Driving with mild cognitive impairment and dementia: balancing risks and rights

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Talk overview

1. Health changes in normal ageing and driving
2. Multifactorial model of driving safety
3. Mild Cognitive Impairment and driving
4. Dementia and driving
Physical functioning
• Strength
• Neck rotation
• Co-ordination

Visual function
• Acuity
• Contrast sensitivity
• Eye disease

Cognitive changes
• Attention and memory
• Slower reaction time and processing speed, slower decision-making, slower to visually scan a road scene
• Increase in cognitive impairment and dementia

Example of macular degeneration
Source: Royal Society of the Blind
Decreased visual distance and sensitivity to the contrast between darkness and bright lights along roadways can be noted.

Medical related visual problems (cataracts, glaucoma, and macular degeneration) can also impact on your driving abilities.

**LIGHT REQUIREMENTS DETERMINED BY AGE**

Vision at aged 20

Vision at aged 40

http://dev.seniordriving.aaa.com/understanding-mind-body-changes/vision/light-requirements
LIGHT REQUIREMENTS DETERMINED BY AGE

Vision at aged 60

Vision at aged 80

http://dev.seniordriving.aaa.com/understanding-mind-body-changes/vision/light-requirements
Multifactorial Model of Driving Safety

Driving Behaviour

- Self-monitoring and beliefs about driving capacity
- Capacity to Drive Safely (manage a vehicle)
- Cognition
- Vision
- Physical Function

Decision made on the road, decisions about driving

Anstey et al, 2005
Older adults and driving safety

- Total fatalities decreased 26% from 2003-2013 but increase 8% for drivers 65+
- Older adults have higher rates of pedestrian fatalities
- Older drivers have fewer crashes as a result of infringements:
  - More than 50% of older driver crashes occur at intersections, or while merging.
  - Most involve multiple vehicles.
- Driving cessation associated with isolation, depression, functional impairment, transition into care
Insight reduces in normal ageing


270 drivers asked to rate their driving

- No association between self rating and actual driving performance or crash history, or errors

**Conclusion**: Drivers not necessarily able to accurately assess their own driving skill and safety
Critical errors increase with age in non-demented drivers

Anstey & Wood, Neuropsychology 2011

- Critical errors during an on-road driving test of normal drivers increased with age
- Participants were not demented, living in the community and drove regularly

See also Dawson 2011 JAGS
Mild Cognitive Impairment

- Cognitive impairment (not dementia) affects 20% of adults aged 70+ (Plassman et al, 2008)
- About 6% of older adults develop MCI annually (Ding et al, 2016)
- Cognitive impairment increases risk of dementia (4% conversion per annum) but many do not progress (Mitchell et al., 2015; Chen et al, 2016)
- Older adults therefore may spend many years living with cognitive impairment
- This group of drivers is increasing rapidly
- Sparse data on driving safety in this group
ANU Better Driving Program

Drive Route: Standard

<table>
<thead>
<tr>
<th>Instruction</th>
<th>Comment</th>
<th>Ob</th>
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<th>Brake</th>
<th>Lane pos</th>
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Safety rating from driving test - Cognitively normal compared to MCI

Cognitively normal: n=245
MCI: n = 56

Scoring:
1-3 are given when driver commits multiple serious driving errors
4-6 are borderline safe
7-10 are good drivers

Mild Cognitive Impairment Summary

• Diagnosis of MCI is not sufficient to trigger driving assessment or assume driving is impaired
• Some individuals with MCI are excellent drivers on assessment, some poor – just like the general population
• Slightly greater risk of poor driving
• Identification of eye disease, impaired vision, significant slowing, or significantly impaired executive function, reports from family or person with MCI are indicators of need for assessment
• Consider self reports of multiple crashes, or evidence of damaged car
Dementia and driving – what the research says

• General consensus that individuals with moderate to severe dementia are not fit to drive, so focus is on mild dementia

• About 50% of people with AD drive for 3 years after diagnosis (Piersma et al, Traffic Inj Prev, 2015)

• Current practice is 6 monthly assessment using on-road test and off road assessment, depending on jurisdiction

• Referral to memory clinic for diagnostic assessment typically triggers referral for driving assessment

