Driving Under the Influence of Aging and Cognitive Impairment

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Financial Disclosures

- Research grants: NIH/NIA, Eli Lilly/Avid, Roche, Biogen, Merck, TauRx, Univita
- Speaking and consulting: NHTSA, Medscape, Accera, Amgen
Objectives

- Explain how various age related factors can affect driving fitness in the elderly.
- Discuss how cognitive impairment from brain disease such as Alzheimer’s disease can affect driving, even in the early stages.
- Describe practical approaches to risk assessment and risk modification.
Older drivers: Who are they?
Older adults are generally safe drivers

- On average, older adults drive fewer miles per year than other age groups.
- Less exposure means less crash risk.
- Many older adults limit driving exposure voluntarily (e.g., by avoiding travel during rush hour or bad weather, driving in daylight only)
Older Drivers: Is there a problem?

- October, 2005, St. Petersburg FL.: Ralph Parker, 93, was driving his 2002 Chevrolet Malibu south on 34th St. about 8:30 p.m. Wednesday. The 52-year-old male victim who was living at the Crystal Inn, crosses the highway to go to McDonald's. The Malibu hits the victim and severs his right leg. His body crashes through the windshield. Parker continues driving 3 miles until he is stopped at the Sunshine Skyway tollbooth.

- April, 2005, Spokane, Wash.: Keil A. Ganoung, 80, is sentenced to three years in prison for killing one pedestrian and injuring two others while driving drunk. His daughter said his age and health conditions make him unlikely to survive the sentence.

- January, 2005, Whitman, Mass.: Finding no probable cause, a magistrate dismisses a vehicular homicide charge against Joseph E. Davis, 80, for his role in an accident at a Veterans Day parade. Davis was driving a VFW van when he hit a marcher. According to a police report, Davis "struck the victim, knocking him down and pushing the victim 6 feet along the pavement. He then drove over the victim and then back over the victim, causing fatal injuries."

- April, 2004, Springfield, Mass.: James Carlin, 95, is found incompetent to stand trial in the killing of a motorcyclist in a traffic accident two years earlier. Prosecutors said they reached the conclusion reluctantly after lengthy testimony and testing.

- July, 2003, Santa Monica, Calif.: Ten people are killed and 63 injured when George Russell Weller's car careens through a farmers' market. Investigators ruled out mechanical failure, concluding that Weller stepped on the gas instead of the brakes. Weller, 88, has been charged with 10 felony counts of vehicular manslaughter with gross negligence. A judge has refused to dismiss the charges.
WARWICK, R.I. -- A 91-year-old Warwick woman was hurt Monday when her car crashed into a Salvation Army Family Store, police said.

An officer said the car crashed into the store at 558 Greenwich Ave. at about 1:40 p.m.

Police said the female driver had minor injuries and that she was taken to Kent Hospital for evaluation. Her name was not released.

Investigators said no one in the store was hurt.

Police said the woman inadvertently hit the accelerator, causing the car to mount the curb and crash through a plate-glass window. The car came to rest against an interior wall.

The city building inspector closed the business because of safety and structural concerns.
Rhode Island State Police have released the name of the 89-year-old woman who was killed in a head-on crash on Route 146. Col. Steven O'Donnell said Marie Simone, of Warwick, was killed at about 5:30 p.m. Wednesday after she drove the wrong way onto the highway in Lincoln and crashed head-on into a vehicle driven by 30-year-old Joseph Brophy, of Burrillville. Police said Brophy was recovering at Rhode Island Hospital with injuries that were described as non-life-threatening injuries.
1/6/14: Walpole, MA. 83-year-old Driver
2/17/15: 92 y.o Driver Hits 9 Vehicles
Mayville, Wisconsin
Older Drivers: Is there a problem?

US DOT data 1998; Cerrelli, E.
Older Drivers: Is there a problem?

Figure 1. Overall two-vehicle fatal CIRs by driver age group.

CIR (Crash Involvement Ratio): at-fault/not at-fault
FARS and GES data, 2002-2006
Why are older drivers a concern?

