Driving for the Long Haul: How to Stay Healthy and Safe Behind the Wheel?

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PRESENTATION OBJECTIVES

Identify the safety risks and conditions of drivers with dementia that may put patients at risk for unsafe driving

Utilize effective methods of clinically screening demented patients for driving fitness

Treat impairments and health conditions that impact driving fitness

Consider community resources

DRIVING BENEFITS AND RISKS

- Benefits of driving
  - Working or volunteering
  - Access to health care
  - Social participation

  Supports
  - Autonomy
  - Identify
  - Independence
- Risk of driving
  - Significant costs
  - Environmental impacts
  - Potential health issues
  - Road risks
  - Societal effects

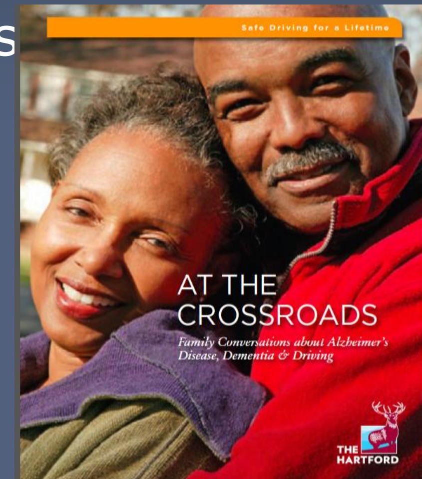
- Benefits of driving cessation
  - Significant cost savings
  - Reduced stress and anxiety
  - Improved personal safety
  - Physical health
  - New social opportunities
  - Environmental impact
- Risks of driving cessation
  - Depression and loss
  - Social isolation
  - Decline in health
  - Difficulty accessing services
  - Disrupt caregiver roles
  - Impact work or volunteering

DRIVING CESSATION RISK FACTORS

- Process
  - Voluntary or Involuntary
- Cognitive Impairment
  - Acute or Chronic
- Physical health
  - Medical conditions
  - Functional limitations
- Psychological health
  - Low confidence
  - Depression
  - Personality traits
  - Anxiety
- Accessibility
  - Transportation support
- Interpersonal influence
  - Feedback from family/friend
  - Physician feedback
  - Society influence
  - Social network support
- Policies
  - State licensing policies
  - License revocation
  - Restricted licensing
- Socio-demographic characteristics
  - Age, gender, minority race
  - Poor education
  - Urban residence
  - Finances, role changes

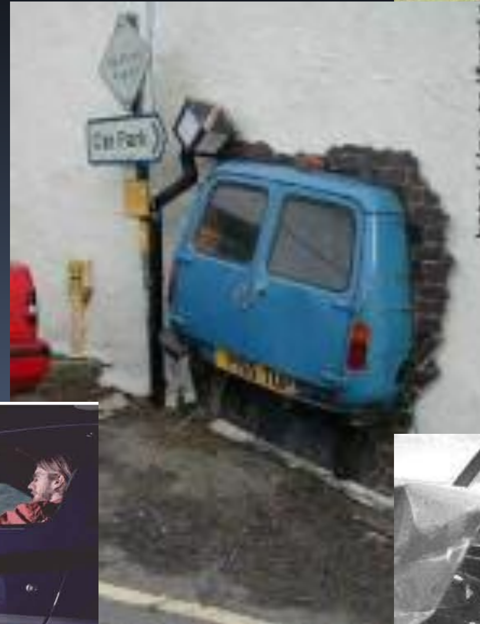
Drivers with Dementia

- Older drivers as an age group are the safest drivers based on absolute crash risk per year
- Many medically impaired drivers will not have an elevated crash risk or only a minimally elevated crash risk
- Age should not be a factor in medical fitness to drive decisions
- Increasing Prevalence of Chronic Disease and Demented Drivers
- Demented drivers carry about a two-fold increase in crash risk
- More Potential Drivers with Multiple Medical Diseases/Meds
- Increased Morbidity and Mortality when in an MVC's
- The most vulnerable are likely low mileage drivers
- Many older adults retire from driving on their own
- Growing transportation burden for families, caregivers, and society to provide trips



Driving Outcomes

- Cessation/Retirement
- Crashes
- Road Tests
- Simulators
- Others



FITNES-TO-DRIVE STAKEHOLDERS

- Patient
- Family and Friends
- Health Professionals
- Organizations
- Patrol Officers
- State DMV
- Insurance
- Community
- Federal/NHTSA

National Guidelines on Driving and Dementia

Current Psychiatry Reports (2018) 20: 16
https://doi.org/10.1007/s11920-018-0879-x

GERIATRIC DISORDERS (W MCDONALD, SECTION EDITOR)

An International Approach to Enhancing a National Guideline on Driving and Dementia

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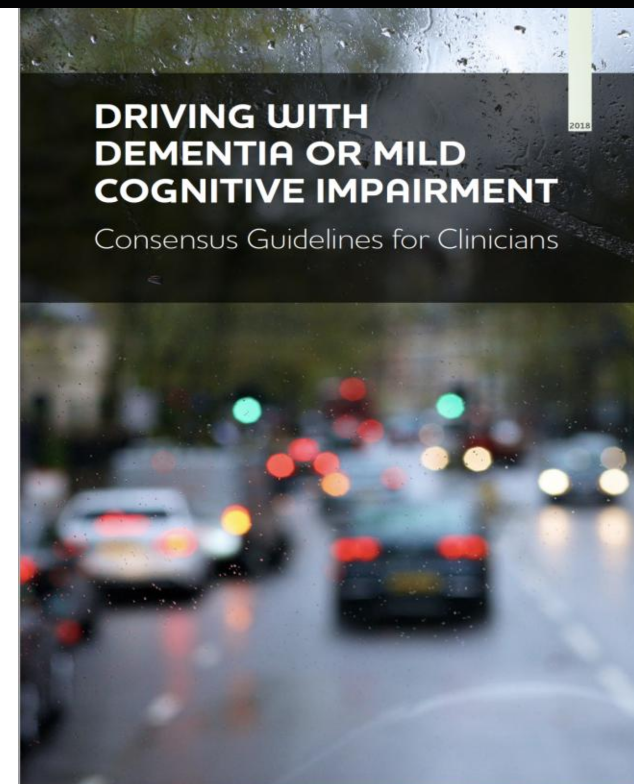

Rapport M, et al. International Approach to Enhancing a National Guideline on Driving and Dementia. Current Psychiatry Reports 2018; 20:16

Driving & Dementia Working Group (2018). Driving with dementia or mild cognitive impairment Consensus guidelines for clinicians. United Kingdom.
Available: https://research.ncl.ac.uk/driving-and-dementia/consensusguidelinesforclinicians/

AFP 2025, Dementia and Driving

Clinical Questions One Might Ask…

Should clinicians be involved in fitness-to-drive evaluations? YES!

