 24-year-old nondemented males. However, crashes per mile were not recorded. Therefore, these figures may overestimate driving competence among demented drivers since 65% had curtailed the number of miles they drove after the onset of illness. Of note, however, in this study, 50% of drivers stopped driving completely by 3 years after disease onset, similar to the 34-month median figure reported previously by Gilley et al.³⁴ Drachman et al suggested that a 3-year guideline may be helpful in defining when to be vigilant for driving incompetence among those elders with early cognitive decline.³³

Similarly, the report by Friedland et al⁶ also found a rise in crashes after 3 years of progressive dementia. Alzheimer's disease patients who had crashes were more likely to be male but were not more cognitively impaired on the Mini-Mental State Examination (MMSE).³⁵ It was recommended by this study group that all persons with AD be restricted from driving regardless of their dementia severity. In a dementia clinic sample from the United Kingdom, 22% of patients with dementia continued to drive 3 years after onset of illness, and two thirds of these people were judged to be impaired drivers by physician assessment.³⁶

The rate of progression of a dementia such as Alzheimer's disease is not uniform across all individuals. Thus, instead of examining disease duration, more specific measures of disease severity have been examined as predictors of impaired driving among dementia patients. In particular, higher Clinical Dementia Rating (CDR)³⁷ has been associated with poorer driving in multiple studies. Dubinsky et al⁹ conducted a review of the driving and AD literature with regard to CDR status. Using a conversion paradigm to stratify prior studies

into CDR categories, they found an increased crash risk for patients with AD relative to age-matched controls and concluded that this crash risk was greater for those with CDR 1 dementia status than for those with CDR 0.5 ratings. Thus, as would be expected, increasing dementia severity was associated with poorer driving abilities.

Sex

Patient sex has been associated with driving impairment in dementia. Specifically, in one study from a dementia clinic sample, male sex and associated arthritis were found as risk factors for driving accidents or violations.³⁸ The sex association in this study, as well as in a study by Carr et al,³⁹ is not clearly understood; possible explanations include sex differences in risk taking or driving competency, although gender roles regarding driving may also account for the findings. In particular, previous studies have shown that older women are more likely than men to stop driving, resulting in greater driving time exposure by men.^{40–42} Thus, the association between sex and driving accidents in dementia may be mediated by patient behavior (ie, time on the road).

Patient or Family Report

A common approach to assessing capacity to drive is to ask patients and their family members about the patient's abilities to operate a car. However, patients with dementia are not good predictors of their own driving impairment. Patients with dementia often have little insight regarding their driving skills^{28,43–45} or about their need to give up driving for safety reasons.⁴⁶ Some studies have found, however, the family members' ratings of the patient's driving abilities are related to motor vehicle accidents.³⁴ On the other hand, other studies have found that family members are not necessarily good judges of the patient's driving skills. Specifically, in one study, family assessments were equivocal in predicting performance on a road test.²⁸ Another study showed that a family member's report of whether the patient was a "safe" or "unsafe" driver was not a significant predictor of actual crashes.⁴⁷ A recent study examined the relationship between on-road driving score and ratings of driving ability made by a dementia patient, an informant/caregiver, and an experienced neurologist. Findings indicated that only the neurologist's ratings were significantly related to on-road driving score, although the informant's ratings were more valid than those of the dementia patient.⁴⁸

It is possible that more detailed questioning of the family member is necessary to obtain a more valid estimate. To this end, Brashear and colleagues⁴⁹ (A. Brashear, personal communication, February 6, 2003) developed a series of 12 questions posed to dementia caregivers regarding driving impairment in the patient. These questions covered the patient's driving habits, whether the caregiver thought the patient was a safe driver, and attentiveness on the road. Specifically, the questions addressed becoming lost, running red lights, obeying stop signs, staying in lane, finding vehicle controls, confusion on 1-way streets, turning the wrong way onto an interstate, driving too slowly or speeding on the road or interstate, and almost hitting another vehicle, object, or person. All participants then took an on-road driving evaluation. The total score on the 12 driving questions as well as on the attentiveness subscale predicted passing versus failing the road test. In particular, the total score on the driving questions was able to correctly identify 83.3% of the patients who went on to fail the road test. This suggests that, with more thorough questioning, family members can be a good source for a clinician regarding recommendations for the patient to have a driving evaluation or to stop driving altogether.