- In 2011, 5,401 older adults died in crashes and another 185,000 were injured.
- Older men are especially vulnerable, possibly because they continue driving longer as they age and drive more miles (↑ exposure).
- A contributing factor is the greater frailty that comes with age.
Safety Trends for Older Drivers

**Older Drivers, Safer Drivers**

U.S. automobile fatalities per 100 million vehicle miles traveled, by age group

Source: Insurance Institute for Highway Safety

The Wall Street Journal
Aging brings the following changes that affect driving:

- Vision and visual perception
- Physical function
- Cognition
Major Vision Conditions Affecting Driving

- **Cataracts**
  - Affect 50% of people 65-74 and 70% of those > 75
  - Obstruct vision, impairing ability to see road, pedestrians, signs.
  - Impair contrast sensitivity, causing distance misjudgment
  - Crash risk 1.3 X that of other older drivers
  - Crash risk after cataract surgery reduced by 50%

- **Glaucoma**
  - Blind spots develop. Peripheral vision decreases ability to see vehicles.
  - Family history an additional risk as well as diabetes, nearsightedness and African American descent
  - Crash risk 1.7-5.2 X that of other older drivers

- **Macular degeneration**
  - Loss of detailed vision causes difficulty seeing road signs, pedestrians staying in lane plus impaired night driving
  - Family history an additional risk as well as light eye color and smoking
  - Crash risk unknown

- **Diabetes**
  - Retinopathy affects approximately 70% of patients with IDDM
  - Diabetic retinopathy can lead to total blindness.
  - Crash risk 4.0 X that of other older drivers

From NHTSA. Safe Mobility for Older People: Notebook, 3-29, April 1999
Physical Aging - Speed

• Aging decreases the speed and coordination of movement.
  – Reaction times are slower

• In certain well learned tasks such as routine driving, older adults seem unimpaired.

• The impact of slowed reaction may be more apparent when driving in unfamiliar settings, in emergency stops for pedestrians or animals, and when “surprise” maneuvers are made by other vehicles.
Major Physical Conditions Affecting Driving

- **Arthritis**¹
  - Affects 80% of people in their 70s
  - Loss of dexterity affects use of controls
  - Reduced range of motion affects reaching and head turning
  - Loss of strength affects wheel and pedal control

- **Diabetes**
  - Peripheral neuropathy can affect a person’s ability to operate brakes, clutch, and the gas pedal.

From NHTSA. Safe Mobility for Older People: Notebook, 3-29, April 1999
Neurologic Conditions Affecting Motor Function: Parkinson’s Disease

- Motor deficits such as bradykinesia and rigidity affect driving by limiting important abilities such as:
  - Steering
  - Braking response
  - Turning head and checking blind spots
- Cognitive changes in some patients also affect driving:
  - Hazard detection
  - Poor planning and driving errors
- Also, sleep disturbances and drug effects

Major Medical Conditions Affecting Alertness

- Obstructive sleep apnea
  - Excessive daytime somnolence
  - Treatable with CPAP
- Cardiovascular disease
  - Arrhythmias: Prognosis and treatment impact decisions on safety to drive\(^1\)
- Epilepsy
  - Stroke is the most common cause of new onset seizures in the elderly
  - Recommendations on driving vary by state\(^2\)
  - Most recommendations suggest 3-12 month seizure free interval before return to driving\(^1\)
- Diabetes
  - Acutely, hyper and hypoglycemia can cause drowsiness, lightheadedness, confusion, and loss of consciousness or seizure.

2. Physician’s Guide to Assessing and Counseling Older Drivers
Medications of Particular Concern

- Antidepressants, antihistamines, benzodiazepines
  - Blurred vision (affecting how the driver sees traffic)
  - Drowsiness (affecting driving response)
  - Motor coordination (affecting the physical response to traffic situations)

- Antihypertensives
  - Impair the driver’s response by causing dizziness and fatigue
  - Some medications may cause confusion and sedation (resulting in poor driving response time or falling asleep at the wheel)

- Analgesics
  - Cause confusion that results in dangerously slowed driving and poor response time to traffic situations.
  - Muscle relaxants increase this effect.

Physician’s Guide to Assessing and Counseling Older Drivers
Good Cognition is Critical Too!

