Driving Assessment Following Stroke

Mr. Tadhg Stapleton
Research Fellow

Discipline of Occupational Therapy, Trinity College Dublin.
► Qualitative studies - impact of driving cessation after stroke
► Quantitative studies (international)
► International Practice in driving assessment after stroke
► Irish context of practice
► Irish based study on the assessment of fitness to drive after stroke
Background

- Incidence - approx 10,000 per year admitted to hospital
- Prevalence - estimated at over 30,000
- Irish Stroke patient survey (n= 139), 29% of those who were driving prior to the stroke stopped driving after stroke (IHF 2008)
- American study; (n = 290) 70% stopped driving after stroke, 48% did not receive any advice about driving, 87% had no driving evaluation post stroke, low driving exposure post stroke (Fisk et al 1997)

Irish Heart Foundation National Audit of Stroke Care 2008
Driving patterns after stroke

- American study comparing driving patterns of 50 stroke survivors (24 drivers, 26 non-drivers) with 105 older adults without visual or neurological impairment
- Stroke drivers made significantly less trips per week (12 vs. 8) and visited less places (6 vs. 4) per week compared to non-stroke group
- Stroke drivers had significantly less total miles on the road per week (201 vs. 109)
- Stroke drivers reported significantly more difficulty with driving situations (driving alone, parallel parking, left turns in traffic, highway driving, heavy traffic, and rush hour driving)
- More restricted driving space among stroke drivers
- No difference in self reported crashes in the previous year (8% stroke drivers and 6% non-stroke drivers reported a crash)

Impact of Driving Cessation after Stroke

Qualitative studies

Logan PA, Dyas J, Gladman JRF. Using an interview study of transport use by people who have had a stroke to inform rehabilitation. *Clinical Rehabilitation*. 2004: 18; 703-708. (British study, n = 24)

Lister R. Loss of ability to drive following a stroke: the early experiences of three elderly people on discharge from hospital. *British Journal of Occupational Therapy*. 1999: 62 (11); 514-520. (Australian study, n = 3)

Patomella AH, Johansson K, Tham K. Lived experience of driving ability following stroke. *Disability and Rehabilitation*. 2009: 31 (9); 726-733. (Swedish study, n = 4)

Need to consider both subjective and objective functioning within the context of community integration (Griffen et al. Driving status and community integration after stroke. *Topics in Stroke Rehabilitation*. 2009: 16(3); 212-221.)
Negative psychological, social and functional implications associated with driving cessation

Need to plan ahead and pre-book was inconvenient and a source of frustration

Reduced flexibility, autonomy, convenience and spontaneity in transport alternatives

Guilt associated with seeking help and fear of becoming a burden on family

Value attributed to activities decreased when they could not be performed independently
Restricted lifestyle and isolation, decreased participation in interests and activities that were personally meaningful.

Sudden and unexpected loss, the ability to drive was seen as something permanent and seen as an integral part of lifestyle.

The driving assessment process was perceived negatively by some - feeling violated and degraded by the process, and felt not listened to by healthcare professionals.
International Practice

► 2 phased approach to driving assessment following stroke

► Off-Road Assessment

- Clinical based assessment usually focused on assessment of cognitive, perceptual and other skills believed to impact on driving ability
- Much effort gone into designing the ultimate off-road assessment that can accurately predict the outcome of the on-road assessment
- Issues with sensitivity and specificity

► On-Road Assessment

- Actual driving assessment, usually in a dual controlled car, approximate duration 45, open road driving, standardised route, usually conducted by the same assessor who completed the off-road assessment
- Often seen as gold standard but issues exist related to lack of structure, standardization, reliability and validity


Nouri, Tinson, Lincoln 1987
Nouri and Lincoln 1992
Similar off-road assessment battery, similar population, differing outcomes from the on-road assessment.

Three factors that might explain:
- different driving instructor
- different route
- more severely affected group

<table>
<thead>
<tr>
<th></th>
<th>Pass</th>
<th>Borderline</th>
<th>Fail</th>
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</thead>
<tbody>
<tr>
<td><strong>1987 study</strong></td>
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<tr>
<td>N = 39</td>
<td>22</td>
<td>4</td>
<td>13</td>
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<tr>
<td><strong>1992 study</strong></td>
<td></td>
<td></td>
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<tr>
<td>N = 40</td>
<td>12</td>
<td>8</td>
<td>20</td>
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International Studies

► Akinwuntan et al 2006. Belgian study, n = 68 stroke survivors, off-road an on-road test, 34 (50%) subjects passed, 26 (38%) temporarily unfit to drive, and 8 (12%) were unfit to drive.

