

Driving Safety in Alzheimer's Disease



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Outline



- Case
- Background information
- Natural course of driving ability in Alzheimer's disease (AD)
- Predictors of driving impairment
- Screening for driving impairment
- Discussing driving cessation and DMV reporting

The case of T.G.



CC: “ I still don’t like the food...”

HPI: 86-year-old widowed man with a history of AD, residing at Cortland Place assisted living facility, who presents to establish care as a transfer from a previous fellow. He is accompanied by his daughters. He states that his mood is stable and he is eating and sleeping well. Though he denies significant memory problems, his daughters report that his short-term memory has gradually worsened over the past 18 months. They notice that he is repetitive and has difficulty remembering the plans they have made for a particular day. They have taken over his finances; the facility provides his meals and prompts him to take his medications.

The case of T.G.



His daughters are most concerned about his driving. He has unlimited access to his car and usually does not tell his family when he plans on taking a trip. Though much of his driving is local (church, grocery store), he also visits friends in nearby towns which requires driving on the highway. The patient denies having gotten lost or any recent MVAs or near-misses. His daughters rarely observe him driving and so do not have first-hand knowledge of his driving abilities. He reports, “my driving is fine. I’ve been driving longer than you’ve been alive.”

The case of T.G.



Past Psychiatric History: Onset of progressive memory impairment after death of wife 18 months ago, which is when he moved into assisted living. Diagnosed with AD and started on donepezil about one year ago.

Past Medical History: NIDDM, HTN, hyperlipidemia, vitamin B12 deficiency

Medications: donepezil, amlodipine, atorvastatin, lisinopril, metoprolol, vitamin B complex

Family History: denied

Social History: HS graduate, worked as an airport supervisor and retired in 2011. Wife passed away in 2013. Two supportive daughters.

The case of T.G.



Mental Status Exam:

Patient is alert, casually dressed and well-groomed. Good eye contact. No abnormal movements noted. Speech is normal rate, rhythm and volume with a paucity of content. Mood is “good,” affect is constricted and irritable when discussing driving (e.g. “Dr. Ahmed wouldn’t ask me about this.”) Thought process concrete and confused, thought content is free of delusions. No hallucinations. No suicidal or homicidal ideation. Insight and judgment are impaired.

The case of T.G.



MOCA

- Visuospatial/executive: 1/5
- Naming: 3/3
- Attention: 6/6
- Language: 0/3
- Abstraction: 1/2
- Recall: 0/5
- Orientation: 2/6

+1 for education \leq 12 years

Total = 14/30 (down from 18/30 one year prior)

The case of T.G.



Had a lengthy discussion with patient and daughters addressing poor cognitive testing performance and implications for driving safety. Advised patient that he should stop driving. He was reluctant but agreed to stop driving until a formal driving assessment was completed. Daughters were completely on board.

The case of T.G.



Four weeks later....

Patient and daughters return, reporting that patient had two back-to-back accidents in the Providence Place Mall parking garage during the Christmas season. He hit one car causing \$1000 worth of damage to it, then as he was leaving the garage went into wrong exit lane then backed his car into a concrete pillar causing \$10,000 worth of damage to it. Fortunately, there were no injuries.

At time of appointment, his car was still in the shop and daughters implied that it would be there indefinitely. He never received a driving assessment.

Driving and the elderly



- According to the Department of Transportation, in 2009 there were 33 million licensed drivers aged 65 and older in the U.S.
- Census projections estimate that by the year 2020 there will be 53 million persons over age 65 and approximately 40 million of those will be licensed drivers.
- There has also been a progressive increase in miles driven for each successive cohort of elderly over the past decades

Driving and the elderly



- Older drivers make up 9% of the population but 13% of all traffic fatalities
 - When controlling for distance traveled, older drivers are nine times more likely than younger drivers to be killed in a car crash
- Motor vehicle injuries are the leading cause of injury-related deaths among 65- to 74-year-olds and are the second leading cause among 75- to 84-year-olds (after falls)
- For drivers over the age of 85, the per-mile fatality rate is highest of any group, including male teenagers.
- Elderly drivers are more likely to be involved in accidents during the day, in good weather, at intersections and while turning left (six times greater than non-elderly)

Cognitively impaired drivers



- Canadian data show that 28% of people aged 65 and older diagnosed with AD or another dementia have a driver's license and 73% of those individuals had driven in the previous month
- In one community-based study in N. Carolina, 3238 drivers 65 and older applying for a driver's license renewal were examined using the Short Blessed Mental Status Examination.
 - Moderate to severe impairment (score ≥ 9 errors out of 28 possible, considered c/w dementia) in 6.2% of those 65 and 69 years old, 7.7% of those 70 and 74 years old, 11.9% of those 75 and 79 years old and 18.7% of those 80 years and older

Short Blessed Test

Short Blessed Test (SBT)¹

"Now I would like to ask you some questions to check your memory and concentration. Some of them may be easy and some of them may be hard."

