Vision Deficiency and Commercial Motor Vehicle Driver Safety

Findings of Evidence Report

Presented by
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Issues Considered

- Monocular vision and driver safety
- Red-green color deficiencies and driver safety
- Visual field loss and driver safety
- Cataract and driver safety
- Diplopia and driver safety
## Searches

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Monocular Vision and Driver Safety

• **Crash data:**
  – 3 studies (median quality: low)
  – N = 74 drivers with monocular vision
  – None specifically enrolled CMV drivers
  – 1 study found an increased crash risk associated with monocular vision
  – 2 studies did not
Monocular Vision and Driver Safety

- **Simulated driving performance:**
  - 1 study (low quality)
  - N=40 monocular CMV drivers
  - Comparison group: CMV drivers with binocular vision
  - Assessed recognition distance, mirror checks, lane keeping, clearance judgment, and gap errors
  - No between groups difference in simulated driving performance: Exception: poorer sign recognition among monocular drivers
Monocular Vision and Driver Safety -
Summary

• It remains unclear whether individuals with
  monocular vision can safely operate a CMV
Red-Green Color Deficiency and Driver Safety

• **Crash data**
  – 1 study (moderate-quality)
  – N = 151 color-deficient drivers compared to normal vision controls
  – Difference in self-reported crash rate assessed
  – No between-group difference found
Red-Green Color Deficiency and Driver Safety

- **Signal recognition and response times**
  - 2 small, low-quality studies found that color deficient individuals made more signal recognition errors than color vision normals
  - 1 small, low-quality study found that individuals with color deficiency responded more slowly to colored signals than color vision normals
Red-Green Color Deficiency and Driver Safety - Summary

• No data from CMV drivers
• There is some evidence that red-green color deficiency may impact ability of some individuals to recognize and react to traffic signals and lights
• No evidence that individuals with a red-green color deficiency are at an increased risk for a crash
Visual Field Loss and Driver Safety

- **Crash data:**
  - Standard perimetry (automated or manual)
  - 12 studies (Quality: low/moderate)
  - N = 62,492 drivers
  - 8 of 12 studies found statistically significant associations between VF loss and increased crash risk
  - Optimal field testing parameters could not be determined
• Crash data:
  – Useful Field of View (UFOV) Test
  – 6 studies (median quality: moderate) that enrolled 4,447 drivers
  – All studies showed a statistically significant increase in crash risk associated with VF loss
  – 3 studies found a statistically significant increase in crash risk associated with a $\geq 40\%$ loss on the UFOV test
Visual Field Loss and Driver Safety -
Summary

• No data specific to CMV drivers.
• VF loss measured by standard perimetry is a risk factor for a crash
• Optimal VF testing parameters for predicting crash could not be determined
• UFOV loss is a risk factor for crash
• UFOV loss of $\geq 40\%$
Cataracts and Driver Safety– Crash Data

- 4 studies (Quality: moderate) that enrolled N=943 drivers

- 1 study found that individuals with cataracts are at an increased risk for a motor vehicle crash; the remaining 3 studies did not.

- Study that reported increased crash risk with non-surgically treated cataracts found that crash risk was reduced with surgical treatment.
Cataracts and Driver Safety - Summary

• No data specific to CMV drivers

• It is plausible that visual deficits that result from cataract (glare, reduced VA, diplopia) may have a deleterious impact driver safety

• The visual deficits associated with cataract can be reversed in most individuals through cataract surgery
Diplopia and Driver Safety – Crash Studies

- 1 case-control study (low quality) that included a total of 10 drivers with diplopia
- Prevalence of diplopia evaluated among drivers who crashed and drivers who did not crash compared
- No evidence of increased crash risk for drivers with diplopia
Diplopia and Driver Safety – Indirect Evidence

- **Simulated Driving Performance**
  - 1 moderate-quality study of 10 drivers with diplopia compared to drivers without diplopia
  - No between-group difference was found in recognition responses or reaction times
  - Although consistent with the crash study findings, two small studies of low-to-moderate quality are insufficient to rule out the possibility of an increased risk
Diplopia and Driver Safety

- No data specific to CMV drivers
- Evidence (2 crash studies and a simulated driving performance study) does not provide evidence that the safety of drivers with diplopia is compromised