Identifying Medically At-Risk Drivers

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Developed as part of a Medscape education activity, Assessing and Modifying Risks for Older Drivers, supported by the U.S. Department of Health and Human Services.
Objectives

• Identify common medical problems that may lead to unsafe driving behaviors in older drivers

• Provide the background to plan appropriate strategies to screen older patients for possible driving impairments
Older Drivers: Is There a Problem?

All 2-vehicle Fatal Crashes

Crash Involvement Ratio = at-fault/not at-fault.
Why Are Older Drivers a Concern?

- In 2012, 5560 older adults died in crashes and another 214,000 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.
- The most deadly type of crash, side impact, occurs more characteristically with older drivers.

National Highway Traffic Safety Administration. DOT HS 812 004. 2014.[2]
Safety Trends for Older Drivers

Crash Involvements per 100 Million Vehicle Miles

© Insurance Institute for Highway Safety. 2014.
Older Drivers: Is There a Problem?

- Age is a proxy for physical or cognitive impairments that significantly affect safe driving\(^a\)
- With age, right-of-way and traffic sign violations increase\(^b\)
- With age, intersection:nonintersection crash ratio increases\(^b\)

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\(^a\) Rizzo M. *JAMA*. 2011;305:1018-1026.
Aging Brings Changes That Affect Driving

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

Cataracts\(^a, b\)
- Affect 50% of people 65-74 years and 70% of those > 75 years
- Obstruct vision, impairing ability to see road, pedestrians, signs
- Impair contrast sensitivity, causing distance misjudgment
- Crash risk 1.3 \(\times\) that of other older drivers
- Crash risk after cataract surgery reduced by 50%

Glaucoma\(^c, d\)
- Blind spots develop
- Peripheral vision decreases ability to see vehicles
- Crash risk 1.7-5.2 \(\times\) that of other older drivers

Macular degeneration
- Loss of detailed vision causes difficulty seeing road signs, pedestrians staying in lane plus impaired night driving
- Crash risk unknown

Diabetes\(^e\)
- Retinopathy affects approximately 70% of patients with insulin-dependent diabetes
- Diabetic retinopathy can lead to total blindness
- Crash risk 4.0 \(\times\) that of other older drivers

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National Highway Traffic Safety Administration. DOT HS 809 838. 2007.\(^6\)
\(^a\) Owsley, C, et al. JAMA. 2002;288:841-749\(^7\); \(^b\) MedlinePlus. Cataracts\(^8\); \(^c\) National Eye Institute. Facts About Glaucoma\(^9\); \(^d\) MEDLINEplus. Glaucoma\(^10\); \(^e\) Centers for Disease control and Prevention.\(^11\)
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

- 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

Neurologic Conditions Affecting Motor Function: Parkinson 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 continuous positive airway pressure

Cardiovascular disease
- Arrhythmias: prognosis and treatment affect decisions on safety to drive\(^a\)

Epilepsy
- Stroke is the most common cause of new-onset seizures in the elderly
- Recommendations on driving vary by state\(^b\)
- Most recommendations suggest 3- to 12-month seizure-free interval before return to driving\(^a\)

Diabetes
- Acutely, hyperglycemia and hypoglycemia can cause drowsiness, lightheadedness, confusion, and loss of consciousness or seizure.

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Medications of Particular Concern

Antidepressants, antihistamines, benzodiazepines

- Cause blurred vision and drowsiness, affecting view of traffic and driving response
- Motor coordination affects the physical response to traffic situations

Antihypertensive agents

- Cause dizziness and fatigue impairing driver response
- Some medications may cause confusion and sedation resulting in poor driving response time or falling asleep at the wheel

Analgesic agents

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

Good Cognition Is Critical Too!