► Smith-Arena et al 2006. North American study. n = 39. 29 (74%) passed the off-road driving evaluation, 10 (26%) failed. Of those referred for on-road evaluation (n = 29) 23 passed (overall pass rate 59%, overall fail rate 41%).

► Mazer et al 1998. Canadian study. n = 94, 8 eliminated from on-road test due to poor profile of scores on off-road, 84 completed on-road test, 33 (39%) passed the on-road, 51 (61%) failed the on-road test.
UK Guidelines

► UK - DVLA (Driver and Vehicle Licensing Agency). 'At a Glance Guide to the current Medical Standards of Fitness to Drive'

► DVLA
  ▪ No driving for 1 month post stroke
  ▪ Can resume driving 1 month post stroke if clinical recovery is satisfactory
  ▪ Notify DVLA only if residual deficits present 1 month after stroke (visual field, cognitive, limb function)
  ▪ Commercial - licence revoked for 1 year post stroke

► Rule out cognitive deficit following stroke, brain injury, dementia - visual inattention, distractibility, difficulty multitasking, reaction time, memory, concentration, and confidence

IHF Stroke guidelines

► Patient with stroke or TIA
► Should be asked if they drive or wish to drive before leaving hospital
► Options and advice should be given
► Check for definite bar to driving - significant visual field deficit, reduced visual acuity, epileptic seizures in the previous 12 months, disorders of attention - unilateral neglect
► Notify patient of need to inform insurance company
► 2 phased assessment process - off-road (physical, behavioural, cognitive & visuoperceptual) and an on-road assessment
► Advise on alternative transport options if driving is not indicated

Findings from ongoing Irish Study

- A descriptive study focused on the process of Driving Assessment following stroke within an Irish context of practice.
- Occupational therapy recommendation on the composition of the off-road assessment
- Prospective Clinical study
OT recommendations on the Off-road assessment

- Consensus formation using a Nominal Group Technique (NGT) Approach
- 13 occupational therapists contributed to the meeting
- Consensus reached on components of cognition, perception and executive functions that should be included in an off-road assessment
- Recommendation of standardised assessments that should be used in off-road assessment
Cognition
- Attention, speed of processing, orientation TPP, memory, procedural memory, sequencing, topographical orientation

Perception
- Visual inattention, spatial awareness, depth perception, figure ground, shape form and colour recognition

Executive
- Insight/self awareness, planning/foresight, judgment, problem solving, decision making

Standardised Assessments
- Test of Everyday Attention, Behavioural Assessment of Dysexecutive Syndrome, Motor Free Visual Perception Test, biVABA, Trails A & B, Rivermead Perceptual Assessment battery, MMSE, RBMT, COTNAB

Clinical prospective study

Prospective Clinical Study composed of:
- Occupational Therapy off-road assessment
- On-road assessment conducted by driving instructor with researcher in attendance
- Six month follow-up

Inclusion Criteria
- Diagnosed with stroke
- Driving prior to stroke onset
- Referred by medical doctor and medically fit to undertake the assessment
Data collection Process

- Off-road assessment
  - Driving history interview
  - Cognitive, perceptual, executive and physical assessment

- On-road assessment
  - Researcher completed 2 structured on-road assessment forms - TRIP & JRHREF

- 6 month follow-up
  - To check if still driving 6 months post on-road assessment
Off-road assessment

- Driving History Interview
- Addenbrooke's Cognitive Examination Revised (ACE-R) (includes MMSE)
- Motor free Visual perception Test (MVPT)
- Test of Everyday Attention (TEA) (sustained, selective and divided attention)
- Star and letter cancellation (BIT)
- Trail Making Test A & B
- Frontal Assessment Battery
- Behavioural Assessment of Dysexecutive Function (BADS) (Zoo Map subtest)
- ADSES (Adelaide Driving Self Efficacy Scale)
- Timed Up & Go test
- Test proprioception and stereognosis ULs & LLs
- Vision - acuity, fields, tracking
## Outcomes

<table>
<thead>
<tr>
<th>Occupational therapy off-road assessment</th>
<th>40</th>
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<tbody>
<tr>
<td>On-road assessment with the driving assessor</td>
<td><strong>31</strong> (30 completed actual on-road, 1 deemed unsuitable to take the assessment by driving assessor)</td>
</tr>
<tr>
<td>Cancelled or refused on-road assessment</td>
<td>5</td>
</tr>
<tr>
<td>Unable to take the on-road assessment</td>
<td>2</td>
</tr>
<tr>
<td>Awaiting on-road assessment</td>
<td>2</td>
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International findings - Akinwutan et al 2006 (n = 68, fail = 34, 50%), Smith-Arena et al 2005 (n = 39, fail = 16, 41%), Mazer et al 1998 (n = 84, Fail = 51, 60%)

