Screening Tools for Aging Drivers in the Physician’s Office Setting

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An Important Shift

- Shift from Older Drivers to Medically At-Risk/Impaired Drivers Important
  - An appropriate focus on the medically impaired driver and not the older driver
  - Focus on medical impairment allows for appropriate identification of the issues and targeting solutions
  - Avoids political backlash of targeting seniors inappropriately

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The Role of Illness

Increased At-Fault Crash Risk: Selected Medical Conditions

Challenge Today ... and Projections

Current and Future Dementia Incidence, Ages 65+³

- 1 in 8 Americans 65+ currently has a dementia
- # of Americans with AD projected to triple by 2050

Projected Increases in Dementia by State

Projected Changes Between 2000 and 2025 in Alzheimer’s Prevalence by State

The Paradox

- Cognitive impairment leads to greatest increase in at-fault crashes
  - 2 to 8 times increase in risk of crash
- Yet, in the primary care setting, dementia missed in 67% of cases
  - Mild cognitive impairment missed in over 90% of cases

Cognitively impaired drivers behind the wheel?

- What does a cognitively impaired driver ‘look’ like behind the wheel?
  - Video clips of cognitively impaired drivers
    - All licensed drivers
    - All currently driving
    - Went to see their doctor for reasons other than driving
    - All scored in the ‘normal’ range on the MMSE Folstein et al. (1975)
Good Reasons to be Concerned about Cognitive Impairment

- Can a Physician tell if a Cognitively Impaired Patient is Safe to Drive?
  - Ask the patient?\(^5\)
  - Ask the family?\(^6\)
  - Use screening tools
    1. Developed to **identify cognitive impairment with or without dementia?**
    2. Developed specifically to **identify driving competency of cognitively impaired drivers?**


Accuracy of Screening Tools Developed for Identification of Cognitive Impairment

• Commonly Used Tools by Family Physicians
  • Mini Mental Status Exam (MMSE) (Folstein et al. 1975)
  • Clock Drawing Test (A number of versions are available)
  • Montreal Cognitive Assessment (MoCA) (Nasreddine et al. 2003)
  • Trail Making Test (Reitan 1958)

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Accuracy of Those Tools

- Mathias and Lucas (2009)\textsuperscript{8}
  - Meta-analytic review (consolidation/analysis of data from different studies) – Allows for the comparison of findings from all existing studies
  - Included studies that met defined criteria
    - Published in a journal and in English
    - Not a case study
    - Participants 55 and older, etc.
- Data from 21 studies analyzed (5,797 participants)
- Tools: MMSE; Trails A and B; MVPT; RT; Copy Task; Maze test; Letter Cancellation; Dot Counting; Fluency; Paper folding; UFOV; Card Sort; etc.
- Studies used on-road assessments, simulator, or driving problems as the outcome measure

Results from Mathias and Lucas (2009)

“...A wide variety of cognitive tests used...relatively few used by more than one study”

“...considerable variation in the ability of these tests to distinguish between good and bad drivers”

“In all cases, the good/pass drivers performed better than the bad/fail drivers”

(p. 648)
Results from Mathias and Lucas (2009) (Cont’d)

- “Not possible to determine the extent of overlap in the people who were identified as potentially unsafe and in need of more comprehensive driving evaluations” (p. 650)
- “There is a need for research that assesses sensitivity (e.g., ability of cognitive tests to identify unsafe drivers correctly) and specificity (e.g., ability of cognitive tests to identify safe drivers correctly)” (p. 650)
- “Cut-off scores, with known sensitivity and specificity, could then be used in health settings to determine the need for additional driver assessments” (p. 650)
Related Research

Accuracy of Screening Tools Developed for Identification of Cognitively Impaired Drivers

- # of Screening Batteries
  - California Three-Tiered Test Battery
  - DriveABLE In-Office
  - GRIMPS Battery
  - Useful Field of View®

- Inappropriate for physician’s office (e.g., time, special equipment, costs, etc.)
Why was the SIMARD MD⁹ Developed?

Screen for the Identification of cognitively impaired Medically At-Risk Drivers a Modification of the DemTect¹⁰

- Decisions about driving fitness are some of the most challenging for physicians to make
  - Importance of driving to independence and mobility
  - Fear of damaging physician-patient relationship

- Lack of evidence-based tools to assist with decision making in the clinical setting

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Screening vs. Case Finding

• Screening
  - Done at population level and is a strategy used to detect disease in any individuals without any evidence of disease (e.g., pap smears, mammograms, etc.)

• Case Finding
  - Involves assessment of a smaller group of individuals based on the presence of a risk factor (e.g., administration of the MMSE to individuals suspected of having dementia)
SIMARD MD – The Research

- Started ~ 10 years ago
- Began with a # of screening tools (e.g., MMSE) and neuropsychological tests (Trails A and B, Judgement of Line Orientation [JOLO], etc.)
- Administered tests to a sample of cognitively intact and cognitively impaired drivers (n = 181)
- Use pass/fail on science-based driving assessment for cognitively impaired drivers as our outcome measure
- Scoring and cut points developed statistically
- Then, **validated** the SIMARD MD on a new sample of cognitively intact and cognitively impaired drivers (n = 244)
Disclosure Statement

Relationships
The outcome measure used in the SIMARD MD research was the DriveABLE on road assessment, which is part of the DriveABLE Assessment. Research that led to the development of the DriveABLE Assessment was conducted by Dr. Allen Dobbs, my spouse. Dr. A. Dobbs is the Chief Scientific Officer of DriveABLE Assessment Centres Inc., a University of Alberta spin off company. Dr. A. Dobbs owns shares in the company.