1. What year is it now? _____ Correct (0) Incorrect (1)

2. What month is it now? _____ Correct (0) Incorrect (1)

Please repeat this name and address after me:

John Brown, 42 Market Street, Chicago

John Brown, 42 Market Street, Chicago

John Brown, 42 Market Street, Chicago

(underline words repeated correctly in each trial)
Trials to learning _____ (can't do in 3 trials = C)

Good, now remember that name and address for a few minutes.

3. Without looking at your watch or clock, tell me about what time it is.
(If response is vague, prompt for specific response) Correct (0) Incorrect (1)
(within 1 hour) _____
Actual time: _____

4. Count aloud backwards from 20 to 1 0 1 2 Errors
(Mark correctly sequenced numerals)
If subject starts counting forward or forgets the task, repeat instructions and score one error

20 19 18 17 16 15 14 13 12 11

10 9 8 7 6 5 4 3 2 1

5. Say the months of the year in reverse order.
If the tester needs to prompt with the last name of the month of the year, one error should be scored
(Mark correctly sequenced months)

D N O S A JL JN MY AP MR F J 0 1 2 Errors

6. Repeat the name and address I asked you to remember.
(The thoroughfare term (Street) is not required)
(John Brown, 42 Market Street, Chicago) 0 1 2 3 4 5 Errors

_____, _____, _____, _____, _____

Cognitively impaired drivers



- Drivers with dementia have two to five times greater risk of involvement in a crash compared to age-matched controls according to numerous studies¹
- In driving simulation studies, drivers with AD are more likely to drive off the road, drive under the speed limit, brake unexpectedly, have less awareness of other drivers, have worse lane control, make slower left turns and make more errors at intersections.¹
- Cognitively impaired individuals may be less likely to self-limit their driving than drivers impaired for other reasons (e.g. visual loss) due to poor insight

Driving with dementia



Driving cessation in AD



- Most agree that those with moderate or severe dementia should not drive
- But many individuals are diagnosed early in their disease course and may be able to drive safely for some time
- No consensus amongst physicians on how to best assess driving or when to advise driving cessation
- Driving cessation is far from benign and has been associated with increased social isolation, decreased out-of-home activities, increased depressive and anxiety symptoms and increased risk of SNF placement
 - “I would rather tell a patient he has cancer than tell him he should no longer drive. At least with a cancer diagnosis there is hope.”

Longitudinal study of driving in AD



- Longitudinal study of 128 older drivers (66 probable AD, 23 possible AD, 45 controls) recruited from the memory disorder clinics at RIH and Memorial Hospital by Ott et al
- MMSE, Clinical Dementia Rating (CDR) and a neuropsychology battery along with a driving test were completed every 6 months for 2 to 3 years by subjects with AD and at baseline and 18 months for normal controls
- Crashes and traffic violations collected from subject, informant and motor vehicle registries
- Exclusion criteria: (1) reversible causes of dementia, (2) physical, ophthalmological or neurological disorders other than dementia that might impair driving abilities and (3) certain psychiatric disorders including mental retardation, schizophrenia, bipolar disorder or substance abuse within the past year

Longitudinal study of driving in AD



- Driving road test administered by professional instructor during daytime w/good road conditions
- 10- to 15-minute pre-test in a parking lot, 45-minute road test based on Washington University road test and adapted for RI streets to assess variety of important driving behaviors
- Driving test performance scored from 0 (worst) to 108 (best)
- Those who failed test, had an at-fault accident or advanced beyond mild stage of dementia were advised to stop driving → all complied

Longitudinal study of driving in AD



Clinical Dementia Rating

- 90-minute structured interview of subject and collateral informant that assesses a patient's cognitive and functional performance in six areas: memory, orientation, judgment & problem solving, community affairs, home & hobbies, and personal care
- Global score calculated using algorithm

