

Pennsylvania Academy of Family Physicians Foundation

## Pittsburgh CME Conference

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### **Geriatric Sensory Changes**

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#### **Disclosures:**

Speaker has no disclosures and there are no conflicts of interest.

The speaker has attested that their presentation will be free of all commercial bias toward a specific company and its products.

The speaker indicated that the content of the presentation will not include discussion of unapproved or investigational uses of products or devices.

**Sensory Changes  
&  
The Biology of Aging**

Paula Bordelon, DO

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**Disclosures**

- Dr. Paula Bordelon has no conflict of interest, financial agreement, or working affiliation with any group or organization.

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**Objectives**

- Describe physiology of aging for eye and ear and review the impact of each on seniors
- Describe options that are available for seniors who have loss of hearing or vision
- Review diseases that cause sensory loss

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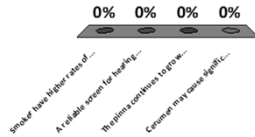
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All of the following are "true" except:

1. Smoker have higher rates of hearing loss than nonsmokers.
2. A reliable screen for hearing loss is the Whisper Test.
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4. Cerumen may cause significant hearing loss, up to 40 dB.



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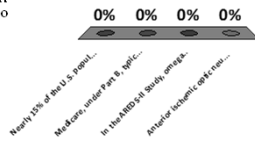
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2. Medicare, under Part B, typically covers yearly screening examinations for glaucoma in patients age 65 and older.
3. In the AREDS-II Study, omega-3 fatty acids were shown to reduce advancement of age-related macular degeneration.
4. Anterior ischemic optic neuropathy is a condition whereby one suffers vision loss due to insufficient blood supply to the optic nerve.



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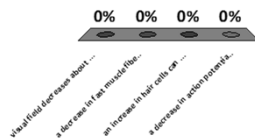
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A consequence of aging includes all of the following except:

1. visual field decreases about 3 degrees per decade beginning in a person's mid-thirties.
2. a decrease in fast muscle fibers leads to decreased strength and contractility.
3. an increase in hair cells can lead to tinnitus in seniors.
4. a decrease in action potentials and number of neurons leads to lengthened response times.



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## Physiology of Aging - Eye

- Iris muscle function regulates pupil size and reaction to light. Aging weakens muscle, result in smaller, more sluggish pupils that dilate slowly in dark
- Visual field decreases  $3^\circ$  /decade and by age 70, have 20-30° total horizontal visual field loss (major cause of accidents)

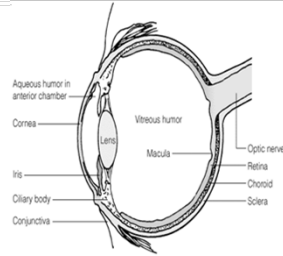


FIGURE 116-1. Structures of the eye that undergo anatomic or physiologic changes with aging.

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## Visual Impairment

- Visual impairment (acuity < 20/40)
  - Increases with increasing age
  - Affects about 1/3 of individuals over age 75
- Blindness (acuity < 20/200)
  - represents about 2% of that population
  - 15% U.S. population > 64 yrs, but 50% of blind population
- Of all office visits made by elderly, about 15% ophthalmologists, one of the highest rates to specialists

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## Visual Impairment

- Impaired vision has been linked to significant deterioration in quality of life
- Impaired vision linked to difficulty performing ADLs
- Visual impairment linked to falls motor vehicle accidents

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## Screening

- American Academy Ophthalmology recommends a comprehensive eye examination at least every 2 years in age 65+
- Assessing Care of Vulnerable Elders (ACOVE) recommend a comprehensive eye examination every 2 years
- USPSTF states insufficient evidence to recommend screening for primary open angle glaucoma

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## Screening

- Medicare does not cover for routine eye examinations
- Medicare covers for glaucoma screening for those at high risk once every 12 months
- Medicare covers for yearly exam for diabetic retinopathy

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## Most Common Causes Blindness

- Glaucoma
  - Open angle
  - Narrow angle
- Age-related macular degeneration
  - Wet form
  - Dry form
- Diabetic retinopathy

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## Glaucoma

- Impacts over 2 million Americans
- Second most common cause of blindness
- Results from optic nerve head damage WITH visual field loss
- Types
  - Primary open angle
  - Acute closure

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## Primary Open Angle Glaucoma (POAG)

- Primary open angle is most common
- Caused by impaired (slow) aqueous drainage leading to increased intraocular pressures (IOP)
- Increase in IOP slower and less severe
- Problematic because patients often suffer substantial vision loss before consulting a physician

