Stroke + Driving... *Doctor can I drive?*

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1. Describe the **prerequisite and requisite skills** required for safe driving that are affected by stroke;

2. What to tell a patient with stroke and family when they ask about driving safety after a stroke - “**crash risk**” post-stroke;

3. What to tell patients/families early on when they ask “**Am I likely to return to driving**?”;

4. Differentiate **suitable/not suitable** management of screening/assessment of driving post-stroke; legislation etc.;

5. Identify measures useful in **quick office screening** versus **comprehensive assessment** of a driver post-stroke;

6. Briefly describe **effectiveness of interventions** to enhance post-stroke driving.
The Complexity of Stroke

- Visual-perception
- Sensory/proprioceptive impairment
- Gross motor function
- Balance/Walking
- New medications
- Behaviour
- Communication
- Vision
- Executive function
- Fine motor function
- Cognition
Multiple co-morbidities

Medications

STROKE

CONCERN: Common Medications + New Prescriptions post-stroke

- benzodiazepines over-represented in crashes – long half life meds more so than short-half life;
- driving impact of sedating antidepressants (amitriptyline, imipramine, doxepin mianserin) seen initially but only mianserin remains a concern after one week;
- nocturnal doses do not impact on next day;
- non-sedating meds do not generally affect driving;
- neuroleptic meds impair driving.
Source: Transport Canada
Retrieved February 20, 2005.
“vision” post-stroke is often misunderstood
Visual attention often affected? Useful field of view strong predictor of crashes

Reproduced with permission, Karlene Ball et al
Ready to test yourself?
Welcome to UFOV® Test 1

This exercise will measure how fast you can identify a single object.

Touch continue for a demonstration
Welcome to UFOV® Test 2

This exercise will measure how fast you can divide your attention between two objects.

Touch continue for a demonstration.

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.
Welcome to UFOV® Test 3

This exercise will measure how fast you can divide your attention between two objects when the outside object is surrounded by clutter.

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.
1. Describe the **prerequisite and requisite skills** required for safe driving that are affected by stroke;

2. What to tell a patient with stroke and family when they ask about driving safety after a stroke - “**crash risk**” post-stroke;

3. What to tell patients/families about “Am I likely to return to driving?”;

4. Differentiate suitable/not suitable management of screening/assessment of driving post-stroke;

5. Identify measures useful in screening versus assessment of a driver post-stroke;

6. Describe effectiveness of interventions to enhance post-stroke driving.
Mrs. W - a 58 year old accountant - has recently experienced a left hemisphere stroke and after 2 weeks in in-patient rehab is discharged home today.

She has mild weakness of the right upper and lower extremity but is quickly returning to good physical function.

She is having slight difficulty finding words but understands what is said. She was working before the stroke and plans to return.

Mrs. W wants to resume driving as soon as possible.

She consults with you – what is the risk based on scientific evidence?
The risk of motor vehicle crashes in post-stroke drivers: a structured review


Funded by the Public Health Agency of Canada
Crashes in those with stroke versus those without stroke

- 2998 abstracts screened
- 7 met inclusion criteria
- 12 additional articles found via citation tracking
- 2 studies met inclusion criteria
- Total = 9 studies (5 cohort and 4 case-control)
Cohort Studies- Only one sufficiently powered

• Sims et al. 2000
  • Studied 17 persons with stroke, out of a total sample size of 174 older adults
  • Followed cohort over five years
    • Cox proportional hazards model adjusted for age, race, gender, and driving exposure
  • 2.71 (95% CI 1.11 – 6.61) for stroke as a factor associated with crash
<table>
<thead>
<tr>
<th>Case-control studies</th>
<th>Crash</th>
<th>No crash</th>
<th>Adjusted Odds Ratio (95% CI)</th>
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<td>Koepsell et al. 1994</td>
<td>Stroke</td>
<td>4</td>
<td>10</td>
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<td></td>
<td>No Stroke</td>
<td>230</td>
<td>436</td>
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<td>Sims et al. 1998</td>
<td>Stroke</td>
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<td>McGwin et al. 2000</td>
<td>Stroke</td>
<td>18</td>
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<td>435</td>
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<td>Sagberg et al. 2006</td>
<td>Stroke</td>
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<td></td>
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<td>2190</td>
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</table>