Clinical Dementia Rating



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 to place of examination; may have geographic disorientation elsewhere	Severe difficulty with time relationships; usually disoriented to time, often to place	Oriented to person only
Judgement & Problem Solving	Solves everyday problems and handles business and financial affairs well; judgement good in relation to past performances	Slight impairment in solving problems, similarities and differences	Moderate difficulty in handling problems, similarities and differences; social judgement usually maintained	Severely impaired in handling problems, similarities and differences; social judgement usually impaired	Unable to make judgements 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 pretence of independent function outside home Appears well enough to be taken to functions outside the family home independent function	Appears too ill to be taken to functions outside the family home
Home & Hobbies	Life at home, hobbies and intellectual interests well maintained	Life at home, hobbies and intellectual interest slightly impaired	Mild but definite impairment of function at home more difficult tasks abandoned; more complicated hobbies and interests abandoned	Only simple tasks preserved; very restricted interests, poorly maintained	No significant function in home
Personal Care	Full capable of self-care		Needs prompting	Requires assistance in dressing, hygiene, keeping of personal effects	Requires much help with personal care; frequent incontinence

Clinical Dementia Rating



Calculation of Global Clinical Dementia Rating Score (Form B4: CDRGLOB)

This page allows the user to input CDR box scores and submit them to a SAS computer program which returns the global CDR based on the Washington University CDR-assignment algorithm.

Select the CDR Box Scores

	0	0.5	1	2	3
Memory	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Orientation	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Judgement and Problem Solving	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Community Affairs	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Home and Hobbies	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Personal Care	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Press to submit.

Press to reset all box scores.

Longitudinal study of driving in AD



Table 3

Global driving rating on road test at baseline and 18 months by group

	Baseline		18 Months	
	Controls (n = 44)	Patients (n = 84)	Controls (n = 21)	Patients (n = 26)
Safe	35 (80)	34 (41)	12 (57)	5 (19)
Marginal	9 (20)	37 (44)	8 (38)	17 (66)
Unsafe	0	13 (15)	1 (5)	4 (15)

Values are n (%).

Longitudinal study of driving in AD



Table 5 Global driving rating on road test at baseline and 18 months by CDR at time of visit

	Baseline			18 Months			
	0 (n = 44)	0.5 (n = 52)	1 (n = 32)	0 (n = 21)	0.5 (n = 7)	1 (n = 18)	2 (n = 1)
Safe	35 (80)	23 (44)	11 (34)	12 (57)	1 (14)	4 (22)	0
Marginal	9 (20)	23 (44)	14 (44)	8 (38)	6 (86)	10 (56)	1 (100)
Unsafe	0	6 (12)	7 (22)	1 (5)	0	4 (22)	0

Values are n (%).

CDR = Clinical Dementia Rating.

Longitudinal study of driving in AD



- CDR 1 group had a failure hazard that was almost four times higher than that of the CDR 0.5 group, with a median time to failure that was almost twice as fast as that of the CDR 0.5 group (324 vs. 605 days)
- Cannot assume that all patients with the same level of dementia have the same driving ability
- Authors recommend driving assessments every six months as reasonable follow-up, but can be difficult to access
- Generalizability?

Clinician assessment of driving ability



- Study by Ott et al of 50 patients with possible or probable AD from the aforementioned longitudinal study
- Informants spent time with patients more than once/week and accompanied patient while driving at least once/month for preceding 12 months
- Primary study physician + five other clinicians assessed each subject's ability to drive on a trichotomous scale: (1) drives alone with good sense of direction and good driving skills (2) drives but with some difficulty or (3) unable to drive safely
 - Assessment based on information from diagnostic interview, CDR and MMSE, physical examination and and patient/informant reports about past MVAs and traffic violations

Clinician assessment of driving ability



- Clinicians completed a visual analog rating scale for each of 22 variables that were available to them from the records, indicating the weight that they gave each variable in their assessment of competence (none to very much)
- Clinician ratings were dichotomized into safe versus unsafe (marginal + unsafe)
- Each subject completed a driving test and was rated on same scale by driving instructor