Memory

- May result in failure to find destinations, but not a crash risk in itself

Visual attention and perception

- Limited field of view and visual perception problems increase traffic crash risk

Executive function

- Impaired judgment and decision making increases traffic crash risk
Driving Under the Influence of Dementia

Crash risk associated with selected medical conditions:
relative risk of crashing

<table>
<thead>
<tr>
<th>Condition</th>
<th>Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dementia</td>
<td>2.1-5.0</td>
</tr>
<tr>
<td>Alcohol abuse and 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</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>1.1-2.0</td>
</tr>
</tbody>
</table>

Common Driving Errors in Alzheimer 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

Key Messages

• It’s not age, it’s ability!
• Abilities are affected by age-associated disease that impact driving
• Abilities can be tested and, in some cases, improved
• Driving cessation is a challenging and important decision for older people with dementia
  • Engage the driver and family early in the process
Thank you for your interest and attention!
Identifying Medically At-Risk Drivers

Older Driver Safety Summit
Planning a Safe and Mobile Future for Massachusetts

Ann Hollis, OTR/L
Beth Israel Deaconess Medical Center
Objectives

- Identify how clinicians can screen for driving safety
- The DriveWise® driving evaluation program
  - Description
  - Tests used
- Conclusion
How can clinicians identify which of their patients would benefit from a clinical driving evaluation?

- Cognitive Screening tests
  - Already commonly used as part of medical assessment of older people
  - 15 to 20 mins to administer
  - Don’t require special equipment or training

- Interview based screening tools
  - Fast and simple
  - Part of standard medical interview
Mini-Mental State Examination (MMSE)

- Orientation, registration, attention/calculation, recall & language

Folstein et al., 1975

<table>
<thead>
<tr>
<th>Orientation</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>What is the (year) (season) (date) (day) (month)?</td>
<td>5</td>
</tr>
<tr>
<td>Where are we (state) (country) (town) (hospital) (floor)?</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Registration</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name 3 objects 1 second to say each. Then ask the patient all 3 after you have said them. Give 1 point for each correct answer. Then repeat until he/she learns all 3. Count trials and record.</td>
<td>3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Attention and Calculation</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serial 7s. 1 point for each correct answer. Stop after 5 answers. Alternatively spell “world” backward.</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Recall</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ask for the 3 objects repeated above. Give 1 point for each correct answer.</td>
<td>3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Language</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name a pencil and watch.</td>
<td>2</td>
</tr>
<tr>
<td>Repeat the following &quot;No ifs, ands or buts.&quot;</td>
<td>1</td>
</tr>
<tr>
<td>Follow a 3-stage command: “Take a paper in your hand, fold it in half and put it on the floor.”</td>
<td>3</td>
</tr>
<tr>
<td>Read and obey the following CLOSE YOUR EYES.</td>
<td>1</td>
</tr>
<tr>
<td>Write a sentence.</td>
<td>1</td>
</tr>
<tr>
<td>Copy the design shown.</td>
<td>1</td>
</tr>
</tbody>
</table>

Total Score

ASSESS level of consciousness along a continuum

Alert Drowsy Stupor Coma

more information on reverse
MMSE and driving

Research shows variable results;

- MMSE score predictive of driving safety (Fox et al., 1997; Stav et al., 2008; Matas et al., 2014)
- <24 is predictive of unsafe driving (Odenheimer, 1994)
- MMSE Not predictive of driving test outcome (Crizzle et al., 2012)
- No association between MMSE score and MVC’s (Joseph et al., 2014)
Montreal Cognitive Assessment (MoCA)

- Visuospatial/executive, naming, memory, attention, language, abstraction & orientation

(Nazzredine et al., 2005)
MMSE & MoCA in the prediction of driving test outcome
Hollis, Duncanson, Kapust, Xi and O’Connor 2015

• Study of 92 adult drivers
• With cognitively intact people, neither test was predictive of road test outcome
• With cognitive impairment MoCA was a better predictor
• As MoCA score decreased by 1 point, a person was 1.36 times more likely to fail
• MoCA ‘cut score’ of 18 or less
Interview based tools

- 4 C’s
- Crash/Citation, Concern, Clinical status, Cognition
- Modeled after CAGE questionnaire
### THE 4 C’s

<table>
<thead>
<tr>
<th>1</th>
<th>No Crashes</th>
<th>None</th>
<th>Good health</th>
<th>Intact</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>1+ fender bender</td>
<td>Mild concern</td>
<td>Mild medical</td>
<td>Mild decline</td>
</tr>
<tr>
<td>3</td>
<td>Major Citation</td>
<td>Moderate concern</td>
<td>Moderate medical</td>
<td>Moderate decline</td>
</tr>
<tr>
<td>4</td>
<td>Crash(es)</td>
<td>Extreme concern</td>
<td>Severe medical</td>
<td>Severe decline</td>
</tr>
</tbody>
</table>
THE 4 C’s
O’Connor, Kapust, Lin, Hollis & Jones (2010)