Should a diagnosis of Alzheimer's disease result in immediate cessation of driving privileges? N0!

Is there a level of dementia severity where driving becomes unsafe? Yes, but variable

How can one rate dementia severity if they don't use the Clinical Dementia Rating (CDR)? Screens-cognition/ADL's

CLINICAL DEMENTIA RATING (CDR):	0	0.5	1	2	3
	Impairment				
	None 0	Questionable 0.5	Mild 1	Moderate 2	Severe 3
Memory	No memory loss or slight inconsistent forgetfulness	Consistent slight forgetfulness; partial recollection of events; "benign" forgetfulness	Moderate memory loss; more marked for recent events; defect interferes with everyday activities	Severe memory loss; only highly learned material retained; new material rapidly lost	Severe memory loss; only fragments remain
Orientation	Fully oriented	Fully oriented except for slight difficulty with time relationships	Moderate difficulty with time relationships; oriented for place at examination; may have geographic disorientation elsewhere	Severe difficulty with time relationships; usually disoriented to time, often to place	Oriented to person only
Judgment & Problem Solving	Solves everyday problems & handles business & financial affairs well; judgment good in relation to past performance	Slight impairment in solving problems, similarities, and differences	Moderate difficulty in handling problems, similarities, and differences; social judgment usually maintained	Severely impaired in handling problems, similarities, and differences; social judgment usually impaired	Unable to make judgments or solve problems
Community Affairs	Independent function at usual level in job, shopping, volunteer and social groups	Slight impairment in these activities	Unable to function independently at these activities although may still be engaged in some; appears normal to casual inspection	No pretense of independent function outside home Appears well enough to be taken to functions outside a family home	No pretense of independent function outside home Appears too ill to be taken to functions outside a family home
Home and Hobbies	Life at home, hobbies, and intellectual interests well maintained	Life at home, hobbies, and intellectual interests slightly impaired	Mild but definite impairment of function at home; more difficult chores abandoned; more complicated hobbies and interests abandoned	Only simple chores preserved; very restricted interests, poorly maintained	No significant function in home
Personal Care	Fully capable of self-care		Needs prompting	Requires assistance in dressing, hygiene, keeping of personal effects	Requires much help with personal care; frequent incontinence

Past National Guidelines

Patients with Very Mild Dementia are Likely Safe to Drive
Patients with Mild Dementia may be unsafe
-Clinicians should consider further assessment
Patients with Moderate to Severe Dementia should not drive
But really depends on the TYPE of dementia!

Etiology	MCI	Mild Dementia	Moderate Dementia	Severe Dementia
ADD	Slightly Increased	Moderate	Very High	
VaD	Increased	High	Very High	
FTD				
DLB				
PDD				

Toepper M and Falkenstein M. Driving Fitness and Different Forms of Dementia. 2019. JAGS 67:2186-2192.

Case-Based Approach

- An 83 year old female presents with early AD
- Daughter raises concerns about driving given mother's slowed reaction time, medications, and other medical conditions
- PMH: HTN, Type II DM, Anxiety Disorder (GAD)
- Medications:

Atenolol 50mg BID,
Metformin 500g BID
Alprazolam .25 TID
Sertraline 25mg QD

Fitness to Drive Steps

- Step 1:
  Driving History and Med Review
- Step 2:
  Examine Co-Morbidities
- Step 3:
  Physical Examination
- Step 4:
  Rate Primary Disease Severity
- Step 5:
  Referral, Rehab, and/or Counseling

Step 1: Driving History

- Driving Behaviors (lostx1)
- Informant Rating (fair)
- Exposure (low)
- Personality (no change)
- Violations (none)
- Crashes (none)
- Others?

Bixby et al. Comparing caregiver and clinician prediction of fitness to drive in people with AD. Am J Occup Ther. 2015; 69: 1-7

Step 2a: Co-Morbid Conditions/Physical Exam

- Visual Acuity
- Visual Fields
- Motor Examination wnl
  - Muscle Strength
  - Range of Motion
- Co-Morbid Conditions
  - Hypersomnolence/OSA
  - Medication Review
  - Medical Conditions
- Cognitive Screens:
  - Clock (normal)
  - TMT A (55 secs), TMT B (190 secs)

SLEEPINESS SCALE

EPWORTH SLEEPINESS SCALE

Name: ______ DOB: ______ Date: ______

This questionnaire was developed to determine the level of daytime sleepiness in individuals. It has become one of the most frequently used methods for determining a person's average level of daytime sleepiness.

Please rate how likely you are to doze or fall asleep in the following situations by selecting the response that best applies. If you have not done some of these activities recently, select what would most likely happen if you were in that situation.

0 Would *never* doze | 1 *Slight* chance of dozing | 2 *Moderate* chance of dozing | 3 *High* chance of dozing

	Chance of Dozing			
Sitting and reading	0	1	2	3
Watching television	0	1	2	3
Sitting inactive in a public place (eg, a theater or a meeting)	0	1	2	3
As a passenger in a car for an hour without a break	0	1	2	3
Lying down to rest in the afternoon when circumstances permit	0	1	2	3
Sitting and talking to someone	0	1	2	3
Sitting quietly after a lunch without alcohol	0	1	2	3
In a car, while stopped for a few minutes in traffic	0	1	2	3
Total Score:				

Interpreting Epworth Sleepiness Scale Scores[1,2]		
Normal	EDS*	High Levels of EDS*
0-10	>10	>16

Sources: 1. Johns M, Hocking B. Excessive daytime sleepiness: daytime sleepiness and sleep habits of Australian workers. *Sleep*. 1997;20(10):844-849. 2. Johns MW. A new method for measuring daytime sleepiness: the Epworth sleepiness scale. *Sleep*. 1991;14(6):540-545.

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*Excessive daytime sleepiness.