COGNITIVE/NEUROPSYCHOLOGICAL MEASURES

Are there any neuropsychological tests that a clinician can use in the office to accurately determine driving competence of the demented patient? One of the most frequently administered cognitive screening tools is the MMSE. Multiple studies have examined scores on the MMSE in relation to driving abilities among individuals with dementia. The results regarding MMSE and driving impairment have been mixed. For example, Logsdon and coworkers⁴¹ reported that general screening tests such as the MMSE were significantly different between demented active and inactive drivers. Other studies have shown a significant relationship between MMSE scores and poorer driving test results.^{50,51} In particular, the MMSE may correlate with driving scores at the middle range of the scale but perhaps less so in the higher range of the MMSE (27/30 and higher).⁵⁰ In 2 prospective studies, however, the MMSE was not found to predict future crashes or violations among older individuals.^{52,53} Taken together, although the MMSE may correlate with degree of driving impairment, it does not appear to predict future involvement in crashes. This is likely because the MMSE is a very brief general cognitive measure weighted toward orientation, memory, and language. As such, it was not designed to assess driving capacity.

In contrast, some neuropsychological measures targeted at specific abilities thought to be important in driving are related to driving impairment in dementia. There is limited evidence that performance on some tests of executive functioning is moderately related to real-world driving abilities, including performance on Porteus mazes,⁵⁴ Clock Drawing Test,⁵⁵ and the Trail Making Test.^{56,57} There is also convincing evidence that measures of visual attention and visuoception are related to driving abilities in both individuals with dementia and healthy older controls. The importance of visual attention for driving abilities in healthy older adults has been demonstrated in a series of articles by Ball and colleagues. They developed a measure, “useful field of view” (UFOV), that captures both speed of visual attention and ability to focus visual attention despite distractions. In 2 prospective studies, UFOV was found to predict crashes over a 3-year time period.^{58,59} However, these studies were not done with patients with dementia. Using a dementia sample, Duchek and colleagues⁶⁰ examined the relationship between computerized, experimental visual attention measures and driving performance during an on-road test. They found that 19% of the variance in driving performance was explained by a measure of visual selective attention on an off-road visual attention test. In fact, visual search abilities were predictive of driving abilities above and beyond dementia severity. Other cognitive measures, including memory scores, did not further predict driving performance.

Based on the findings from these computerized visual attention tasks, the Driving Scenes test of the Neuropsychological Assessment Battery⁶¹ was developed as an office-based tool for assessing the visuospatial attention skills known to be important in driving. Indeed, performance on the Driving Scenes test was correlated with performance on an on-road driving test among healthy older adults and patients with very mild dementia.⁶² Furthermore, a meta-analysis of the literature regarding neuropsychological testing and driving abilities provided support for the particular importance of visuospatial skills for driving abilities in dementia.⁶³ As compared to performance in multiple specific cognitive domains (eg, attention, language, memory), only performance on neuropsychological tests of visuospatial skills was related to on-road tests of driving abilities, particularly when studies using a control group were excluded. Although it is difficult to suggest any particular test based on these findings, the multiple studies included in the meta-analysis used visuospatial measures such as the Wechsler Adult Intelligence Scale, third edition; Block Design and Picture Completion⁶⁴; Judgment of Line Orientation⁶⁵; and the Hooper Visual Organization Test.⁶⁶ Results of other types of neuropsychological tests such as memory

tasks, however, typically do not correlate well with driving impairment in demented individuals.^{51,52,67}

Taken together, the neuropsychological literature suggests that performance on tests of visuospatial abilities, and perhaps executive functioning, may be important factors to consider regarding fitness to drive in dementia. These findings appear to make sense intuitively: although driving obviously requires many complex abilities, it makes sense that the abilities to judge visual information and to organize and juggle several things at once are among the critical components. Given only moderate correlations and individual variability on neuropsychological testing, however, use of neuropsychological tests as the sole indicator to recommend driving cessation does not appear warranted. Nevertheless, neuropsychological tests may be used in combination with other findings to recommend a more thorough and directly relevant assessment of driving abilities, such as administering actual or simulated road tests.

