To Drive or Not To Drive

Melissa Chun, O.D., F.A.A.O.
Diplomate, Low Vision
Director, Vision Rehabilitation Center
Associate Clinical Professor of Ophthalmology
Jules Stein Eye Institute
David Geffen School of Medicine at UCLA

Outline

• Senior Driving
  – Expected visual changes with age
  – DMV requirements for driving
  – Use evidence-based approach for clinical evaluation of driving appropriateness
  – Predictors of risk—what visual factors influence crash risk/driving performance
  – Options for visually impaired driver
  – Manage and counsel these drivers

Problems Related to Driving

• Inability to read road signs
• Night driving
• Sunglare
• Difficulty in changing lighting conditions

Visual Changes With Age

- Community-living elders (N=900) in Marin County
- No exclusion criterion
- Subsample (596) re-tested ~ 4-5 yrs later
- Large battery of tests
- High contrast VA maintained until age 65-70
- Most drastic especially for 85+: attentional field area, glare recovery time, and vision in glare

Population of Older Drivers

• By the year 2030, estimated that one in five drivers in the US will be age 65 or older
• Persons 85 years and older are the fastest growing segment of the elderly population
• 35 million licensed older drivers, 65 and older, nationwide in 2011
  – Over 1.7 million licensed drivers in California who are aged 70 and older

DMV CA: Senior Guide for Safe Driving 2011
• Americans as a whole are healthier now, and living longer more active lives well into their 80s, 90s, and beyond.
• Life-style concerns:
  - Working
  - Volunteering
  - Daily activities
  - Social activities
• It is estimated that 88% of older Americans rely on private automobiles for their transportation needs.

Attitudes Toward Driving

• 801 LV pts surveyed on the importance of driving and difficulty of driving tasks
• 55% of pts rated driving as extremely important
• Of the group that rated driving extremely important, 77% had a driver’s license, 49% still drove
• Of the pts still driving, 39% reported it was at least moderately difficult to do so
• Data suggested that it takes more than 2 yrs after cessation of driving before adapting to loss of that function & driving ceases to be important

Driving Risks for the Older Driver

• Per capita rate of passenger vehicle crash involvements by driver age, 2011
• Insurance Institute for Highway Safety
  (http://www.iihs.org/iihs/topics/vehicles/drivers/62/62)
• Rate of passenger vehicle crash involvement per mile traveled by driver age, 2015
  (http://www.iihs.org/iihs/topics/vehicles/drivers/qanda)

CA DMV Vision Standards

• Unrestricted license: 20/40 with both eyes tested together and 20/40 in one eye and 20/70, at least, in the other eye (per 2007 DL 62 form)
• Unable to license: 20/200 or worse
• Restricted license: potentially everything in between but better than 20/200 (Supplemental Driving Performance Evaluation–driving test)
• No minimum VF requirement
• Biopic drivers permitted in California—not allowed to wear telescope to pass vision test; given driving test to assess safety while driving with biopic telescope. Restrictions may include daytime only.

DMV Renewal Guidelines

• License renew by mail: 70 years of age or older – not eligible to renew license by mail
  Written and vision test are required
• If vision standard not met, Report of Vision Examination (DL 62) must be completed
  Your Report of Vision Examination will be reviewed at DMV and you will take another vision test. If you pass the vision test, DMV will renew your driver license and add (or retain) a corrective lens restriction to your driver license.
• If you do not pass the vision test, DMV will schedule a Supplemental Driving Performance Evaluation (driving test) for you to see if you can compensate for your vision condition.
• If you pass the driving test, DMV will renew your driver license and add (or retain) a corrective lens restriction to your driver license.
Common Restrictions for Senior Drivers
- No freeway driving
- Driving vehicle with an additional right side mirror
- Driving from sunrise to sunset (no night driving)
- Time of day restriction (e.g., not during rush hour traffic)
- Area restriction (e.g., to physician, church, grocery store)
- Restrictions are based on driving examiner’s findings and recommendations; sometimes added because of volunteered information about a physical or mental disability

Visual Function and Driving
- What visual skills are necessary to drive safely?
- Visual functions that have been studied to predict crash risk:
  - Visual acuity
  - Color vision
  - Glare
  - Binocular vision/nerve anatomy
  - Eye movement disorders (scanning difficulties, limited head movements)
  - Motion perception