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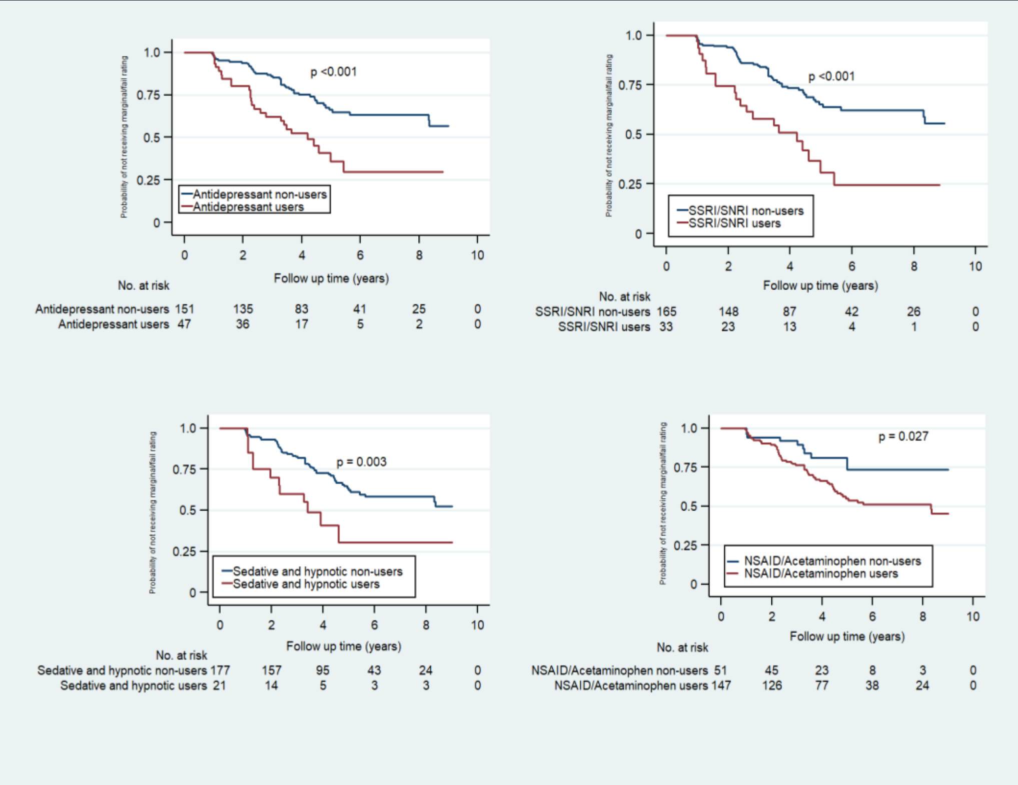
Potentially Driver-Impairing Medications



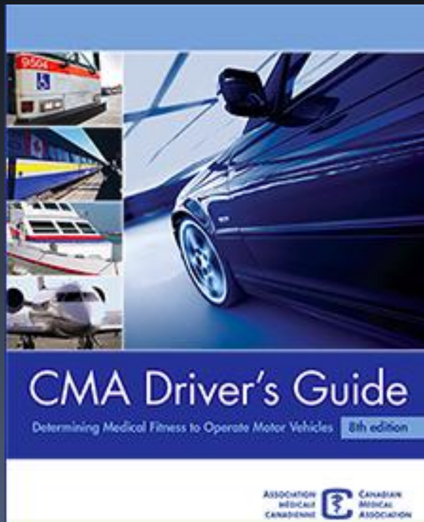
- Narcotics
- Barbituates
- Benzo’s (present)*
- Antihistamines
- Antidepressants
- Antipsychotics
- Hypnotics
- Alcohol
- Muscle Relaxants
- Antiemetics
- Antiepileptic

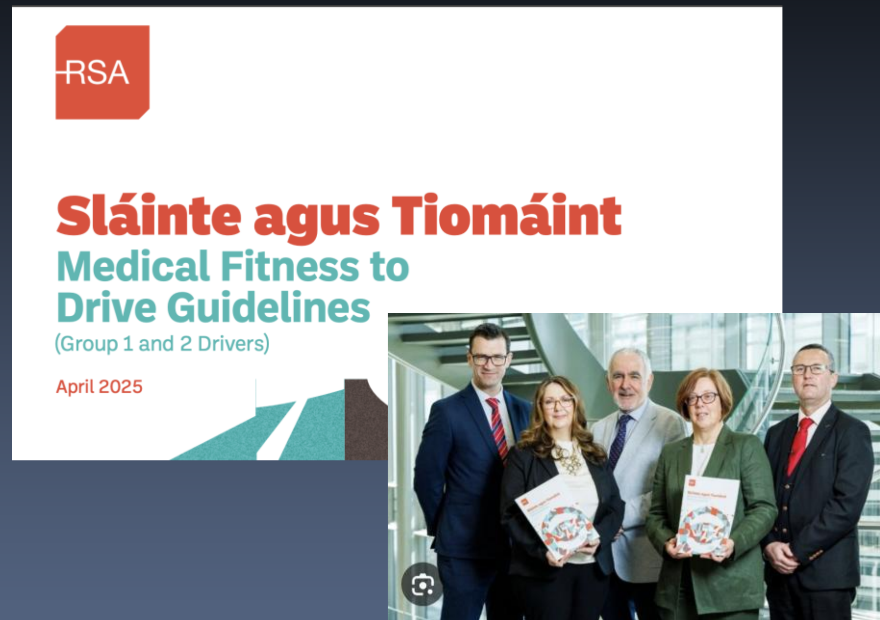
Carr DB, Beyene K, Doherty J, et al. The risk of Medications Impairing Road Test Performance Among Cognitively Intact Older adults. JAMA Open Network. 6(9):e2335651. doi:10.1001/jamanetworkopen.2023.35651

Hetland A, Carr DB. Medications and Impaired Driving. Annals of Pharmacology 2014; 48(4): 494-506

