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# Driving with Dementia

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## SCENARIO:

*You have been Mr. JP's family physician for the past 20 years. He is 86 years old and has been relatively healthy, having had only mild hypertension, osteoarthritis of the knees, and peptic ulcer disease in the way of previous illnesses. Twelve years ago, you referred him to a general surgeon for an elective cholecystectomy, a procedure that he tolerated extremely well. You have always considered him as a well adult, mainly because the principal reason for his visits to your office have been for the renewal of his driving license. Such visits usually are brief and have not raised significant concerns on your part about his overall condition.*

*Mr. JP's current medications include hydrochlorothiazide (HCTZ) one tablet every morning, rofecoxib 25 mg daily for his osteoarthritis, and lorazepam 1 mg every night before sleeping. He has taken this triad of medication for at least the past seven years, and you have had no hesitation in providing him with refills.*

*One Sunday night you receive a telephone call from your hospital emergency room informing you that Mr. JP has been involved in a serious car accident. He is alive, but semi-comatose, having struck another car while turning left across an intersection. Both vehicles were extensively damaged, probably beyond repair, and the other driver has sustained a head injury.*

*You hurry to the hospital to evaluate your patient. In the hospital corridors you encounter Mr. JP's son. He surprises you with an angry outburst, telling you he had phoned you nine months earlier to express concern about his father's driving ability. He also mentions a message his sister left with your secretary six months earlier about Mr. JP's declining memory, judgement and ability to care for himself. He says his family is upset about this accident and asks how you could have renewed his father's driver's license several months earlier.*

The scenario above, although fabricated, should chill any physician who has renewed an elderly patient's driving license. By now, most physicians are at least vaguely aware of the increased prevalence of car crashes involving older drivers. However, on a per-patient basis, older drivers surprisingly have relatively few crashes; when distance driven is taken into account, the crash

rate of drivers over the age of 70 years rivals or exceeds that of the young high-risk group of drivers aged 16 to 24 years.<sup>1,2</sup> There are serious consequences of these crashes and such injuries are on the increase for older drivers.

### The Contribution of Advancing Age

There are numerous, well-described, age-related changes in physical and mental abilities that are relevant to driving. However, most experts agree it is unlikely that the changes associated with normal aging account for older-driver

crashes. It is much more likely that age-associated medical conditions, or their treatments, result in impaired driving competence.

In 1996, the Ontario Ministry of Transportation indicated that one of the two best predictors of an older driver having had a crash during the previous five years was the presence of at least one medical condition.<sup>3</sup> However, such medical conditions usually do not prevent a senior from obtaining a license to drive. Table 1 shows that a wide variety of medical conditions increase the risk of an at-fault crash. The greatest increase

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in risk occurs when cognition is affected. However, general practitioners should be aware that a wide variety of medical conditions can affect mental abilities important for safe driving. Notwithstanding that, individual medical conditions have not been found to be good predictors of driving safety. For example, Johansson<sup>4</sup> compared the crash rate of seniors in Finland, where medical examinations are required for license renewal, with crash rates of seniors in Sweden, where there are no restrictions in renewing drivers' licenses. The study showed comparable crash statistics for the two countries, indicating the medical evaluations were not effective in reducing crash rates. Despite these limitations, medical conditions continue to be used as key criteria for determining fitness to drive. It might be more sensible to consider these conditions, as well as certain medications, as red flags to raise medical concern rather than as absolute criteria.

### Demographic Considerations

In Canada, major injuries to road users aged 65 years and over increased by 21% between 1989 and 1994.<sup>5</sup> The recent statistics for senior drivers are more striking when considering that major injuries for young road users have decreased during this same time period. Furthermore, older persons are potentially at more risk when they are in a crash; they are more likely than younger people to be killed or injured<sup>6-8</sup> and, when injuries do occur, are four-times more likely to be hospitalized.<sup>9</sup> Also, recovery time takes longer and is less complete in seniors.