- Retrospective review of 160 DW records
- 4 C’s significantly associated with road test
- Concerns and Cognitive functions >.01
- 95% w 4 C’s score of 9+ marginal to unsafe on the road
DriveWise®
Beth Israel Deaconess Medical Center
Division of Cognitive Neurology
617 667-4074
IS THIS WHERE I COME FOR THAT DRIVING TEST?!
Who are our clients?

- Over 600 individuals tested over 17 years
- People with medical, cognitive or psychiatric problems that may impair driving safety
- A range of diagnoses: Alzheimer’s disease, MCI, MS, Parkinson’s, ALS, Stroke, post ECT, bipolar, musculoskeletal problems, brain tumors
- Ages: 17-97
Demographics
Breakdown by Age

- 17-25 yrs: 1%
- 30-39 yrs: 2%
- 40-49 yrs: 4%
- 50-54 yrs: 3%
- 55-59 yrs: 3%
- 60-64 yrs: 7%
- 65-69 yrs: 9%
- 70-74 yrs: 12%
- 75-79 yrs: 19%
- 80-84 yrs: 19%
- 85-89 yrs: 6%
- 90-94 yrs: 1%
- 95-99 yrs: 1%
- 50-54 yrs: 3%
- 55-59 yrs: 3%
- 60-64 yrs: 7%
- 65-69 yrs: 9%
- 70-74 yrs: 12%
DriveWise®

- Evidenced-based assessment
- Clinical Social Work assessment
- OT office testing
- Road test (OT/Driving Instructor)
- Feedback session (SW)
OT Assessment

- In Office Testing
  - Vision & visual perception
  - Cognition
  - Physical function
- Standardized on road evaluation
Vision Testing

- Visual acuity
- Visual Field
- Tracking
- Depth perception
- Contrast Sensitivity
- Useful Field of View
Useful Field of View
Useful Field of View Test  
(Ball et al., 1987)

• Three part test. Test 1, visual processing. Test 2, divided attention. Test 3 selective attention

• Predictive of road test outcome (Myers et al., 2000; Clay et al., 2005; Wood et al., 2012; Bowers et al., 2013)

• Predictive of at fault MVC’s (Owlsley et al., 1998; Ball et al., 2006; Cross et al., 2009)
UFOV Test 2

Measures speed dividing attention between two objects.

After each presentation you will be asked two questions. Which object was inside the white box?

On which spoke was the outside object located?

Indicate your answer by clicking the button which corresponds to the location of the target.
Cognitive issues relevant to driving

- Attention to task & ability to divide attention
- Information processing speed
- Decision making
- Memory
Trail Making Tests

- Sensitive to divided attention
- Many studies found predictive of driving (Roy et al., 2013)

Reitan, 1955
Physical Assessment

- Strength and range of motion
- Coordination
- Sensation
- Mobility
- Brake reaction time
On Road Evaluation

• The ‘gold standard’ for assessing driver safety (Amick & Ott, 2008)

• Standardized assessment based on the Washington University Road Test (Hunt et al., 1997) presents a variety of driving challenges

• OT and CDI both separately score driving performance (strong IRR)

• Only a ‘snapshot’ of driving
Outcomes of the DriveWise Evaluation

- Individuals can either pass, fail, or be referred for remediation.

Overall Results

- 44% Pass
- 39% Fail
- 16% Remediation
- 1% Unclear

By Gender

- Female: 71 Pass, 63 Fail, 32 Remediation, 1 Unclear
- Male: 108 Pass, 94 Fail, 33 Remediation, 4 Unclear
Improving things for older drivers

• Infrastructure improvements

• New technology
  – Vehicles
  – Training to improve skills

• Adapting vehicle for physical limitations

• Strategies for individual drivers
  – Limiting driving & planning journeys
  – Minimizing distraction
Conclusions

- Simple tests can help screen who will benefit from a driving evaluation
- In office tests whilst predictive are not enough
- On road evaluation is currently the best measure
- Age alone does not predict poor driving
Plenary Session I – Medical Track:
Identifying Medically At-Risk Drivers