Co-Morbid Conditions
Clinician Medical Guidelines

Updated, Evidenced-Based
Also Refer to Your Own State Laws/Statutes





www.cma.ca

https://www.rsa.ie/docs

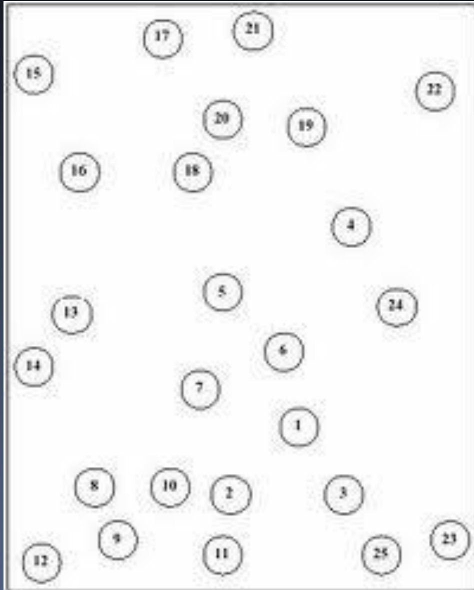
www.austroads.com.au

Hypersomnolence/Epworth Sleepiness Scale >10, Alcohol, Substance Abuse, Depression/PHQ >10, Visual Acuity OU 20/40 , HHIE>26

OUR CASE: ESS 10, PHQ 12, VA 20/40 corr, HHIE 10, HgbA1C 6.5

Step 3: Cognitive/Functional Screens

Trails A

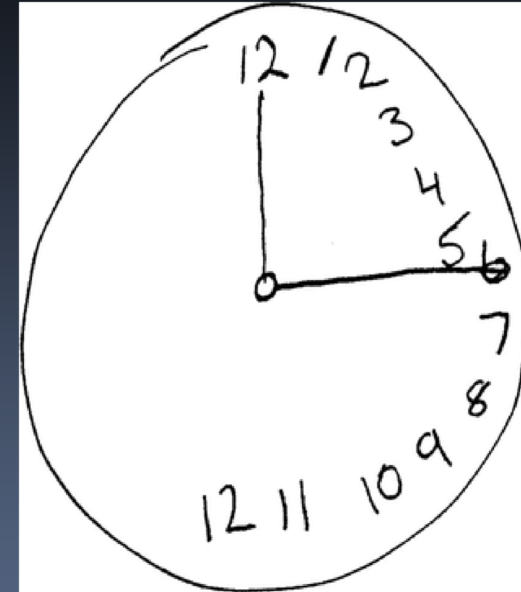


AD-8

Alzheimer's Detection: AD8

Remember, "Yes, a change" indicates that you think there has been a change in the last several years cause by cognitive (thinking and memory) problems	YES, A change	NO, No change	N/A, Don't know
Problems with judgment (e.g. falls for scams, bad financial decisions, buys gifts inappropriate for recipients)			
Reduced interest in hobbies/activities			
Repeats questions, stories or statements			
Trouble learning how to use a tool, appliance or gadget (e.g. VCR, computer, microwave, remote control)			
Forgets correct month or year			
Difficulty handling complicated financial affairs (e.g. balancing checkbook, income taxes, paying bills)			
Difficulty remembering appointments			
Consistent problems with thinking and/or memory			
TOTAL AD8 SCORE			

Clock Drawing



- TMT A is as good as TMT B in some dementia samples in prediction of driving impairment
- TMT A>50 secs/TMT B >180 secs would identify many at risk for an unsafe rating on the road test
- No in-office test or battery of tests have sufficient test characteristics to be sole determinant of FTD
- Two or more IADL's impaired due to cognition are at higher risk for driving impairment
- A formal assessment is recommended if the patient desires to continue to drive

Papandonatos GD, et al. JAGS; 2015; 63

STEP 4: RATING DISEASE SEVERITY

- Gradual onset/decline in episodic (short-term) memory
- Needing some assistance with check book
- Still cooking, but less complex meals
- Clinical Dementia Rating 0.5 or very mild dementia
- Labs/MRI unrevealing, SBT 6,MMSE 24, Dx AD

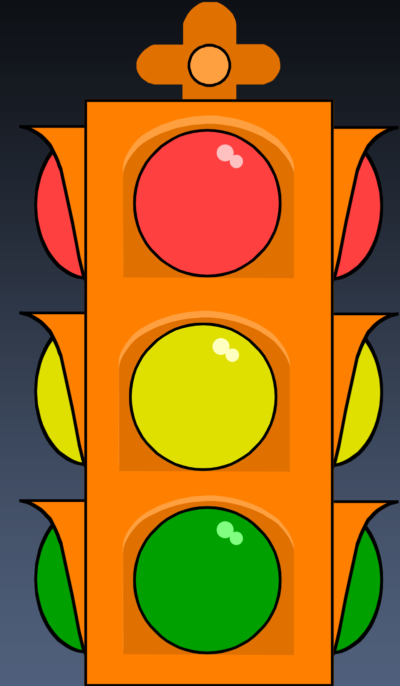
What if you can't do a CDR or Full Psychometrics?

Clinical Measure of Dementia Severity	No Dementia (CDR=0)	Questionable or Very Mild Dementia (CDR=0.5)	Mild Dementia (CDR=1.0)	Moderate to Severe Dementia (CDR=2.0)
For the Dementia Specialist: Clinical Dementia Rating	No memory loss or inconsistent memory loss Fully oriented Judgment intact Function intact Personal care intact	Consistent slight forgetfulness Slight difficulty with orientation or judgment Slight impairment in community activities or home activities Personal care intact	Memory loss interferes with everyday activities Geographic disorientation Moderate impairment in judgment Mild but definite impairment of community or home activities Needs prompting for personal care	Severe memory loss Severe difficulty with time relationships and judgment No longer independent in activities Only simple chores preserved Needs assistance in personal effects
For the Clinician:	**N (SD)**	**N (SD)**	**N (SD)**	**N (SD)**
Short Blessed Test	1.2 (1.9)	4.8 (5.9)	15.4 (5.2)	18.5 (5.5)
MMSE	28.9 (1.3)	23.1 (2.5)	20 (3.9)	16.1 (4.7)
For the Psychologist: Logical Memory	8.8 (2.9)	4.3 (2.7)	1.9 (1.7)	1.5 (2.3)
Block Design	30.1 (8.6)	22.2 (9.8)	12.0 (9.6)	3.2 (6.6)
Digit Symbol	45.6 (11.5)	31.7 (13.6)	17.0 (13.3)	8.3 (8.7)
Trailmaking A	40.9 (20.0)	70.2 (39.2)	108.3 (50.5)	???
Benton Copy	9.6 (.88)	9.1 (1.6)	7.3 (2.7)	???