How concerned should family physicians be about the risk of senior drivers? What is the role of family physicians in terms of promoting patient autonomy and independence versus the consideration for public health and safety? What tools are available to help family physicians assess competency to drive? Are there uniform laws across Canada that obligate physicians to report impaired drivers?

The number of older drivers will more than double by the year 2020. In fact, the number of drivers over the age of 70 years is increasing faster than any other age group. In addition to there being more

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senior drivers than ever before, they are driving more and longer into old age, where the risk of accident is highest.<sup>10</sup> With no change in current accident-related fatality rates, the number of older drivers' fatalities in 2030 could be three to four times greater than in 1995—a rate that would exceed the number of alcohol-related traffic fatalities in 1995.<sup>11</sup>

### Dementia and Driving

In 1995, the Alzheimer Society of Canada established a task force on ethics which considered the issue of dementia and driving. It was composed of experts from the medical, legal, research, ethics,

Table 1

### Risk Factors for Elderly Drivers Having At-Fault Crashes

Risk factor	Relative Risk
Diabetes	2.2
Vascular	1.8
Pulmonary	2.1
Psychiatry	2.5
Neurology	5.1
Cognition	7.6

Adapted from: Diller E et al. NHTSA Technical Report HS 809023; Washington 1998.<sup>19</sup>

and caregiving communities. Draft guidelines for “tough issues” were developed and distributed as surveys to a broad cross-section of relevant persons. These surveys

produced well over 500 responses. The issue drawing the second highest number of responses (one response less than the central issue of communicating the diagnosis) concerned driving. Driving was included as a “tough issue” because effective processes to evaluate driving competence simply were not available.

After considering the responses, the final version of Tough Issues: Ethical Guidelines was prepared and made available in 1997 by the Alzheimer Society of Canada.

In discussing the issue of driving, the guidelines emphasize the need for monitoring a patient's driving ability and

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state that “when driving is recognized as dangerous, autonomous automobile access must be removed immediately.” It also is noted that a diagnosis of Alzheimer’s disease (or any other dementia) does not automatically mean the individual is incompetent to drive.

Although the guidelines highlight the importance of monitoring and evaluating driving competence, the lack of appropriate evaluation tools has been widely acknowledged. This shortcoming leaves physicians and others in a very difficult position.

### **The Status Quo**

The responsibility for patient monitoring and reporting by physicians is legislated in some provinces;<sup>12</sup> in other provinces, medical examinations for driving must be completed by physicians based on patient age or some other

a poor predictor of crashes.<sup>14-17</sup> When MMSE scores have been compared to road-test performance, the correlations have typically been in the 0.5 to 0.6 range. In this range, the MMSE is accounting for less than 40% of the variance and is, therefore, clearly insufficient for making decisions about individual patients.

Physicians commonly assume that sending patients with cognitive impairment and dementia for conventional licensing road tests is sufficient to determine fitness to drive. Unfortunately, these road tests have not been effective in revealing the driving problems of those with cognitive impairment. Undoubtedly, this is because the road tests focus on assessing basic skills which, for the experienced driver, already are highly learned. Overlearned skills tend to be preserved when mental competence declines. Specialized driving eval-

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requirement. There is, however, no consensus on a tool to use in evaluating driving competence in the case of dementia or other causes of cognitive impairment. The most commonly recommended tool is the Folstein Mini-Mental Status Examination (MMSE).<sup>13</sup> This is disconcerting, given the evidence from retrospective studies showing that the MMSE is of very limited usefulness for this goal as it is

uations have been developed in some urban areas but, sadly, the focus has been on evaluating physical disabilities and ameliorative vehicle modifications rather than the cognitively impaired individual’s competence to drive.