<table>
<thead>
<tr>
<th>Driving Outcome</th>
<th>n</th>
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<tr>
<td>Safe for immediate unrestricted driving</td>
<td>23 (77%)</td>
</tr>
<tr>
<td>Safe for restricted driving</td>
<td>5 (16%)</td>
</tr>
<tr>
<td>Lessons recommended</td>
<td>2 (6.6%)</td>
</tr>
<tr>
<td>Unsafe/Fail</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Total</td>
<td>30</td>
</tr>
<tr>
<td>Mean score and range</td>
<td>TRIP (max = 209)</td>
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<tr>
<td>----------------------</td>
<td>------------------</td>
</tr>
<tr>
<td>Safe</td>
<td>196.9 (169-209)</td>
</tr>
<tr>
<td>Restricted</td>
<td>175.5 (132-196)</td>
</tr>
<tr>
<td>Lessons</td>
<td>146 (134 - 158)</td>
</tr>
</tbody>
</table>
Kruskal Wallis Analysis

grouping variable - on-road driving outcome (safe, restricted, lessons)

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<tr>
<th>On-road Assessment Scale</th>
<th>P Value</th>
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<tbody>
<tr>
<td>TRIP (n = 27)</td>
<td>0.032</td>
</tr>
<tr>
<td>JRHREF (n = 27)</td>
<td>0.001</td>
</tr>
<tr>
<td>ADSES</td>
<td>0.015</td>
</tr>
</tbody>
</table>
## Mann Whitney U test comparing immediately safe for unrestricted and unsafe for unrestricted driving

<table>
<thead>
<tr>
<th>Off-road assessment</th>
<th>Scores (mean and range)</th>
<th>P value</th>
</tr>
</thead>
</table>
| Time to complete star cancellation | Safe 63.96 (33-175) seconds  
Unsafe 102 (38-286) seconds      | 0.048  |
| Map search 1 (TEA)             | Safe 28.7 (14-49) targets  
Unsafe 18.75 (7-39) targets      | 0.023  |
| Map search 2 (TEA)             | Safe 51.87 (27-75) targets  
Unsafe 35.88 (20-70) targets      | 0.020  |
| Selective attention (TEA)      | Safe 8.26 (1-10) correct strings  
Unsafe 6.43 (3-9) correct strings  | 0.037  |
| Zoo Map 1 time (BADS)          | Safe 128.7 (48-276) seconds  
Unsafe 227.67 (115-478) seconds | 0.026  |
| ADSES                          | Safe 110.35 (80-120)  
Unsafe 97 (84-111)               | 0.003  |
| ADSES by proxy                 | Safe 108.43 (84-120)  
Unsafe 89.67 (72-118)            | 0.033  |
| OT impression after off-road   | Safe 8.76 (5-10)  
Unsafe 6.57 (4-10)               | 0.042  |
Six month follow-up (ongoing, n = 19)

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<tr>
<th>Not driving at follow up</th>
<th>2</th>
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<tr>
<td>Reported crash/incident</td>
<td>2</td>
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<tr>
<td>Amount of driving</td>
<td></td>
</tr>
<tr>
<td>Same as before</td>
<td>9</td>
</tr>
<tr>
<td>Little less than before</td>
<td>4</td>
</tr>
<tr>
<td>Lot less than before</td>
<td>4</td>
</tr>
<tr>
<td>Driving Skill</td>
<td></td>
</tr>
<tr>
<td>Same as before</td>
<td>13</td>
</tr>
<tr>
<td>Little worse than before</td>
<td>3</td>
</tr>
<tr>
<td>Little better than before</td>
<td>1</td>
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Future directions of the research study

- Qualitative component to explore the clinical reasoning and decision making processes of the main stakeholders in the return to driving decision for people with stroke
  - Medical Consultants
  - Occupational Therapists
  - Driving Assessors
Driving is an important issue that needs to be addressed after stroke. Perhaps some reluctance to address this issue due to absence of clear guidelines?

The process of determining fitness to drive after stroke needs clarification and standardisation.

Need greater awareness of the international research findings and consider how they apply within the Irish context.
Acknowledgments

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► Dr Deirdre Connolly and Prof. Des O’Neill - research supervisors
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