O'Neill D and Carr DB. Older Drivers. 6th Edition Pathy's Principles and Practice of Geriatric Medicine. 2019

What Are The Next Steps?

- **Green Light**
  - No red flags
  - Monitor at intervals
  - Full speed ahead!
- **Yellow Light**
  - Red flags/co-morbid illnesses
  - Decline in traffic skills
  - Deficits on office screening
  - Consider referral and caution!
- **Red Light**
  - Driving Retirement/Counseling
  - Stop!



Step 5: REFERRAL SOURCES

- Primary Care Physician
- Subspecialist
- Neuropsychologist
- Occupational Therapists
- Physical Therapists
- Speech Therapists
- Case Managers
- MCHS!

Driving ability after a stroke: evaluation and recovery. [Review]
Murie-Fernandez M; Iturralde S; Cenoz M; Casado M; Teasell R.
Neurologia. 29(3):161-7, 2014 Apr.

A Driver Rehabilitation Specialist On-Road Driving Assessor

- One who plans develops, coordinates and implements driving services for individuals with disabilities

- These individuals are often Occupational Therapists with specialized training in driver assessment and rehabilitation

Driving Evaluation at WU OT

Who performs the evaluations:

*__Peggy P. Barco__, OTD, OTR/L, CDRS, FAOTA; Professor in Program in Occupational Therapy and Department of Medicine
(over 20 years of experience)

Physician referral is required.
Send to WUOT 4444 FP via EPIC.

Otclinical@wustl.edu
(314) 286-1669

Referral must mention driving.

Note:
On the driving evaluation referral it is helpful to mention if you desire one of the following:

- **Baseline Evaluation**
- **Near home evaluation**

Our Continuum of Services

- Comprehensive Driving Evaluation inclusive of recommendations and education
- Clients can be seen at our office or at their home (if they live locally in Missouri)
- For those who need OT services prior to or following an evaluation – we (WU OT) can see them in their home to facilitate readiness for the driving evaluation or follow up services (after evaluation)

Clinical Questions One Might Ask…

How often should patients be retested with a progressive disease if they pass their initial evaluation? 6-12 months

Does the performance based road test as administrated by occupational therapists and/or the licensing authority result in a safety benefit in drivers with dementia? Yes

When and how do you make a referral to the licensing authority? Depends on local/state/national guidelines

How to you take a patient off the road that refuses to stop driving? Not easily

Case cont.

- No history of prior poor driving performance
- She has a very mild dementia, CDR=0.5
- It is expected to progress
- Alprazolam was tapered off and sertraline ∧
- Visual acuity was 20/40 corrected/no field cuts
- She passed her initial OT/CDRS road test
- She was scheduled for a f/u at 6 months with nurse practitioner, one year with physician
- At six months there was no change in status

Case cont. f/u one year

- She had one minor crash when backing into a car in a parking lot
- The daughter noted more cognitive and functional decline (higher order IADL's)
- The probability calculator for predicting road test failure was performed
- Based on the history of progression, calculator score and history of at-fault crash, driving retirement was suggested
- Patient resistant to driving cessation
- Consider referral to social services/DMV

IRISH GUIDELINES FOR DRIVERS WITH DEMENTIA

- *Those who have poor short-term memory, disorientation, attention, lack of insight and judgement are almost certainly not fit to drive.*
- *A decision regarding fitness to drive is usually based on consultant medical assessment, further assessment by occupational therapy and/or neuropsychology, with a low threshold for an on- road driving assessment*
- *In early dementia when sufficient skills are retained and progression is slow, a license may be issued subject to annual review or sooner if a significant medical or functional decline is noted. A formal driving assessment is recommended as an integral part of assessment and review but the overall decision rests with the treating doctor (see section 3.6).*
- *It is unlikely that safe driving can be maintained in the presence of moderate dementia (e.g. the additional presence of basic activity of daily living (BADL) impairments such as problems in dressing, washing, grooming) and is to be strongly discouraged. If the patient desires to drive, they should be formally assessed and monitored very carefully.*
- *People with 2 or more IADL impairments are at higher risk of driving impairment*
- *Evaluation every 6-12 months recommended*
- *Conversations about driving retirement are encouraged*

REMOVING THE RESISTANT DRIVER

- Ask physician to "prescribe" driving retirement orally/writing
- Focus on other medical conditions as the reason to stop driving
  - (e.g. vision too impaired, reaction time too slow)
- Use a contract (see THE HARTFORD At the Crossroads guide)
- Vehicle-Related Tactics
  - Hiding/filing down keys
  - Replacing keys
  - Do not repair the car/ send car for "repairs" but do not return
  - Remove the car by loaning, giving or selling
  - Disable the car
- Discuss financial implications of crash or injury
- Refer to police (Gardai) or licensing authority

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When and How Should You Refer to the Licensing Authorities?

Please complete the Driver Condition Report if you have personal knowledge about a driver you believe is no longer able to safely operate a motor vehicle.

- You should report only your firsthand knowledge of the driver.
- You should complete the entire form and sign your name on the reverse side.
- After reviewing this report, the Director of Revenue may require the driver to take certain tests such as a medical, vision, or driving test.
- All information contained in this report shall be kept confidential, unless released by a court order.
- A driver condition report must be completed by one of the following: a physician, chiropractor, registered nurse, psychologist, law enforcement personnel, social worker, professional counselor, optometrist, physical or occupational therapist, emergency medical technician, or immediate family of the driver. (Immediate family members consist of spouse, parent, child, grandparent, sibling, grandchild, great grandparent, aunt, uncle, niece, nephew, or great grandchild. In-laws are excluded as immediate family members).

Driver's Personal Information

Please provide all information available for the person being reported.