Clinician assessment of driving ability

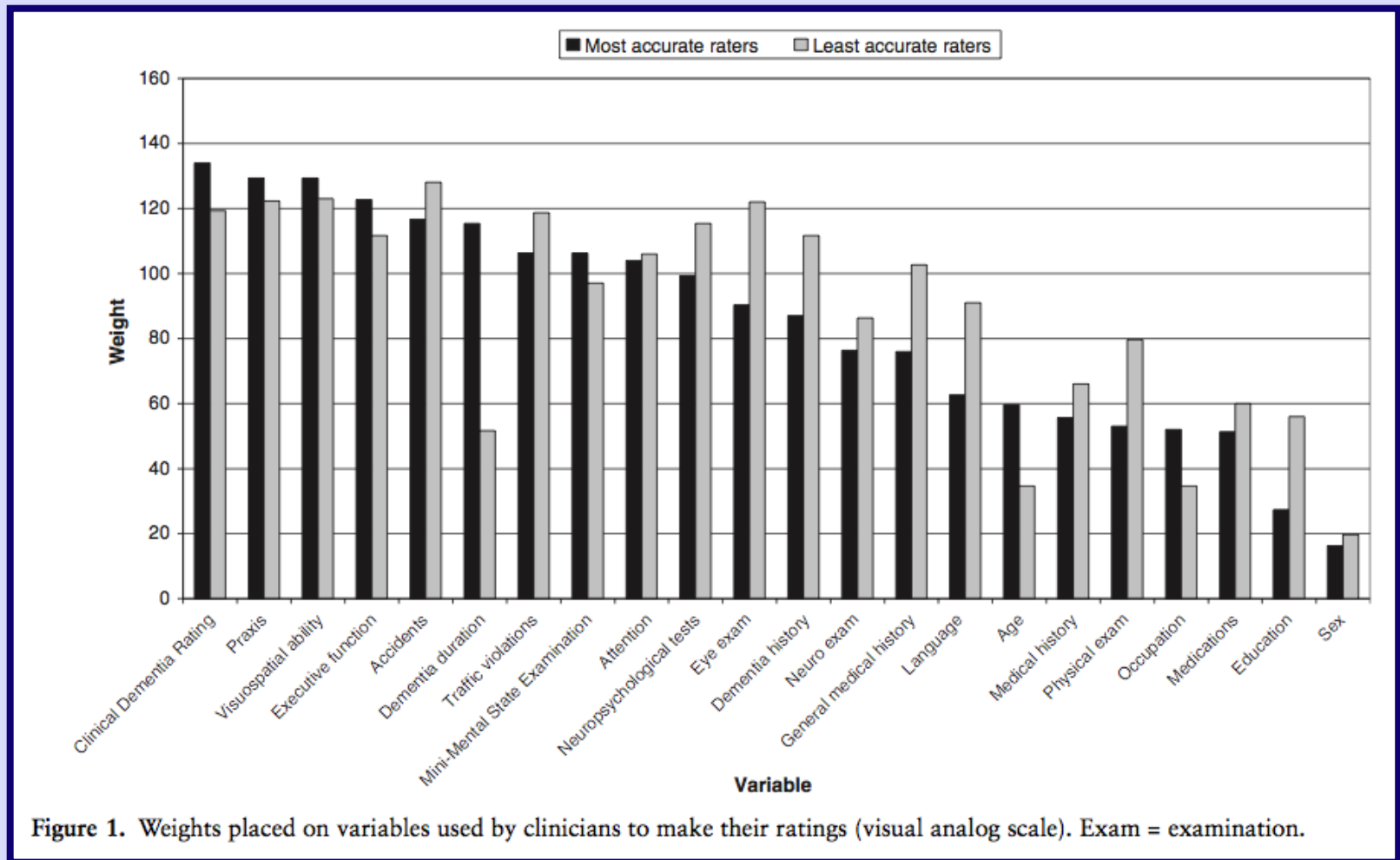


Table 1. Clinician Predictions of Drivers Rated Categorically Safe by the Driving Instructor

Clinician	JB	BO	AD	CW	AC	DA
Sensitivity	59.1	95.2	49.5	59.1	40.9	45.5
Specificity	92.9	59.3	96.4	82.1	82.1	75
Positive predictive value	86.7	64.5	90.9	72.2	64.3	58.8
Negative predictive value	74.3	94.1	69.2	71.9	63.9	63.6
Correct classification	78*	75*	74*	72*	64*	62

* $P < .05$, chi-square.