On-Road Testing

To obtain information about a patient's actual driving behavior, on-road testing protocols have been developed. In particular, Odenheimer and coworkers⁵⁶ have shown that road testing of elderly and demented subjects is safe, reliable, and valid. Using a 45-minute road test with both closed course and in-traffic components, 30 elderly licensed drivers with a range of cognitive abilities were examined. Performance in traffic was correlated with cognitive test scores on the MMSE, visual memory, and traffic sign recognition tests. No significant correlation was found with simple reaction time. Although a correlation was found with the MMSE, there was no apparent cutoff score that would discriminate those who failed from those who passed.

In a report by Hunt and coworkers,²⁸ 25 subjects with questionable to mildly severe AD were compared to 13 age-matched controls on a 1-hour road test. Forty percent of those rated as mildly demented were rated as incompetent to drive, while all of those rated questionable, very mild, or normal passed the examination. Among those participants with dementia who did not pass, they scored most poorly on several specific items: overall judgment, signaling from curb, attending to task, awareness of how driving is affecting others, and driving at an appropriate speed. As reported above, general cognitive measures such as the CDR were correlated with impaired driving performance, as were more specific tests of memory, language, timed performance, visuoception, and attention. No correlation was found with joint mobility, strength, coordination, or primary visual abilities. In a follow-up study of a larger sample of 58 controls and 67 AD subjects, Hunt and coworkers reported on the reliability of a standardized road test and confirmed their previous observations that more severe dementia (eg, CDR ratings) predicted driving impairment.²⁹ Failure rates on the road test for controls were 3%, for very mild AD 19%, and for mild AD 41%.

A road test study from the University of California, Los Angeles, examined 13 subjects with AD, 12 with vascular dementia, 15 diabetic patients, 24 normal elder subjects, and 16 younger controls. Performance in the 2 groups with dementia was similar and differed significantly for the 3 other control groups. Normal elders performed as well as their younger counterparts did. Cognitive test scores on the MMSE, short-term memory, and visual tracking tasks correlated with driving performance. The number of collisions and moving violations per 1000 miles were also significantly correlated with driving test performance during the 2 years preceding the examination, suggesting that road tests can be used to separate fit from unfit drivers with dementia.⁵⁰ This study adds further to the validity of road testing of subjects with dementia. Prospective information on crashes and traffic violations were not reported, however. The predictive value of on-road testing therefore

remains unclear. Such prospective information, though desirable, may not be obtainable from an ethical perspective, since persons clearly impaired on road tests are unlikely to be permitted to continue driving. It is also unclear to what degree the road tests developed by researchers to evaluate dementia patients parallel the road tests used by actual on-road examiners at community/hospital evaluation centers. Furthermore, testing patients with dementia on the road may be unsafe for the patient, evaluator, and other drivers.¹⁰ As such, a safer alternative for evaluation has been to develop driving simulators.

Driving Simulator Testing

Driving simulators have been developed as a way to assess driving skill while maintaining the safety of the patient, testers, and community. Moreover, driving simulators also provide the opportunity to present challenging/hazardous conditions or events that may not be prudent to present during on-road testing. Once a driving simulator is obtained, it can also be a more cost-effective way to assess driving abilities than an on-road evaluation.

Early studies using driving simulators established that many people with dementia were impaired on driving simulation tasks. One study examined 13 active drivers with dementia on performance in a driving simulation laboratory. Seven subjects performed normally, while 6 were rated as poor. The poor performance group scored lower on the MMSE as well as on cognitive tests of non-verbal and visual perception abilities.⁶⁸ In a study examining predictors of performance on a driving simulation task among 41 subjects with AD, a significant portion of drivers with MMSE scores less than 20 failed the test.⁶⁹ Activities of daily living/instrumental activities of daily living impairment did not correlate with driving performance. Using the Iowa Driving Simulator, Rizzo and colleagues found that crashes in a group with AD were related to visuospatial impairment.⁵⁷ This confirms earlier neuropsychological findings suggesting that impaired visuospatial abilities may lead to unfit driving abilities in those with dementia. The finding that some, but not all, of patients with dementia are impaired on driving simulators has been replicated.³²