### **Effective Driver Evaluations**

More than 10 years ago, Dr. Allen Dobbs and his coworkers believed the issue of driving competence

was of critical importance. Together with physicians, neuropsychologists and rehabilitation therapists in the Northern Alberta Regional Geriatric Program (NARG), he moved towards the development of an effective evaluation procedure. The algorithmic steps, implemented over years of senior driver tests, included:

1. Establishment of a clinical driving consultation.
2. Drawing in partners (*e.g.*, NARG, the Canadian Automobile Association [Alberta], the Alberta Solicitor General, Alberta Health and Wellness, Alberta Transportation and Utilities, and the City of Edmonton) to develop a collaborative research program.
3. The articulation of a two-pronged stand-alone driving evaluation that included: (i) a competence screen, and (ii) on-road testing to identify driving errors that regularly decline with driving competence.
4. Validation of the competence screen and on-road test with an entirely new sample of senior drivers.

Soon after launching their research, Dobbs’ group discovered that the major impediment to driver evaluation was the lack of information regarding the different types of driving errors. The working premise soon became that not all errors could be presumed to indicate declining competence to drive. Some driving errors, they theorized, might just reflect bad habits of competent drivers. Therefore, before any in-car driver evaluation could be justified, there first had to be empirical documentation of errors

that do and do not signal declining competence. Hence, comparisons were developed to study the driving abilities of hundreds of medically compromised drivers (vs. normal, healthy drivers). The driving performance of potentially unsafe drivers needed to be compared with that of controls, since dementia patients, as a group, are unsafe drivers. Numerous citations in the medical literature attest to the increased prevalence of car crashes in drivers with dementia.<sup>14,18</sup> Accordingly, comparisons to identify those errors which differentiate the two groups would be useful in developing a road test to evaluate driving competence of individuals.

Road tests, however, in addition to being expensive, are dangerous when a driver is incompetent and unnecessary if a driver is competent. For these reasons, a second goal of the research was to improve the economy and safety of the drivers' evaluations. Accordingly, a competence screen that accurately predicted road-test performance—at least for the more competent drivers and the more dangerous drivers—was developed. The strategy was to create a competence screen identifying two cut-off scores. The high score criterion would identify the performance level needed to accurately predict passing performance. The low score criterion would identify the performance level below which accurate predictions of a failing performance would be achieved (road test result). Driving errors were categorized using a concept mapping technique. This resulted in 12 categories of specific errors (e.g., positioning on turns, signal-

Table 2

### Targeted Medical History for Driving Assessments

- Prescription medications (narcotics, anticholinergic medications, benzodiazepines, psychotropics, anti-spasmodics, anti-Parkinson medications)
- Nonprescription medications (alcohol, illicit drugs)
- Visual problems (cataracts, glaucoma, macular degeneration, diabetic retinopathy)
- Hearing problems
- Cardiovascular disease (aortic aneurysm, arrhythmias, sick sinus syndrome, pacemaker, postural blood pressure changes causing dizziness, myocardial infarct, unstable angina)
- Cerebrovascular disease (transient ischemic attacks, strokes)
- Nervous system diseases (e.g., seizures, central sleep apnea, labyrinthitis or Meniere's disease, Parkinson's disease, dementia, head injury/subdural, multiple sclerosis)
- Respiratory diseases (chronic obstructive pulmonary disease, obstructive sleep apnea)
- Endocrine and metabolic conditions (diabetes, hyperparathyroidism, hypo- and hyperthyroidism, electrolyte disturbances [e.g., sodium])
- Psychiatric conditions (depression, schizophrenia, bipolar disorder, psychosis)
- Musculoskeletal diseases (osteoarthritis, osteoporosis, rheumatoid arthritis, peripheral neuropathy)
- Infectious diseases (respiratory, urosepsis, acquired immune deficiency syndrome)
- Driving history (infractions, motor vehicle accident)

ing, speed errors) and a category of hazardous or potentially catastrophic errors. These latter areas are defined as areas which require traffic to adjust or the examiner to take control to avoid a crash or dangerous situation. The frequency and severity of errors within each category were tallied and then analyzed for each of three groups: 1) above the higher cut-off, 2) below the lower cut-off, and 3) indeterminate (between the two cut-offs).