Clinician assessment of driving ability



Clinician assessment of driving ability



- Accuracy was greatest for physicians with specialized training in dementia, regardless of their years of clinical experience
 - The senior geriatric neurologist, the geriatric neurology fellow and the geriatric psychiatry fellow were the most accurate; the general practitioner, geriatric nurse practitioner and neurologist/dementia specialist were less accurate
- The largest discrepancy between the two groups was in the weight given to dementia duration, which the most-accurate raters more heavily weighed
 - “Three year guideline” found in multiple studies: crash rate in AD increases above control rates three years after onset
- GPs can be trained to weigh the most relevant variables more heavily

Evaluation of driving safety



- Most patients early in the course of dementia are still able to pass a driving performance test; therefore, a diagnosis of dementia should not be the sole justification for the revocation of a driver's license
- On-road driving test is the gold standard but expensive and difficult to access (\$300-400, not covered by Medicare, trained evaluators scarce)
- In terms of history, most experts recommend heavily weighing family concern and recent MVAs/traffic violations
- Patients will often deny that they are having any difficulty

Am I a Safe Driver?

Check the box if the statement applies to you.

- I get lost while driving.
- My friends and family members say they are worried about my driving.
- Other cars seem to appear out of nowhere.
- I have trouble seeing signs in time to respond to them.
- Other drivers drive too fast.
- Other drivers often honk at me.
- Driving stresses me out.
- After driving, I feel tired.
- I have had more "near misses" lately.
- Busy intersections bother me.
- Left-hand turns make me nervous.
- The glare from oncoming headlights bothers me.
- My medication makes me dizzy or drowsy.
- I have trouble turning the steering wheel.
- I have trouble pushing down on the gas pedal or brakes.
- I have trouble looking over my shoulder when I back up.
- I have been stopped by the police for my driving recently.
- People will no longer accept rides from me.
- I don't like to drive at night.
- I have more trouble parking lately.

**If you have checked any of the boxes, your safety may be at risk when you drive.
Talk to your doctor about ways to improve your safety when you drive.**

Use of MMSE in evaluation of driving safety



- Large prospective study by Joseph et al (2014) of baseline MMSE as predictor of involvement in an MVC
- Some guidelines (such as from the American Academy of Neurology) use $\text{MMSE} \leq 24$ as an indicator of driving risk
- Included 17,538 “frequent drivers” (driving at least once per week) age 55 and above with cardiovascular disease or diabetes mellitus that were enrolled in two large cardiovascular medication studies from 733 centers in 40 countries

Use of MMSE in evaluation of driving safety



- MVC incidence determined by self-report at 2-year follow-up and penultimate visit (mean 4.5 years); MVC as reason for hospitalization or death also determined
- Total follow-up time of 79,631 person-years
- During follow-up, 1,068 (6.1%) of participants were involved in a MVC as the primary driver (0.01 crashes/person-year)
- Fifty-five (5.1%) of MVCs required hospitalization and nine MVC-related fatalities were identified, with three confirmed to have occurred while the participant was the primary driver

Use of MMSE in evaluation of driving safety



Table 2. Motor Vehicle Crash (MVC) Risk According to Mini-Mental State Examination (MMSE) Score

MMSE Score (Reference 30)	Model 1		Model 2	
	Hazard Ratio (95% Confidence Interval)	P-Value	Hazard Ratio (95% Confidence Interval)	P-Value
27-29	1.16 (1.01-1.32)	.03	1.06 (0.93-1.22)	.39
24-26	1.03 (0.85-1.27)	.74	0.96 (0.78-1.19)	.73
<24	0.80 (0.55-1.14)	.21	0.72 (0.50-1.05)	.09

- Model 1: Unadjusted.
- Model 2: Multivariable model using age, sex, education level, region of habitation, employment status, categorical MMSE score, history of MVC in past 2 years, falls within past year, alcohol consumption, prior stroke, systolic blood pressure, diabetes mellitus, use of oral hypoglycemic agent or insulin, laser treatment for diabetic retinopathy, cataracts, sleep apnea, physical activity score, psychosocial stress score, and depression as covariates.