• Memory
  – May result in failure to find destinations, but not an accident risk in itself

• Visual attention and perception
  – Limited field of view and visual perception problems increase traffic accident risk

• Executive function
  – Impaired judgment and decision making increases traffic accident risk
DRIVING WITH ALZHEIMER’S DISEASE: HOW MUCH OF A PROBLEM IS IT?
## Crash Risk Associated with Selected Medical Conditions:
### Relative risk of crashing

<table>
<thead>
<tr>
<th>Medical Condition</th>
<th>Relative Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dementia</td>
<td>2.1 – 5.0</td>
</tr>
<tr>
<td>Alcohol abuse &amp; dependence</td>
<td>2.1 – 5.0</td>
</tr>
<tr>
<td>Schizophrenia</td>
<td>2.1 – 5.0</td>
</tr>
<tr>
<td>Sleep apnea</td>
<td>2.1 – 5.0</td>
</tr>
<tr>
<td>Epilepsy</td>
<td>1.1 – 5.0</td>
</tr>
<tr>
<td>Cardiovascular disease</td>
<td>1.1 – 5.0</td>
</tr>
<tr>
<td>Psychiatric disorder</td>
<td>1.1 – 5.0</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>1.1 – 2.0</td>
</tr>
<tr>
<td>Musculoskeletal/ motor disability</td>
<td>1.1 – 2.0</td>
</tr>
<tr>
<td>Vision disorder</td>
<td>1.0 – 2.0</td>
</tr>
</tbody>
</table>
BRAIN CHANGES IN ALZHEIMER’S DISEASE: EFFECTS ON DRIVING
Neuropathologic Changes Characteristic of Alzheimer’s Disease

AP = amyloid plaques.
NFT = neurofibrillary tangles.
Courtesy of Albert Enz, PhD, Novartis Pharmaceuticals Corporation.
Extrastriate Visual Areas: Two Major Pathways

“Where”

Parietal cortex

Central sulcus

“What to do”

MT (V5)

Prefrontal cortex

“Inferotemporal cortex

“Who”

V1

V2

V3

V4
Common Driving Errors in Alzheimer’s Disease

- Forgetting where driving
- Difficulty navigating
- Failure to anticipate traffic situations
- Reduced problem-solving around complex driving situation
- Poor lane keeping
- Failure to check blind spots
Time to driving restriction due to failed road test, at fault MVA, or dementia progression

Converging evidence from two longitudinal studies of drivers with dementia\textsuperscript{1,2} suggest that:

- Many patients with mild dementia can pass a road test.
  - 42/61 (69\%) based on combined data
- Close monitoring and regular assessment (q 6 months) of driving competence

Patients with mild dementia may continue to drive safely for up to a year
- Plan for early and gradual cessation rather than immediate termination of driving privileges in this group

Alzheimer’s Association Position Statement on Driving

- “The diagnosis of Alzheimer’s disease is not, in its own, a sufficient reason to withdraw driving privileges. “

- The determining factor in withdrawing driving privileges should be an individual’s driving ability.”
Principles of Assessment

- Age and diagnosis alone are not reasons to restrict driving.
- Office based screening for risk
  - Older drivers in general
  - The cognitively impaired older driver
- Referrals for specialized assessment
- Interventions for those with modifiable risk
- Advice on restrictions and driving retirement
- Monitoring
Physician’s Plan for Older Driver’s Safety

At risk

Medical interventions
- For diagnosis and treatment

Deficit not resolved
- Refer to Driver Rehabilitation Specialist:
  Is the patient safe to drive?
    No
    - Counsel and follow up
      • Explore alternatives to driving
      • Monitor for depression and social isolation
      • Adhere to state reporting regulations
    Yes

Deficit resolved

Formally assess function (ADReS)
- Vision
- Cognition
- Motor function

Not at risk

Health Maintenance
- Successful Aging Tips
- Tips for Safe Driving
- Periodic follow-up

From AMA Physician’s Guide to Assessing and Counseling Older Drivers
Assessment of Driving-Related Skills

• From the AMA Physician's Guide to Assessing and Counseling Older Drivers
  – To assist physicians in evaluating the ability of their older patients to operate a motor vehicle safely as part of their everyday activities.
  – Support from National Highway Traffic Safety Administration
    • http://www.nhtsa.gov/people/injury/olddrive/OlderDriversBook/

• An evidence-based recommendation to physicians that assesses three key functions for safe driving
  – Vision
  – Cognition
  – Motor function
ADReS Score Sheet