Further research with driving simulators has been able to elucidate the specifics of driving impairment among people with dementia. That is, researchers have been working toward understanding the dimensions on which someone with dementia may be prone to have problems with driving. For example, Cox and his colleagues used an interactive driving simulator to evaluate qualitative aspects of driving performance. They found that relative to age-matched controls, patients with AD were more likely to drive off the road, drive slower than the speed limit, apply less break pressure when trying to stop, and take more time while attempting to make left turns.³⁰ Using the Iowa Driving Simulator, researchers have created simulated crashes while testing patients with dementia. Based on the hypothesis that poor visual attention may lead to crashes among people with dementia, each person tested experienced the illegal incursion of another vehicle at an intersection he or she was to reach in 3.6 seconds. Among those who crashed, complex analysis of vehicle maneuvers demonstrated that inattention and either slow or inappropriate responses were key in leading to the accidents.³² This is consistent with earlier neuropsychological findings that visual attention is associated with unfit driving abilities among those with dementia.^{60,62}

Although it has been argued that driving simulators are not valid assessments of true driving abilities, a recent study suggests otherwise. Participants (healthy controls and those with dementia) were tested on both on-road and driving simulator protocols. A strong correlation was found (-0.67) between the 2 types of driving assessment, suggesting that lower driving simulator scores (with fewer errors) are strongly related to better on-road driving abilities. Moreover, committing hazardous or lethal errors on the driving simulator was strongly related to failing the on-road test (during which such errors would be corrected early by the copilot/tester).⁷⁰ These findings suggest that driving simulators may be a valid estimator of

on-road abilities. Moreover, a recent retrospective study suggests that among older adults, performance on a PC-based driving simulator task was associated with self-reported history of accidents⁷¹; it is hoped that these findings will be extended to individuals with dementia in the future. Although the research regarding driving simulators suggests it may be a powerful tool for assessing driving in dementia, at present, driving simulators are not available on a large-scale basis.

The Gold Standard Problem

Taken together, although it appears that there are many factors that suggest driving impairment in individuals with dementia, there currently is no gold standard for assessment of risk. That is, even such naturalistic evaluations as on-road testing or driving simulators may not adequately reflect a person's true capabilities. People may be more anxious or more cautious with a tester present. During on-road evaluations, testers cannot let certain errors occur to maintain their own safety, and therefore it is not known how the examinee might have handled such errors. Older adults also may not be comfortable with an electronic driving simulator, preferring rather their own car. Nevertheless, the physician must make an assessment or refer for an assessment to guide recommendations regarding driving for an individual with dementia. Potential approaches for the physician are discussed below.

PHYSICIAN APPROACHES TO DRIVING AND DEMENTIA

Effects of Stopping Driving

Before outlining the role a physician may take regarding drivers with dementia, it bears noting the effects that prohibiting driving may have on patients with dementia. Driving is a valued privilege among the elderly, as it represents a sense of independence and indeed may be essential to some for maintaining social activities, family and friend contacts, and church and shopping activities. Driving may be the only way for an elder to maintain social contact or provide necessary transportation for self and spouse.^{14,22,72,73} One study in California evaluated the effects of license revocation on patients with dementia. The large majority of patients who lost their license subsequently relied on family and friends for transportation. There was no increase in the use of alternative transportation sources, such as walking or using public transit, taxis, or van services. Many people reported inadequate transportation, especially people who were younger, were healthier, and/or did not live with at least 1 person who was licensed to drive. For their part, caregivers reported significant disruptions to their lives, including missing work or stopping working altogether to aid the person with dementia.⁷⁴ It is not surprising that driving cessation may lead to increased depressive symptoms in the patient⁷⁵ and, we may hypothesize, in the caregiver as well.

Taken together, these studies point out that it is desirable to avoid premature withdrawal of driving privileges if at all possible. Individual dignity and quality of life must be seriously addressed in any public policy or individual decision to revoke driving privileges. The reasons for termination of driving need to be discussed openly with the person, and alternative forms of transportation should be offered or provided.