Use of MMSE in evaluation of driving safety



- MVC in the previous 2 years, depression, sleep apnea, recent falls and lower SBP were associated with future MVCs
- MMSE primarily evaluates verbal cognitive function, with less emphasis on the visual attention, spatial orientation, and executive function skills that have a greater effect on driving performance

Other predictors of driving safety



- Study by Dawson et al compared 40 drivers with probable early AD (mean MMSE 26.5) and 115 cognitively normal elders on a battery of cognitive, visual and motor tests and a standardized 35-mile driving route using instrumented vehicle during daytime/good weather
- Exclusion criteria included non-AD neurologic disease, brain lesions due to cerebrovascular or neoplastic disease, alcoholism, stroke, depression or other psychiatric conditions, vestibular disease and motion sickness.

Other predictors of driving safety



- Neuropsychological tests included:
 - Rey-Osterreith Complex Figure Test-Copy: visuoconstruction
 - Complex Figure Test-Recall: visual memory
 - Block Design subtest from WAIS-R: visuoconstruction
 - Benton Visual Retention Test: visual working memory
 - Trail-Making Test B: executive function, working memory, attentional set shifting
 - Rey Auditory Verbal Learning Test: verbal memory
 - Judgment of Line Orientation: visuospatial perception
 - Controlled Word Association Test: phonemic fluency
- Composite COGSTAT score calculated
- Driving safety errors categorized by expert based on video review

Table 2 Driver safety errors in Alzheimer disease (AD) and normal control groups

Safety errors	AD (n = 40)	Controls (n = 115)	p Values for difference		
			Crude	Age- and gender-adjusted	
Starting and pulling away from curve	1.08 (0.97)	1.09 (0.81)	0.7097	0.4392	
Traffic signals	2.35 (1.56)	2.18 (1.56)	0.5101	0.4739	
Stop signs	3.80 (1.98)	3.61 (1.89)	0.7610	0.6587	
Other signs	0 (0)	0 (0)	—	—	
Turns	6.50 (3.09)	5.44 (2.79)	0.0838	0.1412	
Lane observance	17.03 (11.00)	10.84 (7.77)	0.0003	0.0039	←
Lane change	5.75 (2.86)	5.00 (2.75)	0.1253	0.9386	
Overtaking	0.10 (0.38)	0.15 (0.46)	0.5075	0.5539	
Control of speed	4.03 (2.71)	3.56 (2.79)	0.2634	0.7504	
Backing up	0 (0)	0 (0)	—	—	
Parallel parking	0.38 (0.49)	0.37 (0.52)	0.8172	0.7172	
Head-in parking	0 (0)	0 (0)	—	—	
Curves	0.00 (0.00)	0.01 (0.09)	0.5653	0.7983	
Railroad crossing	0.03 (0.16)	0.19 (0.58)	0.1115	0.0533	
Miscellaneous	0.98 (1.03)	0.73 (1.05)	0.0859	0.4132	
Total safety errors	42.00 (12.84)	33.18 (12.22)	<0.0001	0.0148	←
Total more serious errors	4.35 (2.97)	1.90 (1.59)	<0.0001	<0.0001	←
Total less serious errors	37.65 (11.66)	31.26 (11.49)	0.0009	0.0516	

Groups were compared using Wilcoxon rank sum for crude p values and multiple linear regression for adjusted p values.

Table 3 Changes in total safety errors for a 1 SD increase in cognitive, visual, and motor predictors

Predictors	Coefficient estimate (SE)
Cognitive tests	
CFT-Copy	-3.54 (1.54)* ←
CFT-Recall	-4.44 (2.38)*
JLO	-0.58 (1.97)
Blocks	-2.29 (1.91)
BVRT (Errors)	4.12 (1.55)* ←
TMT-A	2.97 (1.46)* ←
TMT-B	2.40 (1.35)*
AVLT	2.43 (2.48)
COWA	-2.37 (2.31)
COGSTAT	-4.14 (1.66)* ←

Visual tests	
Contrast sensitivity	0.32 (1.86)
UFOV-Total	3.44 (1.72)*
Near visual acuity	-1.48 (1.38)
Far visual acuity	0.22 (2.06)
Structure from motion	-0.25 (1.49)
Motor tests	
Get-Up-and-Go	2.79 (2.55)
Functional Reach	-4.31 (1.99)* ←
Grooved Pegboard	0.80 (1.54)

Coefficients and p values for multiple linear regression, adjusting for age and gender. Values expressed as coefficient estimate (SE).
 *p < 0.05.
 †p < 0.10.