Relationships Between Visual Function and Crash Rates
- Several studies have reported positive associations between VA and crash involvement
- However, magnitude of correlation typically is small and only weakly related to crash rate
- Research generally does not support its reliability in identifying high-risk drivers

Role of Visual Acuity
- One of the most influential work by Burg and reanalyzed by Hills and Burg (1960s)
- Analyzed data from 17,500 CA drivers
- VA demonstrated statistical, significant relationship with crash rates in older drivers however, magnitude of correlation was low. Therefore, one should not conclude that poor vision is a causal factor in traffic crashes.
- Numerous subsequent studies have shown remarkable agreement that VA is only weakly associated with crash involvement and unsafe driving performance for older drivers
- While studies have found relatively strong associations for dynamic VA, research from static VA’s however, associations between normal VA and driver safety are still weak (as well established normal values)

Contrast Sensitivity
- Reduced contrast sensitivity has been associated with poor driving performance, self-reported difficulties, and poor crash performance
- Wood found high (0.71) correlation between Pelli-Robson scores and driving performance (simulated decreased contrast) and CS correlated with self-reports of driving difficulty
- Rubin et al. (2007) found that a CS of worse than 1.35 log CS (less than 30 on Pelli-Robson; 36 normal) resulted in 2x more likelihood of driving cessation
- CS score of 1.25 (approx 6.2%) on Pelli-Robson was only independent predictor of crash involvement—drivers with history of crash involvement were 6x more likely to have PR score ≤ or equal to 1.25. CS impairment need only be present in 1 eye for collision risk to be elevated. (Owsley 2001)
- Owsley found however that when adjusted for driving exposure, contrast impairment was not a significant predictor of future crashes
Visual Field

- Most notable study on relationship between VF and driver safety—Johnson and Keltner (1983)
- Utilized automated VF screening of 10,000 applicants for driving license renewal and compared driving records over the previous 3 years
- Incidence of VF loss was 13% for those over 65 years old (about half of those with VF defects were previously unaware)
- Reported crash and violation rates were twice as high among those with severe binocular VF loss than those without any loss. VF loss in one eye, results not statistically significant. Monocular VF screening tests are poor predictors of crash involvement
- Subsequent studies have been mixed; however those with severe VF loss e.g. RP, glaucoma with VF 100 degrees or less horizontal extent had significantly higher risk of accidents (Szlyk 1992, 2005)

Useful Field of View

- Computer generated test
- Tests tasks that involve divided attention and simultaneous processing of information from both central and peripheral VF
- Requires identification of simultaneously presented central stimuli while having to identify peripheral target either in the presence or absence of distracter targets
- Number of studies have found strong association between reduced UFOV and at-fault crash involvement
- Oswald et al (1998 JAMA) found that UFOV impairment was the only visual deficit related to future crash involvement (other impairment evaluated were VA, CS, VF)

Multiple Test Batteries

- Although no single test provides the perfect answer to driver-screening problems, a battery of tests could provide better discrimination
- Visual function measures that have high correlation with driving performance:
  - Contrast sensitivity (Pelli-Robson)
  - Decina and Staplin linked visual examination data from 12,400 drivers in Pennsylvania to crash histories and found drivers that did not meet a combined vision screening criterion (including VF, VA and CS) was strongly related to crash rates in older drivers (Decina, Accident Anal Prev 1993)
  - In a prospective population study, 1801 drivers aged 65-84 were identified over a 2-year follow-up study period. 120 (6.7%) were involved in a crash. The study concluded that glare sensitivity, VF loss and useful field of view (UFOV) were significant predictors of crash involvement. (Rubin et al, IOVS, 2007)

Summary

- Poor association of VA and driving risk
- Weak association for most of the other visual function tests unless impairment is severe
- Best predictor so far is UFOV
- Recommendation: Woods 2002
  - Comprehensive visual assessment including high contrast VA, low CS (Pelli-Robson), VF
  - Supply full refractive correction & appropriate tint
- Education program that includes classroom and on-road training
- Regular testing, with driving test at DMV

Bioptic Driving

- 34 states in the United States currently permit visually impaired people with moderately reduced vision to drive with aid of a bioptic telescope. (Peli E. Driving with Confidence 2002)