• Critical issue is identifying when adults with mild dementia should cease driving – lack of evidence to inform clinical practice
In-car technology monitoring of driver behaviour – dementia vs no dementia

Eby et al, Accident Analysis and Prevention, 2012

17 dementia, 22 no dementia
Age 76
Drove for 2 months
4 cameras, microphone, audio radar to capture speed, GPS, accelerometer
• Video analysis – 15000 trips of people with dementia, 7000 in comparison group

• Cabin review for each ignition cycle to identify the driver, and check for passengers and a navigation device.
• Seat belt review for each ignition cycle using driver face video, which showed the driver’s shoulders.
• A sampling of all events in which the driver slowed to below 5 mph (8 kph) in order to assess behaviors at stop lights, stop signs, intersections, some unprotected left turns and other stops (including any mid-block stops).
• Red-light running review, which sampled instances of drivers passing through a signalized intersection at speeds remaining above 10 mph.
• Wayfinding trips of interest, a detailed review of video, audio, and numerical data to identify trips that may have contained driver wayfinding errors.
Results

Drivers with mild dementia

- Drove fewer km, and less often, less at night, closer to home, less likely to drive on freeway
- More likely to drive 10km below speed limit
- Less likely to wear seatbelt
- Less tailgating (ie safer)
- More lost likely trips
- No different in running red-lights
- No different in causing traffic conflicts left turns
- No different in pedal errors
- No different in running stop signs

NO LESS SAFE
Early Dementia and Crash risk

- Carr et al, 2000, US data found no increased risk – 5 year retrospective state crash record data from 58 normal controls and 63 people with AD (JAGS, 2000).
- MMSE does not predict crash risk (Joseph et al, JAGS, 2014)
- Prior to index hospitalization with dementia, people with dementia have more crashes than those admitted without dementia. However, in the three years following admission, they have fewer (Meuleners et al, 2016, Journal of the American Geriatric Society).
- Claims of triple the crash risk seem unsubstantiated by any evidence
Types of errors on road and GPS

- 60 drivers with dementia, 43% passed the driving test
- Drivers with dementia (Barco et al 2015, JAGS) made twice as many errors than controls
  - Errors of drivers with dementia who failed the driving test were not operational, but were tactical and information processing
    - lane position, difficulties in turning left
- Driving instructions (GPS) were not helpful to drivers with early AD or older drivers for left hand turns – they increase cognitive complexity and the number of items to which attention is needed (Paire-Ficoult, et al, Accident Analysis and Prevention, 2016).
Research on driving and dementia

- Lots of expert opinion and little data
- Lack of studies
- Very small sample sizes
- Poor control groups
- Mostly cross-sectional
- Lack of multidisciplinary teams with knowledge of dementia AND driving
- Minimal use of technology
- Minimal research on cessation and alternative transport

URGENT NEED FOR EVIDENCE!!!
Can physicians judge if person with dementia is safe to drive?

*Fitness-to-drive Disagreements in Individuals With Dementia*. Ranchet M¹, et al.. Gerontologist 2016.

68 patients underwent medical, visual, and road tests. Physicians and On-road assessors provided medical fitness-to-drive recommendations.

**RESULTS:**

Compared with the on-road assessors, the physicians overestimated the fitness to drive of 24 (35%) patients and underestimated the fitness to drive of 15 (22%) patients.

Gold standard remains the On Road Driving test by Occupational therapist.

- Type of dementia will impact on which driving skills are affected – not possible to make overall statements
- Assessment focuses on impaired driving skills rather than etiology
- Insufficient research on dementia subtype to generalize