Patient's Name: __________________________ Date: __________________

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

   Patient's
   
   R  L

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

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

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

<table>
<thead>
<tr>
<th>Right</th>
<th>Left</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neck rotation</td>
<td></td>
</tr>
<tr>
<td>Finger curl</td>
<td></td>
</tr>
<tr>
<td>Shoulder and elbow flexion</td>
<td></td>
</tr>
<tr>
<td>Ankle plantar flexion</td>
<td></td>
</tr>
<tr>
<td>Ankle dorsiflexion</td>
<td></td>
</tr>
</tbody>
</table>

   Notes:

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

<table>
<thead>
<tr>
<th>Right</th>
<th>Left</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shoulder adduction</td>
<td></td>
</tr>
<tr>
<td>Shoulder abduction</td>
<td></td>
</tr>
<tr>
<td>Shoulder flexion</td>
<td></td>
</tr>
<tr>
<td>Wrist flexion</td>
<td></td>
</tr>
<tr>
<td>Wrist extension</td>
<td></td>
</tr>
<tr>
<td>Hand grip</td>
<td></td>
</tr>
<tr>
<td>Hip flexion</td>
<td></td>
</tr>
<tr>
<td>Hip extension</td>
<td></td>
</tr>
<tr>
<td>Ankle dorsiflexion</td>
<td></td>
</tr>
<tr>
<td>Ankle plantar flexion</td>
<td></td>
</tr>
</tbody>
</table>

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

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

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>All 12 hours are placed in correct numeric order, starting with 12 at the top</td>
<td></td>
</tr>
<tr>
<td>Only the numbers 1-12 are included (no duplicates, omissions, or foreign marks)</td>
<td></td>
</tr>
<tr>
<td>The numbers are drawn inside the clock circle</td>
<td></td>
</tr>
<tr>
<td>The numbers are spaced equally or nearly equally from each other</td>
<td></td>
</tr>
<tr>
<td>The numbers are spaced equally or nearly equally from the edge of the circle</td>
<td></td>
</tr>
<tr>
<td>One clock hand correctly points to two o'clock</td>
<td></td>
</tr>
<tr>
<td>The other hand correctly points to eleven o'clock</td>
<td></td>
</tr>
<tr>
<td>There are only two clock hands</td>
<td></td>
</tr>
</tbody>
</table>
# Maryland Pilot Older Driver Study

<table>
<thead>
<tr>
<th>Functional status measure</th>
<th>Baseline OR(^a)</th>
<th>Updated OR(^b)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor-free Visual Perception Test</td>
<td>4.96</td>
<td>3.60</td>
</tr>
<tr>
<td>Trail-Making, Part B</td>
<td>3.50</td>
<td>1.80</td>
</tr>
<tr>
<td>Delayed Recall</td>
<td>2.92</td>
<td>3.34</td>
</tr>
<tr>
<td>Useful Field of View, Subtest 2</td>
<td>2.48</td>
<td>2.23</td>
</tr>
<tr>
<td>Rapid Pace Walk</td>
<td>2.64</td>
<td>3.23</td>
</tr>
<tr>
<td>Head-Neck Rotation</td>
<td>2.56</td>
<td>2.01</td>
</tr>
</tbody>
</table>

\(^a\)1 year retrospective crash data + mean prospective observation interval of 20 months

\(^b\)1 year retrospective crash data + mean prospective observation interval of 32 months

Driving and Dementia:
Practice parameter: American Academy of Neurology, Revised 2010

- Consider the following characteristics useful for identifying patients at increased risk for unsafe driving
  - The Clinical Dementia Rating scale (Level A): those with moderate dementia should not drive.
  - A caregiver's rating of a patient's driving ability as marginal or unsafe (Level B)
  - A history of crashes or traffic citations (Level C)
  - Reduced driving mileage or self-reported situational avoidance (Level C)
  - Mini-Mental State Examination scores of 24 or less (Level C)
  - Aggressive or impulsive personality characteristics (Level C).

- Consider the following characteristics not useful for identifying patients at increased risk for unsafe driving
  - A patient's self-rating of safe driving ability (Level A)
  - Lack of situational avoidance (Level C).