* Adjusted for age & sex
*# Adjusted for driving exposure
≠ Unadjusted odds ratio
• There appears to be an increased risk of crashes in those with stroke;

• **BUT** we do not know about specific stroke sequelae or side of lesion and crash risk specific to these;

• **IMPORTANT**: once we know more clearly about crash risk by sequelae we will be better able to assess the impact of interventions on reducing crash risk.
What to tell patients/families about “who is likely to return to driving”

- 3 studies between 1986 and 2008
  - 2 of 3 examined physical function ONLY
  - 1 examined visual perception and cognition ONLY

- FINDINGS: Persons with better cognition, physical function, and visual perception are more likely to return to driving


Driving post-stroke: predictors of driving resumption


QUESTION: At three months post-stroke could we predict who would return to driving at one year?
Participants

- 678 persons with stroke recruited while in acute care in Ontario or Quebec, Canada

- interviewed at 1, 3, 6 and 12 months post-stroke return home
  - used 3 month interview and 12 month data

- health status and health-related quality of life measures (SF-36, Stroke Impact Scale, etc.)
I can drive a car anywhere, as before

I can drive a car in my neighborhood, avoiding traffic or highways

I cannot drive since my stroke

I have never driven a car, or had stopped driving long before my stroke
678 original cohort

446 assessed for driving at 12 months

290 pre-stroke drivers

232 not assessed for driving

177 61% returned to driving

113 did not return to driving

156 did not drive before stroke
What factors predicted return to driving?

• Predictive effect:
  – type of stroke (hemorrhagic less likely to return to driving)
  – physical strength and activity
  – cognition (MMSE – each point reduced odds by 30%)

• Mediating variables:
  – gender (female more fatigued)
  – fatigue
Today’s Learning Objectives

1. Describe the **prerequisite and requisite skills** required for safe driving that are affected by stroke;

2. What to tell a patient with stroke and family when they ask about driving safety after a stroke - “**crash risk**” post-stroke;

3. What to tell patients/families about “**Am I likely to return to driving**?”;

4. Differentiate **suitable/not suitable** management of screening/assessment of driving post-stroke;

5. Identify measures useful in **screening** versus **assessment** of a driver post-stroke;

6. Describe **effectiveness of interventions** to enhance post-stroke driving.
Screening versus Assessment

Screening is typically a quick, relatively inexpensive beginning to the assessment process.

The assessment process is usually more detailed, to provide a more definitive diagnosis.

- Who should be screening?
- What should screening consist of?
- Who should be doing in-depth assessment?
First - clarify your role … medical vs functional fitness to drive

While “provincial/state licensing authorities have the final responsibility for determining medical fitness to drive”

the physician assesses “medical” fitness

the occupational therapist or certified driver rehabilitation clinician screens/assesses “functional” fitness
Why the emphasis on the functional?

- A focus on diagnosis alone, rather than on function, is potentially discriminatory as per….

- The **Grismer Estate case** [1999] 3 S.C.R. 868, a leading **Supreme Court of Canada** decision on human rights law.

- Terry Grismer was forced to give up driving because of homonymous hemianopsia - a medical condition that at the time precluded driving;

- The Human Rights Tribunal found that the Superintendent directly discriminated and went on to order a reassessment of Grismer's visual abilities and a **functional evaluation** of driving ability.
Who screens for driving in Quebec …

- 5 disciplines doctors, optometrists, nurses, psychologists and occupational therapists are recognized by the Code de Securité (Article 603)

- In Quebec - physicians may report medical status of any person whose medical status could affect driving. In Ontario - must report.