Name (Last, First, Middle)			Social Security or Driver License Number	
License Plate Number	State of Issuance	Date of Birth (MM/DD/YYYY) ___ / ___ / ______	Telephone Number (___) ___ - ____	
Address		City	State	Zip Code

Reset Form | Print Form

MISSOURI DEPARTMENT OF REVENUE
DRIVER LICENSE BUREAU, P.O. BOX 200
301 WEST HIGH STREET, ROOM 470
JEFFERSON CITY, MO 65105-0200

TELEPHONE: (573) 751-2730
FAX: (573) 522-8174
WEB SITE: **www.dor.mo.gov**

FORM **1528** (REV. 04-2019)

PHYSICIAN'S STATEMENT

DRIVER OR PATIENT SECTION

PATIENT NAME (LAST, FIRST, MIDDLE) | SOCIAL SECURITY NUMBER | DATE OF BIRTH (MM/DD/YYYY) __ / __ / ____
PATIENT'S MAILING ADDRESS | CITY | STATE | ZIP CODE

Driver responses to the information below is requested for full evaluation purposes, but is not mandatory for completion and submission of the form by eligible medical provider.

I hereby authorize and accept that:

- My physician will conduct a medical examination to determine my fitness to operate a motor vehicle safely and responsibly.
- My physician will respond to any additional questions from the Driver License Bureau (DLB) and, if necessary, he or she may submit copies of my medical records to the DLB.
- The DLB will make a final decision concerning my eligibility for driver licensure based on all available information.

Signature of Driver or Patient ______________________ Date (MM/DD/YYYY) ________

DRIVER AND PATIENT (respond to all questions below before seeing your physician)

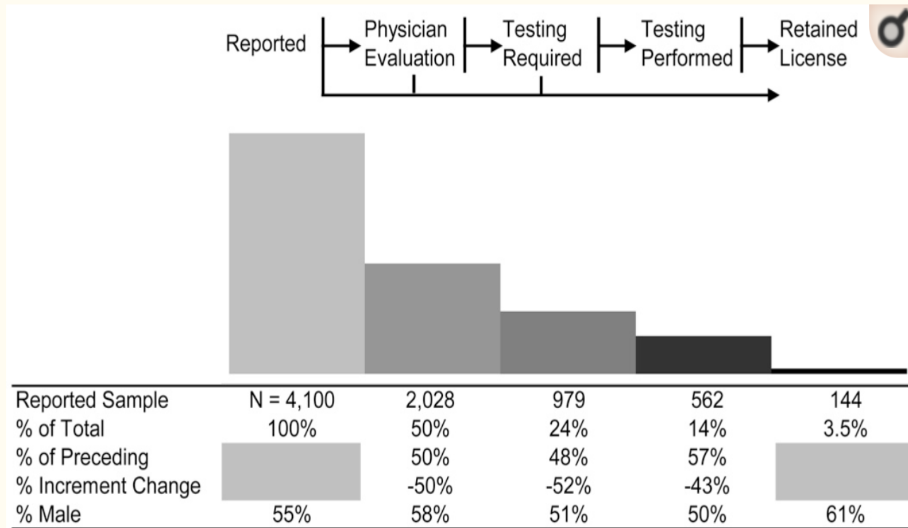
1. How many driving trips do you make in a typical week? ______
2. Do any of your regular trips involve driving at night? ☐ Yes ☐ No
3. What is the one-way distance of your furthest regular trip? ______ miles
4. Do any of your regular trips involve speeds ≥ 55 MPH? ☐ Yes ☐ No
5. Were you pulled over by a police officer in the past year? ☐ Yes ☐ No
6. Were you involved in a crash as a driver in the past year? ☐ Yes ☐ No
7. In addition to driving, what other modes of transportation do you use regularly? (check all that apply)
   - ☐ Ride with Family Member or Friend
   - ☐ Walk or Ride a Bicycle
   - ☐ Public Bus, Van or Train
   - ☐ Private Bus, Van or Taxi
   - ☐ Other ______

Missouri has voluntary reporting law, anonymity, confidentiality

Know your own state law and statutes

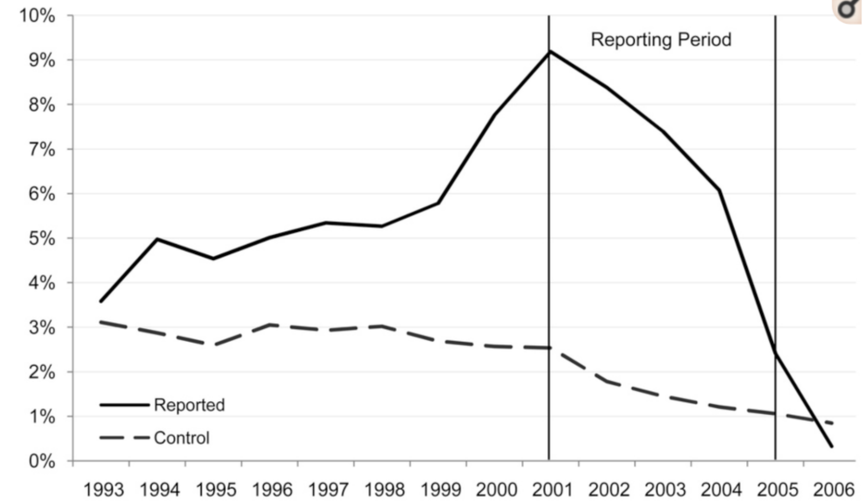
Consider your own clinic policy with legal advice

Are patients who are referred to the state for formal testing safe before or after evaluation?



Reported Sample	N = 4,100	2,028	979	562	144
% of Total	100%	50%	24%	14%	3.5%
% of Preceding		50%	48%	57%	
% Increment Change		-50%	-52%	-43%	
% Male	55%	58%	51%	50%	61%

Fig. 2



Does referral to the DMV/DOR reduce crash risk?

Meuser TM, et al. Motor-Vehicle Crash History and Licensing Outcomes for Older Drivers Reported as Medically Impaired in Missouri. Accid Anal Prev 2009; 41: 246-252

Clinical Questions One Might Ask…

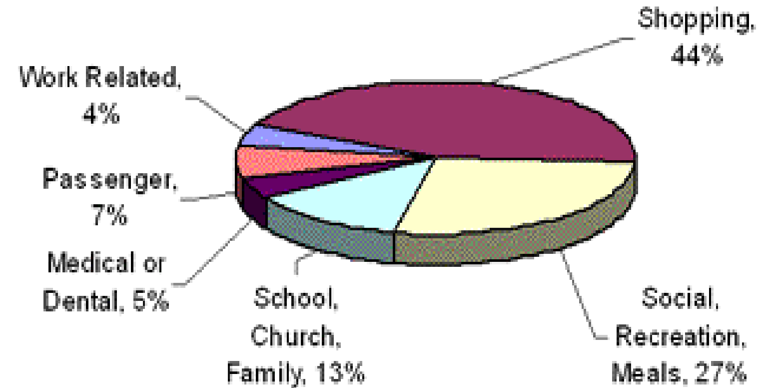
Are there additional interventions (passengers, technology) that can further mitigate risk? YES!

