Variations in Vision Impairment

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Vision that can’t be...

- corrected to 20/40 or better
- improved with standard glasses or contact lenses
- corrected with surgery or medicines

What do we mean by “vision impairment”?
Vision impairment is the best-corrected visual acuity less than 6/12 (≤20/40) in the better-seeing eye (including those who were categorized as being blind by the U.S. definition.)

Source: National Eye Institute
<table>
<thead>
<tr>
<th>Vision Problem</th>
<th>Estimated Number of Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Population ≥ 40</td>
<td>142,648,393</td>
</tr>
<tr>
<td>All Vision Impairment</td>
<td>4,195,966</td>
</tr>
<tr>
<td>Blindness</td>
<td>1,288,275</td>
</tr>
<tr>
<td>Low Vision</td>
<td>2,907,691</td>
</tr>
</tbody>
</table>
2010 U.S. Prevalence Rates for Low Vision

Source: National Eye Institute
Cases of Low Vision (in thousands)

Source: National Eye Institute
2000 U.S. Prevalent Cases of All Vision Impaired by Gender

66%

Female

34%

Male

Source: National Eye Institute
All Vision Impaired

Source: National Eye Institute
- Media Opacities
- Macular dystrophies and degenerations
- Peripheral retinal degenerations
- Optic nerve anomalies
- Visual cortex (brain) damage

What goes wrong with vision?
What

- Anything that prevents light from reaching the retina (receptor layer) of the eye
- Fuchs’ Corneal Endothelial Dystrophy
  - Clouding of the front-most layer of the eye
- Cataracts
  - Cloudy lens behind the pupil
  - Generally age-associated, but can be congenital, trauma, or medication related
Effect

- Generally a hazy view of the world
- “Dirty windshield” effect
- Light scattering
- Worse when viewing bright point sources of light
- Reflected light can bypass filters and visors
- Leading cause of blindness in the US among persons over 65
- 10 percent of the population over 52, 33 over 75
- Of those who are not legally blind, 90 percent have the dry variety

Age-Related Macular Degeneration
What

- Drusen: deposits underneath the retinal pigmented epithelium
- “Sick” RPE
- Degeneration of the RPE leads to degeneration of the outer retinal layers
- Only changes to wet in 20 percent of the cases

Dry Macular Degeneration
What

- Drusen may be a precursor
- A breakdown of the RPE and Bruch’s membrane leads to sub-macular neovascularization
- When the new vessels leak, scarring occurs which destroys the macular receptors
Effect

- Loss of central vision
- Peripheral vision is intact
- Acuity loss in the range of near perfect to 5/125
- Difficulty reading, identifying faces, driving
What

- Number one cause of new blindness in the 20-74 year old age group
- Responsible for 10 percent of the blind population of the US
- Breakdown of retinal vessels leads to hemorrhage, edema and retinal detachments
Effect

- Multiple small blind spots from hemorrhage and laser treatment
- Macular edema distorts central vision
- Vitreous hemorrhage causes significant reduction in vision
- Retinal detachments can lead to total blindness
What

- Hereditary condition which includes:
  - Progressive visual field loss
  - Night blindness
  - Abnormal electroretinogram

- Characteristic pigmentary pattern
- Many syndromes associated with RP

Retinitis Pigmentosa
Effect

- Gradual peripheral vision loss
- Cataracts
- Ultimate loss of central vision

Retinitis Pigmentosa
Damage to the nerve fibers blocks signals to the visual center of the brain

- Glaucoma
- Vascular occlusions
- Multiple sclerosis

Optic Nerve Anomalies
What

- Optic nerve atrophy caused by intolerance to intraocular pressure
- Risk factors
  - Age
  - Family history
  - Race
  - Myopia
Effect

- Blind spots
- Overall dimming of vision
- Profound vision loss or total blindness
What

- Cerebro-vascular events (strokes)
- Traumatic Brain Injury (TBI)
- Leads to infarct (damage) to brain tissue that processes the information it gets from the eyes
Effect

- Minor events
  - TIA’s
  - Headaches
  - Resolving field loss
- Major events
  - Significant visual field loss
  - Cortical blindness
  - Diplopia
• Eye disease changes visual perception
• The prevalence of vision impairment will increase markedly in the coming decades
• Building design has a significant impact on accessibility for visually impaired persons

Summary
“The church and the law deal with the yesterdays of life; medicine deals with the tomorrows.”

Dr. William J. Mayo, 1926
Acknowledgments

The Hulda B. and Maurice L. Rothschild Foundation
www.TheRothschildFoundation.us/
American Foundation for the Blind
www.visionaware.org/
National Eye Institute
www.nei.nih.gov/eyedata/lowvision.asp