Elin Schold Davis, OTR/L, CDRS
American Occupational Therapy Association
Bethesda, MD
It Matters in People’s Lives

• **Driving** is and will remain the **primary mode** of transportation for older adults.
• **Driving** represents the ability to maintain connections and contribute to the community.
• Studies show there may be a relationship between health, sense of autonomy, the **ability to drive**.
• Loss of mobility can lead to depression, low life satisfaction, health problems, isolation, and loneliness.
The Purpose of Identifying the Medically at Risk Driver

• Is to serve the individual driver
  – Awareness and prevention
  – Informed choice to access education or refresher
  – Early for informed choice or planning for driving retirement

• To prioritize safety - individual and community
  – Unfortunately some impairments cannot be compensated nor remediated

• Build message of wellness, not “take away”
Increased Risk for Injury

Frailty and Fragility
“they sustain injuries more easily and are more frail which reduces their odds at recovering from injuries”.

Medically at risk
- Diminished strength, vision or cognition

2013 DOT HS 811 864  www.NHTSA.gov
Distinguish the tools –
Distinguish the providers

• Medically at Risk
  – Screening, assessment and road test DMV
  – Comprehensive Driving Evaluation

• Purpose and interpretation

Information necessary and required to make decisions about an individual’s Driver’s License status
“different, not necessarily better”

Different Services
Different Providers
Different Outcomes and Implications

Comprehensive Driving Evaluation
Screening Tools
Driving Evaluation DI/DMV

License Status Determination
Conundrum: need for policies, licensing action, and services

- Individuals do not always make the appropriate decisions with regards to driving modification or cessation because of lack of insight, poor judgment, and loss of reasoning ability (Adler & Kuskowski, 2003).

- Up to 25 percent of older adults continue driving after a physician’s recommendation for driving cessation (Dobbs, Carr, & Morris, 2002).
Spectrum of Driver Rehab Services

Types:
- Community Based
- Medically Based
- Specialized Driver Eval & Train

Descriptions of:
- Program style
- Providers & Credentials
- Provider’s Knowledge
- Provider’s services
- Outcome

Spectrum of Driver Services: Right Services for the Right People at the Right Time
A description consumers and health care providers can use to distinguish the type of services needed for an older adult.

<table>
<thead>
<tr>
<th>Program Type</th>
<th>Driver Safety Programs</th>
<th>Driving School</th>
<th>Driver Screen</th>
<th>Clinical IADL Evaluation</th>
<th>Driver Rehabilitation Programs (Includes Driver Evaluation)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typical Providers and Credentials</td>
<td>Program specific credentials (e.g., AAP and AAA Driver Improvement Program).</td>
<td>Licensed Driving Instructor (LDI) certified by state licensing agency or Dept. of Education.</td>
<td>Health care professional (e.g., physician, social worker, neuropsychologist).</td>
<td>Occupational Therapy Practitioner (Generalist or Driver Rehabilitation Specialist). Other health professional degree with experience in instrumental activities of daily living (IADL).</td>
<td>Driver Rehabilitation Specialist®, Certified Driver Rehabilitation Specialist®, Occupational Therapist with Specialty Certification in Driving and Community Mobility.</td>
</tr>
<tr>
<td>Required Provider’s Knowledge</td>
<td>Program specific knowledge.</td>
<td>Instructs novice or reluctant drivers, excluding medical or aging conditions that might interfere with driving, for purposes of teaching/training/refresher/updating driving skills.</td>
<td>Knowledge of relevant medical conditions, assessment, referral, and/or intervention processes.</td>
<td>Knowledge of medical conditions and the implications for community mobility including driving. Assess the cognitive, visual, perceptual, behavioral and physical limitations that may impact driving performance. Integrates the clinical findings with assessment of on-road performance.</td>
<td>Applies knowledge of medical conditions with implications to driving. Assesses the cognitive, visual, perceptual, behavioral and physical limitations that may impact driving performance. Integrates the clinical findings with assessment of on-road performance.</td>
</tr>
<tr>
<td>Typical Services Provided</td>
<td>1) Classroom or computer based refresher for licensed drivers: review of rules of the road, driving strategies, state laws, etc.</td>
<td>2) Enhanced driving performance.</td>
<td>3) Acquire driver permit or license.</td>
<td>4) Acquire driver permit or license.</td>
<td>5) Acquire driver permit or license.</td>
</tr>
<tr>
<td></td>
<td>1) Counsel with family members for students/driver skill development.</td>
<td>2) Counsel with family members for students/driver skill development.</td>
<td>3) Counsel with family members for students/driver skill development.</td>
<td>4) Counsel with family members for students/driver skill development.</td>
<td>5) Counsel with family members for students/driver skill development.</td>
</tr>
<tr>
<td></td>
<td>1) Basic skills refresher course for teens, adults, license point.</td>
<td>2) Assess driving performance; provide access to counseling and education for alternative transportation options.</td>
<td>3) Develop an individualized transportation plan considering client diagnosis and needs, family/caregiver, environmental and community options and limitations.</td>
<td>4) Develop an individualized transportation plan considering client diagnosis and needs, family/caregiver, environmental and community options and limitations.</td>
<td>5) Develop an individualized transportation plan considering client diagnosis and needs, family/caregiver, environmental and community options and limitations.</td>
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<td>1) Referral management procedures.</td>
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</tbody>
</table>