What are the transportation alternatives in our community? REFER!

When can we expect driverless cars that will make fitness-to-drive evaluations moot? Not Today

The Importance of the Automobile

- The Transportation Method of Choice
- Autonomy
- Identity
- Social Connectedness
- Psychological and Physical Health Correlates
- Private cars account for over 90% of trips made by seniors



Mobility Counseling
Transportation Alternatives

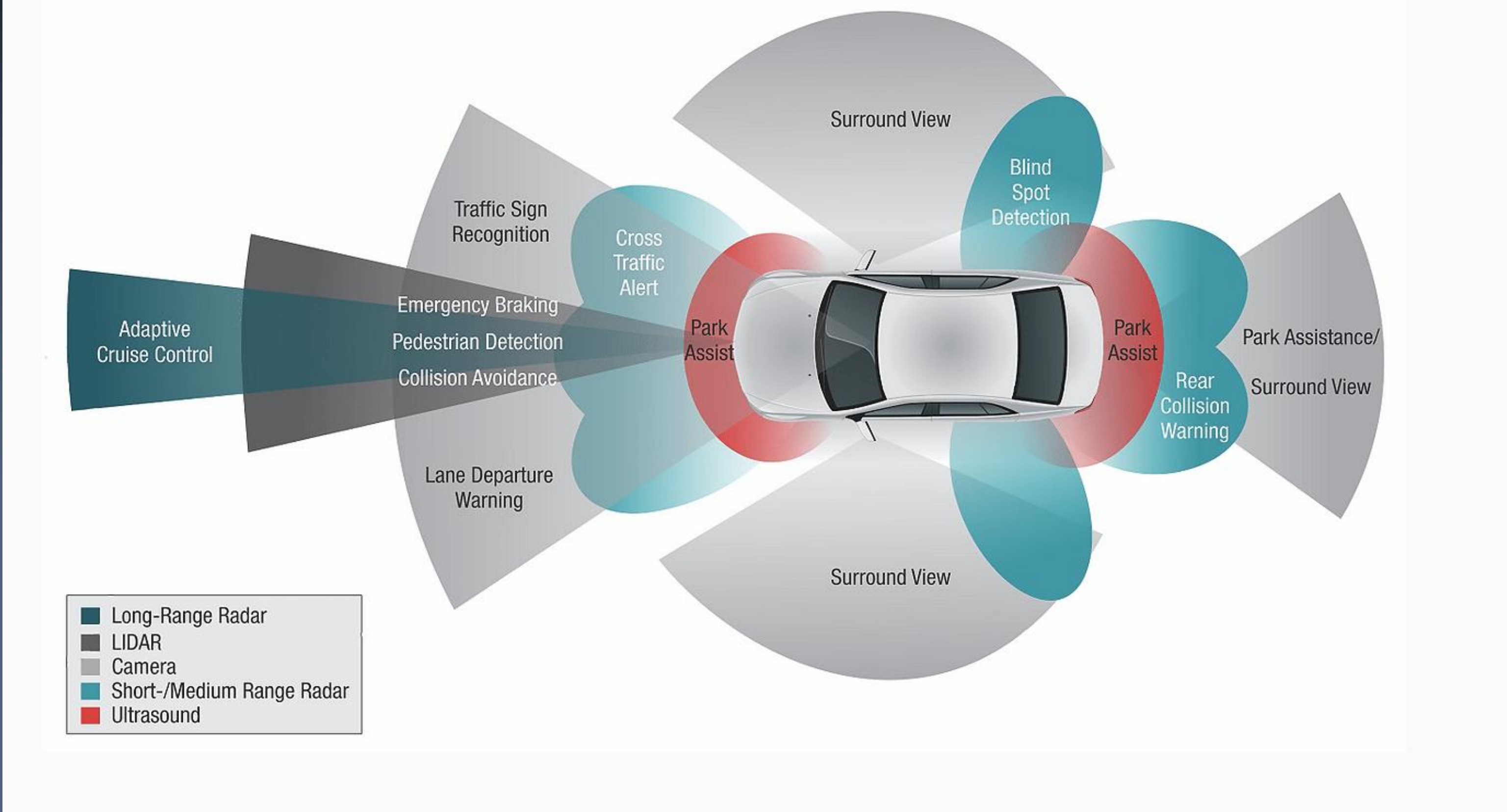
- St. Louis Options
  - Social Work Referral
  - CORP
  - Call-A-Ride
  - Good Shepherd
  - Metro
  - Bus
  - Taxi
  - ITNAmerica
  - Uber
  - MCHS
  - Alz Association

SUMMARY: STEPS TO CONSIDER

- Consider driving in the context of the disease
- Consider involving your physician or specialist
- Consider referral to a driving clinic
- Consider referral to the state DMV's
- Consider list of resources/handouts
- Consider self-help courses (AARP, AAA, etc)
- Consider transportation alternatives

Advanced Driver-Assistance Systems (ADAS)

Definition: ADAS are technological features designed to increase the safety of driving a vehicle. Using a human-machine interface, ADAS can improve the driver's reaction time/raise awareness of dangers on the road



https://www.excalibrationserie.com/services

MyCarDoesWhat.org National Safety Council

- Back up Camera
- Anti-lock brake system
- Blind Spot Monitor
- Automatic Braking
- Lane Departure
- Tire Pressure Monitor
- Adaptive Cruise Control
- Auto Parallel Parking
- Back-up Warning
- Bike/Ped Detection
- Brake Assist
- Push Button Start
- Rear Cross Alert
- Curve Speed Warning
- Drowsiness Alert
- Electronic Stability Control
- Forward Collision Warning
- High Speed Alert
- Hill Descent Assist
- Hill Start Assist
- Lane Keeping Assist
- Left Turn Crash Avoidance
- Obstacle Detection
- Parking Sensors
- Sideview Camera
- Traction Control

https://mycardoeswhat.org

Ergonomics
Comfort Technology

http://www.autotrader.com/car-tips/choosing-a-car-with-comfortable-seats-210732

Adjustable steering wheels

Adjustable pedals

Keyless entry and ignition

Multiposition heated and cooled power seats with memory

Customize instrument panel and reduce clutter

Motorized trunk lids and liftgates

Top Technologies for Mature Drivers: AARP

http://www.aarp.org/home-family/getting-around/driving-resource-center/top-ten-tech/]