Other predictors of driving safety



- Significant predictors of safety errors in those with AD included total COGSTAT score, BVRT score (working memory), TMT-A (visual search and visual motor speed), CFT-copy (visuoconstructional ability) and Functional Reach (measure of balance)
- Anterograde memory is not a good predictor

Use of CDT in evaluation of driving safety



- Study by Freund et al looking at whether the Clock Drawing Test (CDT) predicted driving simulator performance in 119 adults 60 and older in an outpatient driving evaluation clinic
- CDT measures comprehension, memory, visuospatial abilities, abstract thinking, and executive function
- Subjects are verbally instructed to “draw a clock, put all the numbers in, and set the time at 10 minutes after 11”
- Driving simulator used a 30-minute urban course
- Subjects are judged as safe, conditional safe (restricted), or unsafe (failure) based on the number and type of driving errors committed

Table 1

Freund CDT Scoring Scale

Time (3 points)	One hand points 2 (or symbol representative of 2) Exactly two hands <i>Absence</i> of intrusive marks, e.g., writing or hands indicating incorrect time, hand points to number 10; tic marks, time written in text (11:10; ten after eleven)
Numbers (2 points)	Numbers are inside the clock circle All numbers 1–12 are present, no duplicates or omissions
Spacing (2 points)	Numbers spaced equally or nearly equally from each other Numbers spaced equally or nearly equally from the edge of the circle

Table 5**CDT Score to Predict Unsafe Driving Performance Outcome**

CDT Score	Sensitivity	95% CI	Specificity	95% CI
0	1.9	0.3 to 10.1	100	91.7 to 100
1	7.5	2.1 to 18.2	100	91.7 to 100
2	20.8	10.9 to 34.1	97.7	87.7 to 99.6
3	41.5	28.1 to 55.9	97.7	87.7 to 99.6
4	64.2	49.8 to 76.9	97.7	87.7 to 99.6
5	84.9	72.4 to 93.2	76.7	61.4 to 88.2
6	96.2	87.0 to 99.4	58.1	42.1 to 73.0
7	100	93.2 to 100	0.0	0.0 to 8.3

CDT, Clock Drawing Test; CI, confidence interval.

Use of CDT in evaluation of driving safety



- Using a cutoff of ≤ 4 provides moderate sensitivity (64.2%) and high specificity (97.7%) in predicting unsafe driving performance
- Limits false positives but allows for false negatives
 - Authors concerned about wrongful driving cessation
 - Someone can score well on CDT but still need further evaluation if there are other reasons for concern
 - Can consider a higher cutoff if resources available for further driver evaluation

Driving safety algorithm



American Academy of Neurology Quality Standards Subcommittee conducted a systematic review of 422 studies of driving and cognitive impairment in order to develop a revised practice parameter in 2010

Discussing driving cessation



- If a patient has Alzheimer's dementia (or another degenerative disease), the conversation about the eventual driving cessation and transportation alternatives should begin early
- Ideally retirement from driving will be a gradual process with patient and family planning ahead
- Unfortunately, often no one brings up driving cessation until there is an adverse event
- Copilots should never be recommended to unsafe drivers as a means to continue driving

Discussing driving cessation



- Explain why it is important to stop driving to patient and family
 - Give assessment results in easily understood terms and describe the potential risks of driving
- Give a clear, firm recommendation to stop driving
- Discuss alternative transportation options and involve family to make a transportation plan
- Reinforce driving cessation and test for understanding
 - “Do Not Drive” prescription, economic arguments can be helpful
- Follow-up with patient to see if recommendations were followed

Box 2. Steps Family Members Can Take to Ensure That a Resistant Patient With Dementia No Longer Drives

Approaches Involving Physician

Ask physician to “prescribe” driving cessation orally and in writing.

Ask physician to use medical conditions other than dementia as the reason to stop driving (eg, vision too impaired, reaction time too slow).

Use a contract (see “At the Crossroads” in Resources).

Vehicle-Related Approaches

Hide, file down, or replace the car keys with keys that will not start the vehicle.

Do not repair the car or send vehicle for “repairs” but arrange for its removal.

Remove the vehicle by loaning, selling to third party, or donating to charity.

Disable the vehicle.

Financial and Legal Tactics

Ask family lawyer to discuss financial and legal implications of crash or injury to patient, family, or third party.

Refer to the Department of Motor Vehicles.