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## Management POAG

- Mgmt goal is to decrease aqueous production or increase outflow
- Use IOP-lowering medications (alpha or beta adrenergic agonists) and prostaglandin analogs (increase uveal-scleral outflow)
- Argon laser trabeculoplasty
- Intraocular surgery to create fistula +/- anti-metabolite
- Destruction or drainage devices

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## Acute Angle-Closure Glaucoma

- Caused by the eye's drain being suddenly blocked and IOP increasing precipitously
- Causes pain, redness of eye, acute vision loss and often nausea and headaches
- Calls for emergent ophthalmologic referral

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## Glaucoma

Normal vision



Vision in Glaucoma



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## Anterior Ischemic Optic Neuropathy

- Is a microvascular occlusion of the blood supply to the optic nerve
- Caused by
  - NONARTERITIC - impacts those with risk factors vascular disease (i.e. DM or HTN) or
  - ARTERITIC - inflammation (i.e. arteritis)

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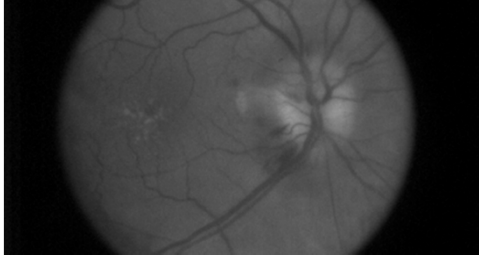
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## Anterior Ischemic Optic Neuropathy



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## Macular Degeneration

- Most common cause of irreversible blindness in the developed world
- Risk factors include: advancing age, genetic predisposition, HTN, smoking, fair-skinned
- Two forms
  - Dry – more common, Drusen
  - Wet – angiogenesis or choroidal neovascularization

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## Macular Degeneration

- Age-related Eye Disease Study (AREDS) found risk of neovascularization decreased by 25% treated with high dose multivitamin therapy 2001
  - 500 mg Vitamin C            400 IU Vitamin E
  - 80 mg Zinc                    2 mg Copper
  - 25K IU Vitamin A(15 mg beta-carotene)
- AREDS II 2006
  - no overall benefit to adding omega-3 fatty acids or mixture of lutein or zeaxanthin
  - 2 subgroups with “some benefit”:
    - No beta-carotene
    - Little lutein and zeaxanthin in diet

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## Macular Degeneration

- Treatment
  - Antioxidants and high-dose MVI
  - Laser therapy
  - Inject inhibitors of vascular endothelial growth factor (VEGF)
    - Pegaptanib
    - Ranibizumab

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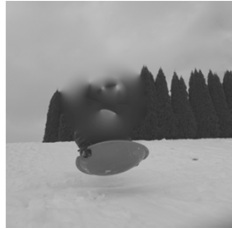
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## Macular Degeneration

Normal Vision



Vision Macular Degeneration



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## ACOVE Strategies: Vision Impairment

- There are 14 quality indicators
  - Offer comprehensive eye exam every 2 years
  - For sudden onset eye pain, corneal opacity, purulent d/c, visual changes, senior must be examined by ophthalmologist within 72 hrs
  - For progressive, chronic visual deficit that interferes with ADLs or needs, need eye exam within 2 months
  - If senior has a cataract, must assess visual fxn yearly
  - If have MD and associated acute worsening, need dilated retinal eye exam within 3 days

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## Physiology of Aging - Ear

- Pinna grows
- External ear canal thins
- Tympanic membrane thickens
- Decrease in elasticity and efficiency of ossicular articulation
- Cochlear neuronal loss/hair cells

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## Hearing Loss

- Hearing loss (HL) is a chronic disease often “down-played” by health care professionals
- Fourth most common chronic disease among older adults
- Increases with advancing age
  - 10% adults age 65-75 have hearing loss
  - 25% adults age 75+ have hearing loss

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### 3 Kinds Hearing Loss

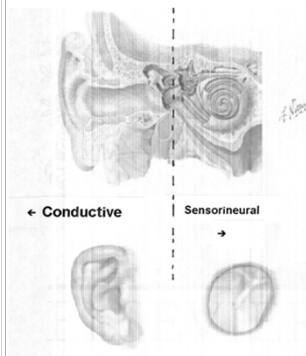
#### Conductive

outer or middle ear fails  
sounds are blocked

#### Sensorineural

mc  
known as nerve deafness  
involves inner ear, 8<sup>th</sup> nerve,  
or brain

#### Mixed



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## Hearing Loss Risk Factors

- Genetic predisposition for presbycusis (women > men)
- Environmental factors
- Gender differences (men before women)
- Cardiovascular disease and diabetes
- Lifestyle – smoking certainly