## Clinical Dementia Rating

<table>
<thead>
<tr>
<th>SCORE</th>
<th>Healthy CDR0</th>
<th>Questionable Dementia CDR0.5</th>
<th>Mild Dementia CDR1</th>
<th>Moderate Dementia CDR2</th>
<th>Severe Dementia CDR3</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEMORY</td>
<td>No memory loss or slight inconsistent forgetfulness</td>
<td>Consistent slight forgetfulness; partial recollection of events; “benign” forgetfulness</td>
<td>Moderate memory loss; more marked for recent events, defect interferes with everyday activities</td>
<td>Severe memory loss; only highly learned material retained; new material rapidly lost</td>
<td>Severe memory loss, only fragments remain</td>
</tr>
<tr>
<td>ORIENTATION</td>
<td>Fully oriented</td>
<td>Fully oriented except for slight difficulty with time relationships</td>
<td>Moderate difficulty with time relationships; oriented for place at examination; may have geographic disorientation elsewhere</td>
<td>Severe difficulty with time relationships; usually disoriented in time, often to place</td>
<td>Oriented to person only</td>
</tr>
<tr>
<td>JUDGMENT AND PROBLEM SOLVING</td>
<td>Solves everyday problems and business &amp; financial affairs well; judgment good in relation to past performance</td>
<td>Slight impairment in solving problems, similarities, differences</td>
<td>Moderate difficulty in handling problems, similarities, differences; social judgment usually maintained</td>
<td>Severely impaired in handling problems, similarities, differences; social judgment usually impaired</td>
<td>Unable to make judgments or solve problems</td>
</tr>
<tr>
<td>COMMUNITY AFFAIRS</td>
<td>Independent function at usual level in job, shopping, volunteer and social groups</td>
<td>Slight impairment in these activities</td>
<td>Unable to function independently at these activities though may still be engaged in some; appears normal to casual inspection</td>
<td>No pretense of independent function outside home</td>
<td>Appears too ill to be taken to functions outside a family home</td>
</tr>
<tr>
<td>HOME AND HOBBIES</td>
<td>Life at home, hobbies, intellectual interests well maintained</td>
<td>Life at home, hobbies, intellectual interests slightly impaired</td>
<td>Mild but definite impairment of function at home; more difficult chores abandoned; more complicated hobbies and interests abandoned</td>
<td>Only simple chores preserved; very restricted interests, poorly maintained</td>
<td>No significant function in home</td>
</tr>
<tr>
<td>PERSONAL CARE</td>
<td>Fully capable of self care</td>
<td>Needs prompting</td>
<td>Requires assistance in dressing, hygiene, keeping of personal effects</td>
<td>Requires much help with personal care; frequent incontinence</td>
<td></td>
</tr>
</tbody>
</table>

Morris JC. Neurology 43:2412-2414, 1993
Figure: Evidence-Based Approach to the Assessment of Older Adult Drivers with Cognitive Impairment/Dementia

Step 1: Diagnosis of Mild Cognitive Impairment or Dementia
Screen for dementia using validated tool (e.g., MMSE, Short Blessed Test)
Use standard criteria to diagnosis MCI, Dementia (see text)
Evaluate for reversible causes of cognitive impairment
Rate Dementia Severity (Table 2)

Review history with caregiver

Impaired Traffic Skills
Impaired IADL's
Impaired Cognitive Domains

Yes, but questionable or mild dementia* or significant impairment in visuospatial, executive, or attention abilities
Yes, but moderate to severe dementia* OR already in at-fault MVA
No, or questionable dementia

Consider Referral
Subspecialist
Neuropsychologist
Driving Clinic**
DMV***

Monitor for progression or changes every 6 months

Patient refuses

Recommend
- Driving Cessation
- Transportation
- Alternatives
- Steps for Resistant Drivers

Driving Recommended?

* Dementia severity rating: See Table 2. For more information, see Dubinsky, et al. (2000)
** Performance Based Driving Evaluation recommended, if available
*** DMV referral for refractory or high-risk situations
The Road Test

- Closed course in specially fitted vehicle vs open road
- Administered by a professional
  - Driving rehabilitation specialist
    - Driving school instructor
    - Occupational therapist
  - State motor vehicle registry official
- “Gold standard” but valid test of driving skill in which situation?
  - Most patients with Mild Cognitive Impairment or mild Alzheimer’s disease pass
  - Good predictor of crashes?
  - Unable to see how individual reacts to dangerous situations
  - Impact of anxiety/unfamiliarity with car and course on performance
Risk Reduction: Physician Role