Such comparisons resulted in the identification of three groups of driving-error categories.

The first group was labeled **nondiscriminating errors** because these errors were made equally by competent and incompetent drivers. These errors reflect the bad habits of experienced drivers—not compromised driving skills. Any evaluation utilizing these errors as

indicators of driving incompetence would be inappropriate.

The severity scores for the second group of errors (e.g., positioning on turns, observational errors) reliably discriminated between cognitively impaired elder drivers and healthy control groups, and reliably differentiated healthy older drivers from healthy younger drivers. These **discriminating errors** are defined as “potentially dangerous,” and are signals of declining competence.

The final group (e.g., wrong way on a freeway, stopping at a green light, going through a red light) was labeled as **criterion errors**. These errors were displayed only by drivers from the cognitively impaired group.

The identification of the error categories, and the discovery of the groupings of these categories, provided the basis for understanding the meaning of different types of

Table 3

### Targeted Physical Examination for Driving Assessments

Parameter	Test(s)
Vision	Visual fields, Snellen acuity
Hearing	Whisper test
Cardiovascular	Normal exam, electrocardiogram (ECG) if needed, postural blood pressure
Pulmonary	Normal exam, oximetry if needed (test and exercise)
Gastrointestinal	Standard exam
Musculoskeletal	Range of motion (ROM) cervical spine, strength, tone, extension and flexion (shoulder, wrist, ankles, hips and knees)
Balance and gait	Get-up-and-go test (subject rises from chair, stands, then walks three meters, turns around and sits down)
Central nervous system	Normal exam, cerebellar (finger-nose, heel-shin), lower motor and upper motor findings, proprioception, sensory
Cognitive	MMSE, especially the intersecting pentagons—clock face, the praxis (ability to do a planned series of motor action on command), agnosia (ability to identify objects), executive function ability (Trails A and B test), judgement, insight
Psychiatric	Normal exam, geriatric depression scale (if appropriate)
Functional decline	Assess decline in activities of daily living (ADL) and instrumental ADL (e.g., shopping, cooking, finances)

driver errors. This knowledge enabled the development of an empirically justifiable scoring scheme and provided the criteria for laying out road courses at sites which reveal the important differentiating errors. These findings also provided the empirical basis for specifying an unsafe-driver criterion.

What has emerged is a competence screen consisting of a set of computer-presented tests. Successful performance requires memory, judgement, decision-making, attention, motor-speed abilities and integration or shifting among these domains. The road test is given on a specifically designed course that requires 40 minutes to complete. The vehicle used is an automatic mid-sized car equipped with dual brakes. The maneuvers have been designed to reveal the

driving errors of medically compromised drivers.

To validate the utility of the competence screen, two outcomes are required:

1. Competence screen scores above the upper cut-off point and below the lower cut-off point must accurately predict passing and failing road test performance, respectively.
2. The number of drivers left in the indeterminant category (between the two cut-off points) are those who do need a road test, and substantially reduce from the total the number of individuals who did in fact require it.

This two-step procedure is now utilized in a number of different locales across the country, four of which are in Alberta. The evaluation has been commenced

under the name Driveable Assessment Centres. The procedure is stand-alone in that it does not require specially-trained personnel to administer it. The test is exacting: many individuals with presumed mild cognitive impairment fail the evaluation. Therefore, the test takes pressure off family physicians to come to a decision completely on their own about a senior's driving competence.

The cost involved, assumed by the patient or family, has been a point of contention. Hope persists that the provincial government will eventually assume the cost of this evaluation.