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## Hearing Loss: the Basics

- Sounds are described by frequency and intensity
  - “frequency” (pitch)
    - Measured in Hertz (Hz)
    - Most important sounds 250 to 6000 Hz
    - Vowels 250-1000 Hz
    - Consonants:
      - C, p, ch, g, h, sh: 1000-2000 Hz
      - f, k, s, t, th: 3000-8000 Hz
  - “intensity” (loudness)

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## Hearing Loss: the Basics

- “intensity” (loudness) is measured in decibels (dB)
- Person with “normal” hearing can hear sounds from range 0 to 140 dB
- Whisper about 30 dB
- Normal conversation 50 – 60 dB
- Lawn mower 105-110 dB
- Maximum iPad volumen 115 dB
- Jet plane taking off 120-130 dB
- Gun shot from rifle 130 – 140 dB

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## Presbycusis

- Sensorineural, symmetrical, & progressive HL
- Characterized as sensory, neural, strial, cochlear, combined, indeterminate
- Occurs first at high frequencies (8000 Hz) but progresses to lower frequencies
- High frequencies are important for auditory discrimination in the presence of background noise
- Have inability discriminating between many consonant words (e.g. "cable" "table"; "sick" "thick")

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## Diagnosis of HL

- Slowly progressive so often unnoticed
- May be perceived as cognitive impairment
- Otoscope tone generator at frequencies 500, 1000, 2000, 4000 Hz) at 25 dB and 40 dB
- Reliable screen is "Hearing Handicap Inventory of Elderly"
- Cerumen may cause significant HL (up to 40 dB)

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## Strategies to Improve Communication

- Ask listener what is the best way to communicate
- Obtain listener's attention
- Eliminate background noise
- Speak toward better ear
- Listener must see speaker
  - Speak face-to-face
  - Speak each word clearly and distinctly in COMPLETE sentences
  - Light should be on speaker, not behind speaker
- Use "teach me" technique

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## ACOVE Strategies: HI

- Screen for hearing loss at initial evaluation & annually
- If self-reported HL or fails screen, make an appropriate referral within 3 months to ENT or audiologist
- If a candidate for hearing aid, offer rehabilitation with a hearing aid.
- Conductive HL warrants referral to ENT
- If fail to benefit from hearing aid, for persisting hearing handicap, offer hearing rehab or assistive device

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## Hearing Rehab

- Hearing Aids
- Assistive Devices
- Cochlear Implants
- Living with Hearing Loss Classes
- Listening Training
- Lipreading Training
- Coping Strategies

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## Physiologic Changes Aging

BODY SYSTEM	CHANGE	CONSEQUENCE
Nervous	<ul style="list-style-type: none"> <li>↓ Neurons</li> <li>↓ Action potential</li> <li>↓ Axon branches</li> </ul>	<ul style="list-style-type: none"> <li>↓ M. innervation &amp; response time lengthens</li> <li>↓ Fine motor control</li> </ul>
Muscle	<ul style="list-style-type: none"> <li>Fibers shrink</li> <li>↓ Type II (fast)</li> <li>↑ Fat deposits</li> </ul>	<ul style="list-style-type: none"> <li>Tissue atrophies</li> <li>↓ Tone/contractility</li> <li>↓ Strength</li> </ul>
Skeletal	<ul style="list-style-type: none"> <li>↓ Bone density</li> <li>↓ Flexibility</li> <li>Joints stiffen/cartilage thins</li> </ul>	<ul style="list-style-type: none"> <li>Movement slows &amp; becomes limited</li> </ul>

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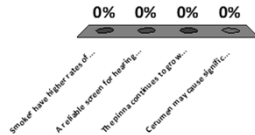
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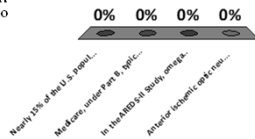
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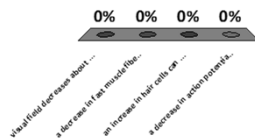
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## Websites

- <http://one.aao.org/preferred-practice-pattern/comprehensive-adult-medical-eye-evaluation--octobe>
- <http://www.medicare.gov/coverage/glaucoma-tests.html>
- <http://www.uspreventiveservicestaskforce.org/Page/Topic/recommendation-summary/glaucoma-screening>
- [http://www.rand.org/content/dam/rand/pubs/working\\_papers/2005/RAND\\_WR180.pdf](http://www.rand.org/content/dam/rand/pubs/working_papers/2005/RAND_WR180.pdf)
- <http://www.nei.nih.gov/news/pressreleases/050513.asp>

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