Smart features for older drivers: AAA CARFit VIRTUAL

http://seniordriving.aaa.com/SmartFeatures

http://readwrite.com/2014/04/16/backup-cameras-law-2018-nhtsa-safety/

ADAS and Older Drivers

Older adults request: Blind Spot Warning Systems, Crash Warning Systems, Emergency Response Assistance Systems, Drowsy Driver Alerts, Reverse Monitoring Systems; 1/3 in survey report they have these technologies

http://www.reuters.com/article/us-column-miller-cars-idUSBRE98G05I20130917

Which would experts at UMTRI recommend for older adults based on;

1) Potential to help overcome declines in abilities that may occur when people age
2) Ease of understanding and use
3) Potential to prevent crashes.

Automatic crash notification, Automatic emergency braking, automatic parallel parking, adaptive cruise control, adaptive headlights, back-up camera/alert, blind spot warning, rear cross-traffic alert, forward collision warning, lane departure warning, navigation assistance

https://deepblue.lib.umich.edu/bitstream/handle/2027.42/177532/UMTRI-202315.pdf?sequence=1&isAllowed=y

https://assets.publishing.service.gov.uk/media/5eff37f1d3bf7f7691f44c2f/experiences-of-advanced-driver-assistance-systems-amongst-older-drivers.pdf

Attuquayefio, T., Hansen, A., Hosking, D., McCallum, J., Regan, M. and Anstey, K.J., (2023) "In ADAS We Trust: Older Drivers and Advanced Driver Assistance Systems (ADAS)". Sydney andCanberra: University of New South Wales and National Seniors Australia. DOI 10.17605/OSF.IO/B27PR

Autonomous Vehicles (AVs)

SAE J3016™ LEVELS OF DRIVING AUTOMATION

	SAE LEVEL 0	SAE LEVEL 1	SAE LEVEL 2	SAE LEVEL 3	SAE LEVEL 4	SAE LEVEL 5
What does the human in the driver's seat have to do?	**You are driving** whenever these driver support features are engaged – even if your feet are off the pedals and you are not steering			**You are not driving** when these automated driving features are engaged – even if you are seated in "the driver's seat"		
	You must constantly supervise these support features; you must steer, brake or accelerate as needed to maintain safety			When the feature requests, you must drive	These automated driving features will not require you to take over driving	
	These are driver support features			**These are automated driving features**		
What do these features do?	These features are limited to providing warnings and momentary assistance	These features provide steering OR brake/acceleration support to the driver	These features provide steering AND brake/acceleration support to the driver	These features can drive the vehicle under limited conditions and will not operate unless all required conditions are met		This feature can drive the vehicle under all conditions
Example Features	• automatic emergency braking • blind spot warning • lane departure warning	• lane centering OR • adaptive cruise control	• lane centering AND • adaptive cruise control at the same time	• traffic jam chauffeur	• local driverless taxi • pedals/steering wheel may or may not be installed	• same as level 4, but feature can drive everywhere in all conditions

https://www.researchgate.net/figure/SAE-J3016-levels-of-driving-automation_fig1_339371847
https://www.sae.org/news/2019/01/sae-updates-j3016-automated-driving-graphic

Autonomous Vehicles Barriers: Older Adults

1. Trust in AV
2. Technological Readiness of Using AV
3. Financial Constraints of Using AV
4. Privacy and AV
5. Entering and Exiting the AV
6. Use of AV Interface
7. Controlling the AV
8. What happens after AV fails
9. Change in Fitness-to-Drive Procedures
10. AV insurance

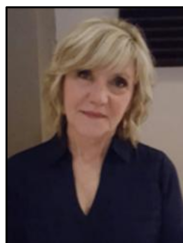
DRIVES Project
Staff Introductions

Dr. Ganesh Babulal
Primary Investigator

Dr. Beau Ances
Primary Investigator

Dr. Yiqi Zhu
Co-Investigator

Dr. David Carr
Medical
Director


Ann
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Data Analyst

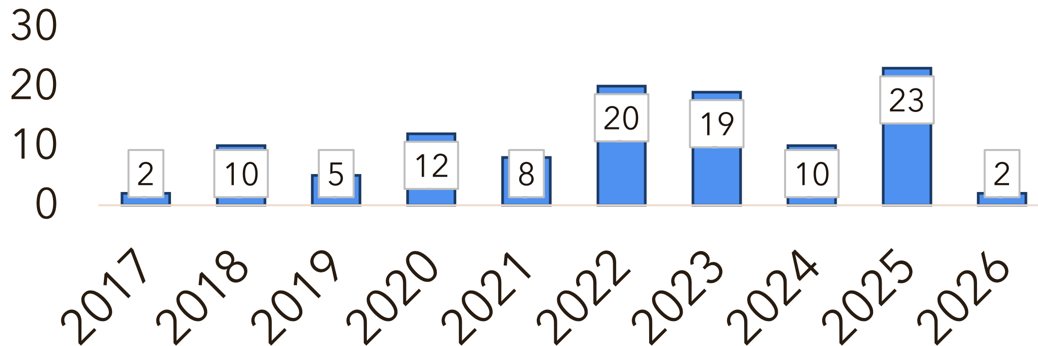
Dr. Semere Bekena
Post-Doc

Dr. Ramkrishna Singh
Post-Doc

Slide courtesy of Dr. Ganesh Babulal

Publications

98 Publications from the DRIVES Project so far!



- **Recruitment:**
  - Total of **624 participants** enrolled!
    - 418 healthy control
    - 102 mild AD
    - 104 depressed

Day-to-day driving habits

Major findings to date on naturalistic studies of older adults:
Changes in driving destinations and driving safety with preclinical AD
Impaired driving with depression
Certain classes of medications associated with driving impairment
Digital driving behaviors predictive of who has AD
White matter location and severity associated with driving impairment

Mentors and collaborators along the way

WashU Medicine

Department of Medicine and Neurology
Division of General Medicine

Discussion