- Maximize functioning
  - Vision
  - Hearing
  - Joint mobility

- Medication review
  - Avoid sedating medications

- Driver safety courses
  - AAA
  - AARP

- Cognitive training
  - AAA: Drivesharp program

- Referral to driving rehabilitation specialist
Monitoring: Caregiver

- Education
  (www.thehartford.com/talkwitholderdrivers)
- Begin the conversation early and repeat periodically
- Create opportunities to observe driving
- Keep a record of driving habits
- Discuss concerns with your healthcare provider
- Actively pursue driving evaluations
# Warning Signs for Older Drivers

The driving behaviors listed below could cause safety problems. They are ranked from minor to serious. Many of the less serious issues may be overcome with changes in driving behavior or physical fitness, while the more serious behaviors may require your immediate action. Since driving ability seldom changes drastically in a short time, you should be able to track changes over time to get a clear picture of overall driving ability.

Here’s how to use this list.
- Observe driving over time, keeping notes to help you understand changes in driving ability.
- Look for a pattern of warning signs and for an increase in the frequency of occurrence.

## Driving Behavior Warning Signs – When Noticed, How Often

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Decrease in confidence while driving.</td>
<td>16. Uses a “copilot.”</td>
</tr>
<tr>
<td>2. Difficulty turning to see when backing up.</td>
<td>17. Bad judgment on making left hand turns.</td>
</tr>
<tr>
<td>5. Other drivers often honk horns.</td>
<td>20. Moving into wrong lane.</td>
</tr>
<tr>
<td>8. Hitting curbs.</td>
<td>23. Ticketed moving violations or warnings.</td>
</tr>
<tr>
<td>9. Scraps or dents on the car, mailbox or garage.</td>
<td>24. Getting lost in familiar places.</td>
</tr>
<tr>
<td>10. Increased agitation or irritation when driving.</td>
<td>25. Car accident.</td>
</tr>
<tr>
<td>11. Failure to notice important activity on the side of the road.</td>
<td>26. Failure to stop at stop sign or red light.</td>
</tr>
<tr>
<td>12. Failure to notice traffic signs.</td>
<td>27. Confusing the gas and brake pedals.</td>
</tr>
<tr>
<td>13. Trouble navigating turns.</td>
<td>28. Stopping in traffic for no apparent reason.</td>
</tr>
<tr>
<td>14. Driving at inappropriate speeds.</td>
<td>29. Other signs:</td>
</tr>
<tr>
<td>15. Not anticipating potential dangerous situations.</td>
<td></td>
</tr>
</tbody>
</table>
Driving Cessation
Who should say no?

- 27% of people with spouses and 40% of those living alone prefer to be told to stop driving by their doctor.
  - Spousal responsibility
  - Adult children have more influence with parents over 70 than with younger parents in their 50s and 60s.

- Men are generally more receptive to driving cessation from sons and women from their daughters.
Rhode Island DMV Regulations

- Ineligible for license:
  - “habitual drunkard, habitual user of any other drug to a degree which renders him incapable of safely driving a motor vehicle.”
  - “any mental disability... which renders him incapable of safely driving a motor vehicle.”
Driving and Dementia: RI Policy

- reporting *not* mandatory
- if report:
  - immunity
  - confidentiality
- report by:
  - family
  - physician
  - DMV examiner, police reports, poor driving record
Driving and Dementia: RI Policy

- Report leads to:
  - Medical evaluation form (by personal physician)
  - Operator Control in DMV
    - refers to Medical Advisory Board if deemed necessary
    - referral for road test option
### Driving and Dementia: Local State Policies

<table>
<thead>
<tr>
<th></th>
<th>Rhode Island</th>
<th>New Jersey</th>
<th>Pennsylvania</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age based renewal procedures</td>
<td>Age 75+ every 2 years instead of 5</td>
<td>No</td>
<td>Age 65+ every 2 years instead of 5</td>
</tr>
<tr>
<td>Mandatory medical reporting</td>
<td>No</td>
<td>Only for recurrent LOC</td>
<td>Any patient who exhibits unsafe driving behaviors</td>
</tr>
<tr>
<td>Immunity</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Anonymity</td>
<td>Yes/No</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

AMA Physician's Guide to Assessing and Counseling Older Drivers
http://www.ama-assn.org/ama/pub/category/10791.html
Steps to Driving Cessation