Reporting impaired drivers



- The American Medical Association’s Code of Medical Ethics on impaired drivers and their physicians states: “in situations where clear evidence of substantial driving impairment implies a strong threat to patient and public safety, and where the physician’s advice to discontinue driving privileges is ignored, it is desirable and ethical to notify the [DMV].”
- Do not breach confidentiality without talking to patient and family first

RI reporting procedures



Reporting Procedures

Mandatory medical reporting	No
Physician/medical reporting	Yes, Any physician who diagnoses a physical or mental condition which in the physician's judgment will significantly impair the person's ability to safely operate a motor vehicle may voluntarily report the person's name and other information relevant to the condition to the Medical Advisory Board within the Registry of Motor Vehicles.
Immunity	Yes, Any physician reporting in good faith and exercising due care shall have immunity from any liability, civil or criminal, that otherwise might result by reason of his actions pursuant to the section. No cause of action may be brought against any physician for not making a report pursuant to this section.
Legal protection	
DMV follow-up	Driver is notified in writing of referral.
Other reporting	Will accept information from court, other DMVs, police, and family members.

Summary



- Driving by the elderly is becoming increasingly common and AD significantly impairs driving ability
- Drivers with AD become unsafe at differing points in the disease course
- Road test or simulator every 6 months is the best way to monitor drivers with AD but is not always practical
- Screening tests of visuospatial and executive abilities (e.g. CDT) are the most helpful screening assessments, but also weigh risk factors (family concern, recent MVA/citations, self-limitation of driving, disease duration)
- Start discussion of driving cessation early and involve family in making a transportation plan

References



1. Adler G. Driving decision-making in older adults with dementia. *Dementia* 2010; 9(1): 45-60.
2. American College of Physicians. Dealing with older, impaired drivers. ACP-ASIM, April 2000.
3. Breen DA et al. Driving and dementia. *BMJ* 2007; 334: 1365-1369.
4. Carr DB et al. Physician's guide to assessing and counseling older drivers, 2nd edition, Washington, D.C. NHTSA. 2010.
5. Carr DB and Ott BR. The older adult driver with cognitive impairment: "it's a very frustrating life." *JAMA*. 2010; 303(16): 1632-1643.
6. Dawson JD et al. Predictors of driving safety in early Alzheimer disease. *Neurology* 2009; 72: 521-527
7. Duchek JM et al. Longitudinal driving performance in early-stage dementia of the Alzheimer type. *JAGS* 2003; 51: 1342-1347.
8. Elliott, VS. Doctors struggle with telling older drivers it's time to park. *Amednews.com*, accessed August 4, 2003.
9. Erten-Lyons, Deniz. When should patients with Alzheimer disease stop driving? *Neurology* 2008; 70: e45-e47.
10. Freund B et al. Drawing clocks and driving cars: use of brief tests of cognition to screen driving competency in older adults. *J Gen Intern Med* 2005; 20(3): 240-244.
11. Iverson DJ et al. Practice parameter update: evaluation and management of driving risk in dementia. *Neurology* 2010; 74: 1316-1324.
12. Joseph, PG et al. The Mini-Mental State Examination, clinical factors, and motor vehicle crash risk. *JAGS* 2014; 62: 1419-1426.
13. Ott BR et al. Clinician assessment of driving competence of patients with dementia. *JAGS* 2005; 53: 829-833.
14. Ott BR et al. A longitudinal study of drivers with Alzheimer disease. *Neurology* 2008; 70: 1171-1178.
15. Ott BR and Daiello LA. How does dementia affect driving in older patients? *Aging Health* 2010; 6(1): 77-85.
16. Rapoport et al. Developing physician consensus on the reporting of patients with mild cognitive impairment and mild dementia to transportation authorities in a region with mandatory reporting legislation. *Am J Geriatr Psychiatry*. 2012; 22(12): 1530-1543.
17. Redelmeier DA et al. Physicians' warnings for unfit drivers and the risk of trauma from road crashes. *NEJM* 2012; 367(13): 1228-1236.
18. Slomski, Anita. Older patients: safe behind the wheel? Physicians may be reluctant to raise the question. *JAMA* 2010; 304(17): 1884-1886.
19. Stutts JC, Stewart JR, Martell C: Cognitive test performance and crash risk in an older driver population. *Accid. Anal. Prev*. 30(3), 337-346 (1998).

Questions?