I do not own shares, do not sit on the Board, nor do I have a direct financial or operational relationship with DriveABLE Assessment Centres Inc.
SIMARD MD Dual Cut Points

- Impaired: 0–30
- Driving Assessment Needed: 31–70
- Competent: 71–130
Unlikely that ‘good’ drivers and ‘bad’ drivers represent distinct populations except at the extreme ends of respective distributions.

Rather, the distributions are overlapping.
Driving evaluation likely not needed at extreme end of distribution

Incompetent Drivers

Competent Drivers

Driving evaluation likely not needed at extreme end of distribution

The ability of cognitive tests to identify ‘safe’ and ‘unsafe’ drivers is variable
Dual Cut Points Can Reduce Erroneous Decisions

False Negative (FN) – identifying someone as ‘safe’ to drive when they are ‘unsafe’
False Positive (FP) – identifying someone as ‘unsafe’ to drive when they are ‘safe’

Single cut point

Incompetent Drivers

Competent Drivers

Dual cut points

Dual cut points can reduce the FP and FN

Incompetent Drivers

Competent Drivers
Predictive Properties

Initial and Validation Study Results (n = 425)

On-Road Results

<table>
<thead>
<tr>
<th></th>
<th>Fail</th>
<th>Pass</th>
</tr>
</thead>
<tbody>
<tr>
<td>Predicted Fail</td>
<td>42</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>53</td>
<td>13</td>
</tr>
<tr>
<td>Predicted Pass</td>
<td>7</td>
<td>36</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>48</td>
</tr>
</tbody>
</table>

Overall % predicted to fail who failed = 87%
Overall % predicted to pass who passed = 81%

Black numbers – Initial Study / Grey Numbers – Validation Study
Driving Outcomes from Indeterminate Group

<table>
<thead>
<tr>
<th></th>
<th>Initial Study</th>
<th>Validation Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pass</td>
<td>40</td>
<td>64</td>
</tr>
<tr>
<td>Fail</td>
<td>49</td>
<td>59</td>
</tr>
</tbody>
</table>

Total: 212
The Role of Policy

- Cut points are a policy issue
- Science can inform about consequences of cut-point selection
- Sensitivity and specificity are ‘related’
The Role of Policy

Increase **sensitivity** (ensure that all drivers identified as unsafe to drive by screening tool are unsafe to drive)

<table>
<thead>
<tr>
<th>Impaired</th>
<th>Indeterminate (Driving Assessment Needed)</th>
<th>Competent</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–xx</td>
<td>xx–70</td>
<td>71–130</td>
</tr>
</tbody>
</table>

A lower cut point would ensure that there are fewer ‘false positives’ (e.g., fewer drivers identified as ‘unsafe to drive’ when they are ‘safe to drive’). Lowering the cut point would increase the number of drivers who fall in the indeterminate range.
The Role of Policy

Increase **specificity** (ensure that all drivers identified as ‘safe’ to drive by screening tool are ‘safe to drive’)

![Diagram showing intervals for impaired, indeterminate, and competent]

- Impaired: 0–30
- Indeterminate: 31–xx
- Competent: xx–130

Raising the cut point would ensure that there are fewer **false negatives** (e.g., fewer drivers identified as ‘safe to drive’ who are ‘unsafe to drive’). Raising the cut point would increase the number of drivers who fall in the indeterminate range.
The SIMARD MD (Summary)

- **Four short tests**
  - Takes ~ 7 minutes to administer
  - Takes < 1 minute to score
  - Available at no cost
  - Dual cut points to assist in decision making in the clinical setting
  - Is a screening tool that allows for the identification of drivers who are most likely to pass and fail a cognitive road test and those in need of further investigation by referral for a driving assessment
  - Physicians need to take into consideration findings from the clinical examination/work-up
Limitations

• All cognitive screening tools have the potential to be affected by language, education, and age

• Initial and Validation Samples – Fluent in English / Moderate to High levels of Education / No extreme upper Age Range

• However, recent research demonstrates that “demographic corrections diminish predictive accuracy for real-world activities with absolute cognitive demands” (Barrash et al., 2010)
Conclusions

- Shifting demographics
  - Number of people with dementia in the United States projected to increase triple by 2050
  - Many will be ‘behind the wheel’

- Need for shift from older drivers to medically at-risk and medically impaired drivers

- Need for education (public, physicians, policy makers, etc.) on the role that medical conditions play in driving performance

- Need for increased collaboration between researchers, policy makers, and the medical community to ensure uptake of evidence-based tools that enable evidence-based decision making
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