- Any person who divulges the information is legally protected)
Transient ischemic attacks (TIA) and driving

“Patients who have experienced either a single or recurrent TIA should not be allowed to drive any type of motor vehicle until a medical assessment and appropriate investigations are completed.

They may resume driving if the neurologic assessment discloses no residual loss of functional ability, and any underlying cause has been addressed with appropriate treatment” (CMA, 2012).

http://www.cma.ca/multimedia/CMA/Content_Images/Inside_cma/WhatWePublish/Drivers_Guide/Section14_e.pdf
**Stroke and driving**

- Patients with stroke should **not** drive for at least 1 month.

- During this time they **must be assessed** by their regular physician, as well as their occupational therapist, physiotherapist or speech pathologist.

They may resume driving if

- no clinically significant motor, cognitive, perceptual or vision deficits

- neurologic assessment discloses no obvious risk of sudden recurrence

- any underlying cause has been addressed with appropriate treatment and,

- a post stroke seizure has not occurred.
Stroke and driving

- In the case of a residual loss of motor power, the patient must take a driving evaluation at a designated driver assessment centre.

- Patients with a visual field deficit due to the stroke, must visit an optometrist or ophthalmologist.

- The report should be sent to the motor vehicle licensing authority reporting all changes in visual field.

- Patients who do resume driving should remain under regular medical supervision.
A Discussion of Issues

- Chief Coroner’s Report re the Death of E. Kidnie

  - “many physicians neither aware nor complying with reporting requirements”
  - “…important for physicians to be educated in identifying and counseling medically impaired drivers …”
  - “should place increased reliance on sources other than physicians for identifying potentially medically impaired drivers”

Korner-Bitensky et al, Response to the Chief Coroner of Ontario, Dec 2006
Confidence in assuming this role is an issue for all!
How confident are family physicians with screening older individuals re driving?

We studied

- 449 family physicians in 5 Canadian regions


We asked questions like…

Physicians are the most qualified professionals to evaluate driving fitness?
I am confident in my ability to evaluate driving fitness.
Also needed to understand what occupational therapists needed to become proficient at in terms of their role

So, we conducted a national survey of 133 OTs working with older adult
When we asked - *How competent do you feel?*

very/somewhat /not very/not at all

**VERY COMPETENT**

Knowledge on conditions effecting driving - 31%

Choosing screening tools - 20%

Screening for impairments - 30%

Assessing on-road performance - 14%

Recommending car adaptations - 8%
So the basics ... what screening tools are available for easy office use?

- Asking 1 question:

  *Do you drive?*
If the person says “yes”

QUERY - Before your stroke had you changed your driving in the past year?

For example,

- Were you driving: in the evening?
  - on the highway?
  - long distances?
  - in busy traffic?

Before your stroke were you having any difficulties driving?
You may also wish to ask family about warning signs that were present pre-stroke

- Forgetting to buckle up
- Getting lost
- Failure to yield the right of way
- Driving too slowly, too quickly
- Not obeying stop signs, traffic lights
- Stopping at green light
- Not noticing other cars
- Having difficulty maintaining lane position
- Reacting too slowly – honked at, passed often

Available at American Medical Association website
Start with a quick Cognition Screen such as….

- **Mini Mental (MMSE)** – cut-off of <24 (some say 18) should not be driving or should be seen for further evaluation.