AOTA The American Occupational Therapy Association, Inc.

Living to its Fullest

OCCUPATIONAL

THERAPY

AOTA

®
Behind The Wheel Using Michon’s Levels

• Operational
  – Strength to control steering wheel and braking
  – Reach to turn signal
  – Shifting into gear
BTW - Michon’s Levels

- Tactical
  - Navigate right and left turns
  - Back up and park
  - Accelerate/ slow in relationship to traffic
  - Lane change & merge
BTW - Michon’s Levels

• **Strategic**
• **Anticipation and Decisions**
  – Route planning, and judgment
  – Decision making & problem solving
  – *Can I manage this traffic?*
• **Problem solve while driving**
  – Proper response to unexpected
  – Inhibit road rage/ frustration
  – *Is it safe to merge onto highway?*
Requires a Range of Services

- Toward staying on the road
- Toward planning for driving retirement
- Respect the abruptness of a medical condition that takes driving “off the table”
  - Leaving a citizen and their family unprepared and (potentially) at a loss.
  - Important role of the medical professional.
Why Occupational Therapy & Driving?

Occupational Therapists:

- Understand the **critical demands** of driving
- Have **science-based knowledge** to understand progressive conditions and life changes affecting driving
- Understand how community mobility affects **quality of life**

[Logo: The American Occupational Therapy Association, Inc.]
Generalist

Non-driver

Impairments clearly exceed threshold for safe driving.

Able to Drive
No impairment indicators to report/restrict license.

Lower Risk: Evidence is Weak; Below thresholds in most areas.

Risk: Degree to which impairment affects fitness-to-drive is unclear. On-road evaluation is justified.

Higher Risk: Evidence is Strong; Above thresholds in most areas.

Non-driver
Impairments clearly exceed threshold for safe driving.

Interventions for Generalists: Plan & Build Options for Mobility

Maximize Skills & Abilities
Self Awareness
Mobility preservation: Driving

Refer to specialized services
Develop transportation alternatives
Mobility preservation: Transition

Promote Driving Retirement,
Mobility preservation: Implement supportive transportation

Dickerson & Schold Davis, 2013
Awareness Initiatives

CarFit

Helping Mature Drivers Find Their Safest Fit

www.Car-Fit.org

Rect v. Incorrect

Safety Awareness Week

Older Driver

Living Life To Its Fullest

The American Occupational Therapy Association, Inc.
Thank You!!

Elin Schold Davis, OTR/L, CDRS
American Occupational Therapy Association

escholddavis@aota.org
1-800-729-2682  X2200
On-Line Resources

AAA-Senior Drivers
http://seniordriving.aaa.com/

AARP-Driver Safety info, online course at
http://www.aarp.org/home-garden/transportation/info-05-2010/Warning_Signs_Stopping.html

National Highway Transportation & Safety Administration (NHTSA)
Older Road Users
http://www.nhtsa.gov/Senior-Drivers

The Hartford Center for Mature Market Excellence