Red flags for visual problems, major lack of insight, increase in risk taking, inability to conceive impact on others, inability to remain in lane, frequently losing car and getting lost, inability to maintain vehicle
<table>
<thead>
<tr>
<th>Disease</th>
<th>Prevalence</th>
<th>Typical course</th>
<th>Early symptoms</th>
<th>Likely driving difficulties</th>
<th>Fitness to drive</th>
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<tbody>
<tr>
<td>Alzheimer’s disease: classical variant</td>
<td>Very high</td>
<td>Slowly progressive</td>
<td>Episodic memory impairment</td>
<td>Perception of signs, obeying the rules of the road, route finding</td>
<td>++; –</td>
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<tr>
<td>Alzheimer’s disease: variant</td>
<td>Low</td>
<td>Slowly progressive</td>
<td>Visual impairment</td>
<td>Perception of signs, obeying the rules of the road, route finding</td>
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<tr>
<td>Alzheimer’s disease: language variant</td>
<td>Low</td>
<td>Very slowly progressive</td>
<td>Loss of train of thought, repetition of syllables</td>
<td>Map reading, slowness</td>
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<tr>
<td>Vascular and mixed dementia</td>
<td>High</td>
<td>Stepwise</td>
<td>Variable</td>
<td>Variable, perception of and reacting to other road users</td>
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<tr>
<td>Frontotemporal dementia: behavioral variant</td>
<td>Moderate</td>
<td>Slowly to moderately progressive</td>
<td>Behavioral change</td>
<td>Judgment</td>
<td>–</td>
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<tr>
<td>Frontotemporal dementia: primary nonfluent aphasia</td>
<td>Low</td>
<td>Slowly to moderately progressive</td>
<td>Difficulties with speaking</td>
<td>Map reading</td>
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<tr>
<td>Frontotemporal dementia: semantic dementia</td>
<td>Low</td>
<td>Slowly to moderately progressive</td>
<td>Difficulties with language comprehension</td>
<td>Map reading, knowledge of traffic signs</td>
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<tr>
<td>Dementia with Lewy bodies</td>
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<td>Slowly progressive</td>
<td>Visual hallucinations, fluctuating attention and cognition</td>
<td>Visual perception, operating a car</td>
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<tr>
<td>Parkinson’s disease dementia</td>
<td>High</td>
<td>Slowly progressive</td>
<td>Psychomotor slowing, executive dysfunction</td>
<td>Operating a car, slowness</td>
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<tr>
<td>Progressive supranuclear palsy: Richardson’s syndrome</td>
<td>Low</td>
<td>Moderately progressive</td>
<td>Postural instability, vertical gaze palsy, cognitive dysfunction</td>
<td>Looking at the nearby road, slowness</td>
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<tr>
<td>Progressive supranuclear palsy: Parkinsonism</td>
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<td>Moderately progressive</td>
<td>Asymmetric onset, tremor</td>
<td>Operating a car</td>
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<td>Huntington’s disease with cognitive impairment</td>
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<td>Slowly progressive</td>
<td>Chorea</td>
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<td>Creutzfeld-Jakob disease</td>
<td>Very low</td>
<td>Fast progressive</td>
<td>Memory impairment</td>
<td>Recall the rules of the road, how to operate the vehicle or where nearby vehicles are located, perceive the location, speed, and direction of one’s own vehicle, the road, road hazards</td>
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<tr>
<td>Normal-pressure hydrocephalus</td>
<td>Very low</td>
<td>Slowly progressive, surgical treatment</td>
<td>Gait disturbance, incontinence, memory impairment</td>
<td>Planning, judgment, operating a car</td>
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</tbody>
</table>

Notes: “+” — patients are probably unfit to drive; “+; –” — certain patients are fit to drive, others are unfit to drive; “?” — complete lack of knowledge about fitness to drive.
Can we intervene to improve safety in driving with dementia?

No research on interventions to improve driving safety in early dementia!

Aim is to encourage cessation not to improve safety

For some people with very mild dementia who may continue to drive for up to 3 years, consider on-road assessment with targeted feedback and driving lessons, plus feedback to person with dementia on ultimate cessation
Conclusion

• Dementia occurs in context of normal ageing changes that impact on driving safety
• Consideration of dementia in context of ageing and driving will reduce stigma
• Early referral and regular assessment remains the best approach to management of driving and dementia
• Greater consideration of remediation in those who continue to drive, to improve road safety
• Need for far better alternative transport and preparation for non-driving
Acknowledgements

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NRMA ACT Road Safety Trust grants

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NHMRC Principal Research Fellowship APP1102694 Anstey, K.J. Research to reduce cognitive decline and optimize aging well.
Variation in licensing requirements

<table>
<thead>
<tr>
<th>Jurisdiction</th>
<th>Licensing procedures and starting age</th>
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<td>Medical test</td>
<td>Knowledge test</td>
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