  Short on time - use only the Cued Recall Test (bed, apple, shoe)

- **Clock Drawing** *(8 elements scored)*

- **MOCA (Montreal Cognitive Assessment)** – (cutoff of 23 high sensitivity for detecting MCI; more sensitive than the MMSE – see the tools at

All of these tools and information on scoring etc. specific to stroke are available on our website Korner-Bitensky et al (www.strokengine.ca)
Clock Drawing

Checklist:

1. All 12 hours placed in correct order (with #12 on top)
2. Numbers have no duplications, omissions, foreign marks
3. Numbers all drawn inside the clock circle
4. Numbers are equally spaced/or nearly so
5. Numbers are equally spaced/nearly from edge of the circle
6. One hand correctly points to 2:00 o’clock
7. The other hand correctly points to 11:00
8. Only two clock hands
Clock Drawing – might also show possible visual perception deficits and presence of unilateral spatial neglect post-stroke
Unilateral Spatial Neglect
Korner-Bitensky et al - www.strokengine.ca

“failure to attend to side opposite of the lesion”

Three Hemispaces (Swan, 2001)

- Personal Space
- Near Extrapersonal Space
- Far Extrapersonal Space

Theory supported by neuroimaging studies
Reaction Time

• Explaining the meaning… excellent face validity for patients

• Translates well into stopping times

• Challenging to find a valid and reliable tool for office use

• Ruler Drop Test
Ruler Drop Test

- Hold ruler in your outstretched index finger and thumb, so that the top of the client’s thumb is level with the zero centimetre line;
- Instruct the client to catch the ruler as soon as possible after you release it;
- Release the ruler;
- Record reading of where the top of the person’s thumb is on ruler;
- The test is repeated 2 more times and use the average.
Executive Function Quick Screen

- **Trail Making A and B** (takes 3 to 4 minutes) (available at www.strokengine.ca)
- Can be scored in errors and in time taken to complete
Trail Making Test A

• Part A - Visual attention and scanning

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Trail Making Test B

- Part B - Visual planning and sequencing

Reprinted with permission
Color Trails Test

- Available to assess those who may have difficulty with number and letter recognition;
Executive Functions –
many definitions exist and complex to assess

- self awareness/insight
- working memory
- judgment
- decision making
- cognitive flexibility
- impulse control
- planning
Mrs. X. is in the emergency department of your acute care site. She was diagnosed this a.m. with a mild right hemisphere stroke. She has some minimal weakness of the left upper and lower extremity that is quickly resolving.

On questioning Mrs. X indicates she is a driver – in fact she volunteers by driving older adults to appointments.

The medical resident indicates that Mrs. X is ready for discharge home this afternoon

... Action needed?
Should Mrs. X. be driving?

Step #1

FIRST – Ask your screening question – are you a driver??? YES SHE IS

IF yes - Review regulations re stroke + driving with Mrs. X and her family;

Step #2

Quick screen - eg MMSE or MoCA, Clock Drawing, Trails A + B, USN assessment if you think it is a concern – Catherine Bergego Scale (longer) APMR2003 Jan;84(1):51-7 is the only validated tool for far extrapersonal space but use a quick check if you are concerned and have a corridor near by…..

Step #3

Discussion with Mrs. X and family re driving and need for evaluation by driver rehabilitation specialist and,

possible training + in car practice that might be recommended.

NO driving for one month as per most guidelines
Visual Impairment

- visual acuity - Snellen
- peripheral vision
- night vision
- glare
- contrast sensitivity (Pelli-Robson)

NOTE: Those with post-stroke USN may have poorer contrast sensitivity contralateral to the lesion – typically left side (Ogourtsova, Korner-Bitensky, Eskes, Fellows, Ptito. Superior colliculi involvement in post-stroke unilateral spatial neglect: A pilot study. Topics in Stroke Rehab - 2011)
Mr. X. has been in acute care for 3 weeks. He has moderate upper and lower limb left sided paralysis that has improved slightly since admission. His MMSE score today is 22 and when you query him and his family – he has had 2 accidents/crashes in the past year.

He was having difficulty with his memory – the wife reports that there had been a diagnosis of mild cognitive impairment 2 years ago and his memory seems worse since the stroke. You also note that his clock drawing looks like this…
Mr X’s clock etc.
Is an Assessment Required?

- Were your screening results sufficiently conclusive so that a specialized driving assessment is not needed?