The Importance of Physician Recommendations and Public Policies

Physician recommendation is often a key factor in a patient's decision to stop driving. Based on an interview study of driving among 56 elders in a retirement community, Persson found that among those who stopped driving, 27% did so as the result of a doctor's advice. The majority felt that this was their personal decision to make based on accumulated evidence from experience with their medical illnesses, as well as the advice of physicians and family.⁷³ Family and physician advice was also reported in 2 additional studies as the primary reasons for driving cessation among persons with dementia.^{54,76}

To some degree, physicians may recognize their key role in advising patients about driving. In one survey of 3450 physicians in Connecticut, 77% responded that they discussed driving with their patients; however, this suggests that approximately 1 out of every 4 do not discuss this issue with patients. Seventy-four percent thought there should be a screening program for elderly drivers, and 59% thought it was their responsibility to report unsafe drivers.⁷⁷ Only a handful of states have statutes with mandatory reporting of medical conditions that impair driving. In several other states, reporting is optional. In some states, physicians who do choose to report are protected from litigation by the reportee, and confidentiality of the report is preserved.⁷⁸ Physicians are encouraged to review the relevant laws in their state or province; these guidelines are noted in the American Medical Association's *Physician's Guide to Assessing and Counseling Older Drivers*.²⁵

Unfortunately, a major crash may be the ultimate factor leading to abstention from driving.⁶ While all investigators in the field agree that there ultimately is a time when all demented drivers become incompetent drivers, guidelines for deciding when to terminate driving privileges are not well defined. There have been multiple attempts to reach consensus regarding practical recommendations for physicians dealing with the problem.

Physician Recommendations

Initial recommendations from researchers suggested that all persons with a diagnosis of dementia such as AD should have their licenses revoked.^{5,6,21,79} In response to this idea, Drachman and others have asserted that the decision whether to renew a license in an elderly driver should be based on competence rather than age per se or medical diagnoses.^{18,23,53,80} That is, impaired competence for driving should be the prerequisite for driving cessation, rather than a diagnosis of dementia. The Alzheimer's Association Board of Directors similarly stated, "The diagnosis of Alzheimer's disease is not, on its own, a sufficient reason to withdraw driving privileges. The determining factor in withdrawing driving privileges should be an individual's driving ability."⁸¹

Several professional organizations and consensus groups have recently published recommendations regarding driving and dementia. These include the American Psychiatric Association,⁸² the American Academy of Neurology,⁹ an International Consensus Conference on Dementia and Driving,⁸³ a Canadian Consensus Conference on Dementia,⁸⁴ and a combined group including the American Association of Geriatric Psychiatry, Alzheimer's Association, and the American Geriatrics Society.⁸⁵ Among those that discuss severity of dementia, all recommend cessation of driving among those with moderate to advanced dementia. This was based on the idea that a diagnosis of moderate to severe dementia indicates sufficient cognitive problems to impair driving.

The consensus is less resounding regarding those with mild dementia. Most of the published guidelines note that driving abilities are unclear in patients with mild dementia and often recommend assessment for driving impairment.⁸²⁻⁸⁴ Moreover, it was recommended those with a history of traffic accidents or spatial or executive/judgment dysfunction be particularly scrutinized.^{82,85} In contrast, the American Academy of Neurology's recent guidelines suggested that those with a CDR of 1, connoting mild dementia, should not be allowed to drive.⁹ This practice parameter was based on a review of the literature in which samples from earlier published studies were converted to CDR severity scores. Unfortunately, the conversion process may have been biased toward rating patients as less severely demented than they actually were. This may have led to the discrepancy between the American Academy of Neurology recommendations and those from other professional organizations.

Clearly, the most challenging assessment and decision for the physician lies in the patient who is questionably or only very mildly demented. As reviewed in detail above, dementia severity, male gender, family report, and performance on certain neuropsychological tests (including visual attention/perception and executive functioning) are factors that, at least in some studies, are related to impaired driving on the road. These dimensions should serve as screening factors during an office visit. Concerns raised by these factors should lead to recommendation for a driving assessment by a professional driving instructor or cessation of driving, consistent with the professional organizations' recommendations detailed above. It has been suggested that multidisciplinary evaluation at a geriatric assessment center is a useful method of addressing the problem.²⁰ Cost-effectiveness of such medical team approaches has recently been challenged, however, and no research has been done to determine the outcome of such evaluations for drivers.