• Discuss the risks, but also recognize the loss of independence in candid discussion with driver
• Get support from family
• Arrange alternative transportation
• Reduce the need to drive
  – Medicine and groceries delivered
  – Have hairdresser make home visits
  – Schedule people to visit regularly
  – Arrange for friends to transport to church, social events
Enforcement of Decision

- Three standard methods – none actually prevent driving
  - License revocation
  - Vehicle registration revocation
  - Insurance cancellation
- If the individual refuses to stop
  - Disable the car
  - File down the keys
  - Take away the car
  - Notify the Department of Motor Vehicles.
    - Ethical concerns: Violation of doctor patient relationship
    - Legal concerns: State obligations and protections

AMA Code of Medical Ethics. Opinion 2.24
STANDARDS FOR MONITORING DRIVING SAFETY
Monitoring Safety

• Routine office visit every 6-12 months
  – Information about driving habits
  – MVA or traffic violations
  – Family member reports of any safety concerns
• Conversation with families and advice on driving
  – Gradual reduction
  – Restrictions: roads, times, distance
  – Thinking about the future
• Referral when necessary
Driving Safety Research Methods

**Empirical Data Collection** (test tracks & simulators)

- Imprecise
- Relies on unproven safety surrogate
- Experimental situations modify driver behavior

**Naturalistic Data Collection**

- “Natural” driver behavior
- Detailed pre-crash/crash info
- Distraction
- Drowsiness
- Aggressive driving
- Driver errors
- Vehicle dynamics
- Potential validation of surrogate measures

**Epidemiological Data Collection** (crash databases)

- Reactive
- Very limited pre-crash data

Dingus. DOT HS 810593, April 2006
Rhode Island Hospital
Alzheimer’s Disease & Memory Disorders Center

Naturalistic Assessment of the Driving Ability of Cognitively Impaired Elders

NIH/NIA 2R01 #AG016335
5/15/07 - 4/30/13
Naturalistic Assessment of Driving

Due to the limitations of simulators and road tests, what the field of research needs now is a scientific examination of the driving performance of older normal and cognitively impaired drivers in:

- the natural setting
- driving in their own cars
- in their own environment
- over an extended amount of time

Obtaining such information in a standardized fashion would allow comparison with formal road test performance and help us to answer the debate about the validity of road testing, as well as the value of neuropsychological test predictors.
Outcome Measures: Video Recording Equipment for Naturalistic Driving Assessment

- Continuous recording from start of ignition
- Two-week epoch
  - 4 hours of day driving selected for grading
- Four small cameras
  - Forward, driver, both side views
- GPS to monitor speed
4 camera setup with GPS
Driver with MCI: MMSE=27; CDR=.5
Driver with MCI: MMSE=26; CDR=.5
Driver with Very Mild AD: MMSE=23; CDR=.5
.05 on re-test with wife in car (AD subject)

(Control subject)
Do road tests or home driving assessments correlate with driving safety/crashes?
Comparisons of Crash Frequency Per Mile Over Past Three years

- Crash frequency = 14/103 drivers
  - .05 crashes per driver per year
- Crashes per mile per year compared to road test score
  - $R^2 = .12, p = .0001$
- Crashes per mile per year compared to home driving CDAS score
  - $R^2 = .01, p = .44$
Conclusions

- Road test performance is a reasonable proxy for estimating fitness to drive in older individuals’ typical driving environments.
  - Road test and home driving assessments were moderately congruent.
  - The road test was also correlated with history of crashes corrected for driving exposure

- Differences between performance assessed using these two methods are poorly understood and deserve further study
  - Age is a factor for driving performance in healthy elders.
    - “Younger” drivers seem more able or willing to be on best “best behavior” in the road testing situation.
    - “Older” drivers seem to compensate in the home environment by driving more conservatively
  - Consider allowance for the anxious driver during road testing
Summary

• Alzheimer's disease affects skills necessary for driving, but many can continue to drive safely for a period of time.
• The best predictors of driving risk are dementia severity, past accidents/violations, family report of driving skills, and possibly reduced driving.
• There is no "gold standard" for assessment of risk, so we must still rely on monitoring by health practitioners and family.
• Plan for gradual cessation and alternative transportation
Thank you and safe driving!