- Are you referring for functional assessment **BUT** already knowing the client will fail ...to “prove to him that he cannot drive safely”

**What other factors should you consider?**
- previous driving experience (family and client checklist)
- his awareness of skills, limitations
- cognition/executive function for learning compensatory skills?
- anticipation that client will follow recommendations re retraining etc.
The “Dirty” Job – when it is obvious
What do we know about clients and their judgments about when to stop driving?

- 37% of those with intermediate cognitive test performance were still driving (Valcour et al, AGS, 2002)
- 23.1% of those with poor cognitive test performance were still driving (Valcour et al, AGS, 2002)
- Medical conditions were most common reason for self-reported driving cessation.
  
  !! The more medical conditions a driver had the less likely he was to have stopped driving (Dellinger et al, AGS, 2001)
Mrs. W. - the 58 year old accountant - left hemisphere stroke - after 2 weeks in in-patient rehab is being discharged home today.

She has mild weakness of the right upper and lower extremity but is quickly returning to good physical function.

She is having slight difficulty finding words but understands what is said. She was working before the stroke and plans to return.

Mrs. W wants to resume driving as soon as possible.

Suggestions to help her get back safely?
What to do re Mrs. W?

- Referral to a driving assessment site
- Private or public?
- What if the patient refuses?
- What do you indicate on the referral?
- What if YOU are it – no other clinician in your region? Far away from major city?
1. Review real numbers re “crash risk” post-stroke;
2. Describe the profile of the individual who will “return to driving” and who will not return post-stroke;
3. Understand the prerequisite and requisite skills required for safe driving that are affected by stroke;
4. Identify measures useful in screening versus assessment of a driver post-stroke;
5. Differentiate a suitable / not suitable referral to a Driver Rehabilitation Specialist;
6. Describe the evidence on effectiveness of interventions to enhance post-stroke driving
National Blueprint for Injury Prevention in Older Drivers

Korner-Bitensky et al, 2007
Public Health Agency of Canada
Some important considerations in considering retraining post-stroke...

“Brain plasticity research is encouraging”

“Health promotion on the rise”

“Reversal of once thought to be “irreversible”

“Life long learning concept”

“Need to increase rehabilitation role in post-stroke return to driving”

“Health promotion on the rise”

“Life long learning concept”

“Need to increase rehabilitation role in post-stroke return to driving”
What types of training exist post-stroke?

- Cognitive training
- Simulator retraining/UFOV training
- In car practicing with adaptations
Does UFOV training improve driving outcomes? RCT

97 patients sub-acute period\UFOV or cognitive training

OUTCOME -
No significant difference by training

EXCEPT

For patients with Right hemisphere lesion
UFOV group 2X more likely to pass on-road test

Simulator training?
Akinwuntan et al, 2006

Cognitive training

Post-intervention
Pre-road driving test results

73% vs 42% pass rate in favor of simulator

Simulator training 15 hours
Does In car training improve driving outcomes?

**STUDY GROUP:** Those with stroke who had failed their on-road test

- 2 hours of in class
- 12 hours on-road

**OUTCOME:**

**ROAD TEST**

85% passed 2nd test

Soderstrom et al 2006.
DYNAVISION
(Klavora et al., 1994-1995; Crotty + George 2009)
FINALLY, another important aspect of intervention…. facilitating gracious driving “retirement”

- Discuss alternatives re mobility – taxi, friends/family transport service
- Discuss financial savings – no more insurance premiums
- Indicate they deserve to be driven “all those years you drove people”
- Most important - respect that it is a very negative experience and they need to be heard

Explain in concrete “face validity” re vision, response time to stop etc.

- patient may accept “visual issues”
- harder to accept “cognitive reason” to stop
Thank you  nicol.korner-bitensky@mcgill.ca
McGill University, Montreal, Canada

LETS DO IT RIGHT – SCREEN, ASSESS, RETRAIN, MAXIMIZE MOBILITY