Implementing Physician Recommendations

Once an individual is found to be incompetent, the issue of advising a person with AD to abstain from driving is particularly problematic since many do not recognize their deficits or, if they do, they tend to minimize their significance.^{44,45,86} Recommendations from the Alzheimer's Disease Association for easing the transition from driving to passenger status include the following: (1) acknowledge the loss, (2) arrange for alternative transportation, (3) solicit the support of others (eg, physician, friends, relatives, insurance agent), (4) make the car less accessible, (5) require the patient to take a driving test, and (6) be firm.⁸⁷

Forced restraint from driving may be required for those dementia patients with more advanced disease who do not comply with voluntary restriction.¹⁴ Unfortunately, revocation of a license does not necessarily lead to driving cessation, particularly when the patient lacks insight and judgment. As a last resort, the keys can be taken away or the vehicle disabled by removing the distributor cap or the wire leading to it. The vehicle can be removed to a distant site, for example, for "repairs." If the vehicle is sold, the money earned from the sale as well as that saved from insurance can be used to pay for public transportation.⁸⁸

Compromises such as limited driving parameters or a graduated program of driving reduction can be made, at least in the early stages of disease when some degree of insight is preserved. Low-risk privileges may include short trips, slow roads, daytime driving, and non-rush hour driving.²⁰ The addition of a copilot will help to avoid problems of getting lost, running out of gasoline, or arranging for emergency repairs.⁶⁹

In addition to making efforts to select those who are unfit to drive, the physician should offer suggestions to help enable people with questionable dementia or mild cognitive impairment to continue driving safely.³⁶ To assist older adult drivers in evaluating and improving on their skills, there are several programs including those sponsored by the American Association of Retired Persons, the American Automobile Association, and the National Safety Council.⁷⁷ Among those who are permitted to continue driving, family members should look for warning signs of impaired driving. A newsletter from the Alzheimer's Association has described the following warning signs for unsafe driving that should be watched for by caregivers: (1) person is unable to locate familiar places, (2) does not observe traffic signs or drives at inappropriate speed, (3) makes poor or slow decisions in traffic, and (4) becomes angry, frustrated, or confused while driving.⁸⁷

FUTURE DIRECTIONS

The burden on the physician is to determine medical competence to drive even though there are no clearly defined criteria for such determination. Furthermore, the physician is left in the uncomfortable ethical position of being a patient advocate who maintains confidentiality

in delivery of care but may be called on by society to report patients suspected to be incompetent drivers for the sake of public safety.²⁵ Driving is a state-given privilege that ultimately can be revoked only by the state. Thus, the physician at present may have a moral and, in some states, a legal obligation to report, although it is ultimately the decision of the state to revoke a license.

Development of clearly defined public policies in this area should reduce the physician's dilemma by providing guidelines to be followed. A more widely accessible and affordable system of public transportation as an alternative to driving for mildly demented individuals also needs to be developed. Discussions in public forums as well as among government, health care, insurance, and automobile industries will be needed. Further research needs to be done to define valid and reliable office screening procedures for physicians to use in identifying those most at risk. Increased use of road testing or driving simulators with at-risk drivers whose status is unclear based on office examination is needed. Although road testing may be the best commonly available assessment tool at present, such testing may not clearly predict performance in stress situations and can be both time-consuming and expensive to institute on a large-scale basis. Much of the research on driving and dementia has focused on AD; a more complex understanding of driving abilities is needed in other types of dementia (eg, vascular dementia, diffuse Lewy body disease) or cognitive impairment associated with other neurological diseases (eg, Parkinson's disease, multiple sclerosis).

Finally, the lack of research regarding intervention for driving impairment in dementia is striking. This is particularly so when compared to the amount of research focusing on determining appropriate timing to terminate driving. Studies are needed to address ways to intervene in the deterioration of such a critical functional ability. For example, one might examine the efficacy of acetyl-cholinesterase inhibitors to slow the progression to impaired driving. Furthermore, the possibility of training very mildly demented drivers should be explored, to help individuals with dementia maintain this critical ability as long as possible. Taken together, the existing research attempts to inform us regarding driving ability in dementia but does not offer any information on slowing the onset of driving impairment or improving driving abilities.

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