CA DMV on Bioptic Driving

- Report of Vision Examination (DL-62)
- Bioptic Telescopic Lens Wearers — If your vision specialist has prescribed a bioptic telescopic lens for you, you may not wear your lens to pass the vision test may not use bioptic lens to meet 20/200 minimum vision requirement
- Supplemental Driving Performance Evaluation (driving test) to determine if you can drive safely while wearing your bioptic telescopic lens.
  - If you pass your driving test, your license will be restricted to wearing your bioptic telescopic lens when driving.
  - If you passed the driving test during the day, you will have a daytime driving restriction.
  - If you passed the driving test at night, you will have only the lens restriction.
Risks of Bioptic Driving

- Few controlled studies of crash risk among bioptic drivers: California (Janke 1994), New York (NY state DMV 1989), Maine (Maine DMV 1983), and Texas (Lippman 1988). They have reported higher crash rates for BTS users, 2-3x higher accident rate.
- Other studies found crash rates similar to those with cardiovascular and neurologic impairments (Lippman 1979) and one study in Mass. Even reported lower crash rates than general population (Korb 1970).

Bioptic Telescope Use Among Moderately Impaired Drivers

- Telephone interview of 58 bioptic drivers
- 74% rated bioptic telescope (bts) very helpful
- 90% would continue to use it for driving even if it were not required for driving licensure
- 62% reported always wearing bts for driving

Bioptic Telescopic Spectacles (BTS)

- Definition: telescope mounted in or on glasses that provide two optical elements for distance viewing
- Spectacle-mounted: hands free use
- Telescope is quickly and easily accessible by tipping head forward in most designs
- Monocular vs binocular

BTS Fitting

- Measure PD
- Standard angle tilt
- Centering 2 mm below eye wire
- Eye size depth with sufficient clearance below
- Ordering information: rx in carrier, eye piece, frame specs
- Adjustments: nose pads, pantoscopic tilt

Training Programs for Bioptic Drivers

- Occupational therapy/hospital driving rehabilitation programs include
  - Clinical visual and perceptual skills assessment
  - Assessment in simulators, reaction time testing
  - On-the-road driving assessment

Options for Patients With Visual Field Loss

- Scanning, head movements
- Side mirrors
- Eli Peli (EP) prisms
  - 57 prism diopter oblique
  - Studies on driving performance with EP prisms
Drivers Education

- Number of classroom-based education program geared to older drivers
  
- Studies have suggested no statistically significant difference in crashes (McKnight 1982, Bedard 2004) and some have even suggested a slight increase in crash risk (Jasko 1994, Nasvadi 2007)
  
- Study of effectiveness of classroom and on-road training program and driving performance (Marottoli, 2007 for AAA Foundation)
  - Reported a 2.87 point difference in driving score, statistical significant between intervention and control group
  - Previous study indicate that a 1-point increase in driving score equated to a 3.3% decrease in crash occurrence over 2 years; hence a 2.87 point improvement equates to a 9.5% decrease in crash risk
  
- Strong evidence that education combined with on-road training improves driving performance (Korner-Bitensky N, J Safety Research 2009)

Programs for the Older Driver

- Programs tailored for the senior population
  - Clinical evaluation of physical, visual, cognitive and visual-perceptual abilities, executive function
  - Usually by OT or Driving Rehab Specialist
  
- On-the-road evaluation/instruction with licensed driving instructor
  - Auto Club
    - Self-rating tool
    - Interactive driving evaluation
    - Clinical assessments (occupational therapist driving rehabilitation specialists)
    - Driving skills evaluations: Adult Skills Audit (90-minute in-car assessment) with referral for BTW training if needed

Programs for the Bioptic Driver

- Low vision rehabilitation driving program
  - Driving Rehabilitation Specialist: driver-ed.org
  
- Hospital based rehabilitation program
  - Cedars-Sinai: Driving and Vision Assessment, Outpatient Rehabilitation Services
  - Northridge Hospital: Driver Preparation Program, Center for Rehabilitation Medicine
  - St Jude: Driver Assessment Program

Alternative Transportation

- Paratransit

- Community/senior citizen center

- City programs

Reporting Requirement

- Physicians are required to report all patients diagnosed with ‘disorders characterized by lapses of consciousness.’

- Physicians are not required to report unsafe drivers

  AMA Physician’s Guide to Assessing and Counseling Older Drivers

Resources for Patients

- Seniordriving.aaa.com (Auto club website for senior drivers)

- www.car-fit.org (adaptive devices for car)