Most of the statistical data from the NARG/University of Alberta research on driving and the cognitively impaired/demented was presented at the 1998 Canadian Consensus Conference on Dementia. Following a lively discussion period, the Conference issued five recommendations pertaining to this issue:

1. While caring for patients with cognitive impairment, physicians should apply a focused medical history and examination (see Tables 2 and 3). "Going through the motions" of evaluating blood pressure with very cursory physical examinations does not suffice. A much more targeted approach is recommended if those seniors incompetent to drive are to be identified in the future. A specific medical history which incorporates questions about driving should be a routine part of the evaluation of elderly patients with suspected dementia. The history should include questions about driving pat-

terns (e.g., how many kilometers driven per week and time of day when driving is usually done). Other specific queries should include whether or not there have been “near misses,” documentation of all accidents and citations, and whether the patient becomes lost while driving. Probing for those factors which worsen the cognitive impairment should also be included in the medical assessment (see Table 4). Records of patient driving status and the competence-altering potential of illnesses and/or treatments should be specifically noted on patient charts.

2. Physicians must be aware that driving difficulties may indicate other cognitive and functional problems that need to be addressed. Although it is more common for memory concerns and details of impaired judgments to alert physicians to the need for an evaluation of driving competence, the opposite also holds true. Practitioners must keep in mind that occasional reports of poor driving or car crashes signal the need for a thorough cognitive assessment.
3. Physicians should encourage patients with dementia and their caregivers to plan early for eventual cessation of driving. This should be mentioned to such individuals as early as possible since it is certain to transpire with the passage of time. Family physicians should provide continuing support for those who lose their capacity to drive. It is important to discuss possible options for transporta-

Table 4

#### Illnesses and Medications Impairing Safe Operation of a Vehicle

- Cardiovascular disease (e.g., cardiac arrhythmia, congestive heart failure, valvular heart disease)
- Cerebrovascular disease (e.g., stroke)
- Neurologic (e.g., head injury, Parkinson’s, multiple sclerosis, tumor, narcolepsy, sleep apnea)
- Respiratory diseases (e.g., chronic obstructive pulmonary disease, respiratory failure)
- Metabolic diseases (e.g., hypothyroidism, diabetes)
- Renal disease (chronic renal failure)
- Dementia (e.g., Alzheimer’s disease, multi-infarct dementia, frontal temporal, Pick’s, Huntington’s, alcoholic, poisonings)
- Psychiatric illnesses (e.g., schizophrenia)
- Medications (e.g., particularly those with central nervous system effects)

tion and mobility, to be aware of the stress and isolation that a caregiver might feel, and to recommend any services that are available to seniors in their locale.

4. Physicians should notify the respective licensing bodies regarding competency to drive, even in provinces that do not

have mandatory reporting. Furthermore, seniors are more susceptible to the development of delirium due to decreased central nervous system reserve and reduced homeostasis caused by the aging process. The fact that demented patients are more predisposed to the development of delirium also has been well-established. Delir-

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5. Healthcare professionals should advocate strongly for access to affordable, valid, performance-based driving assessments. It follows clearly to require a thorough evaluation of cognitive impairment in patients with questionable driving competence. This step often will uncover the presence of a dementia, neurodegenerative disease or other cogni-

ium compromises driving safety. All patients with an unresolved delirium should be prohibited from driving until the condition clears completely.

All practicing physicians are aware that “the involved” senior patient may not agree with discontinuing his or her driving, primarily due to a loss of insight into his or her own deficits. It is extremely important, therefore,

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for physicians to deal with the emotional and broad-reaching implications the loss of driving has on the patient and the patient's family. It is imperative that primary care physicians notify license authorities with any concerns regarding competence to drive, even in those provinces that have not legislated mandatory reporting by physicians. Although the responsibility is not a pleasant one, family physicians should understand

that they are well-placed to monitor the driving competence of their patients. In the case of dementia, monitoring is particularly important since the diagnosis of dementia by itself is not sufficient for drawing conclusions about a patient's driving competence. The emergence of an empirical basis for driver evaluations by DriveAble Testing offers hope of clarifying the muddy waters surrounding this issue.

## Conclusion

While the issue of driving in the cognitively impaired and/or demented patient remains a huge challenge to physicians, it is encouraging to note that definite progress on this front has been made. With the further availability of DriveAble Testing and/or the initiation of similar, empirically based evaluations of driving competence, the issue should become less problematic further downstream.

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