Audiological Management of the Geriatric Patient

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Hearing and the Elderly

Hearing (not hearing loss)

I. Identification
   • the Patients
     » the difference: who, how, why?
     » incidence & prevalence
   • the Problems
     » functional impact
     » Quality of Life (QoL)

II. Treatment
   • the Products
     » Hearing Aids
     » Hearing Assistive Devices
     » Audiological Rehabilitation

III. Outcomes
   • Quantifying the obvious
   • Efficacy vs. Effectiveness

IV. The Profession
   • Doctoral degree
   • Vanderbilt Bill Wilkerson Center
Many Faces of hearing
I. Identification

a. The Patients

b. The Problem
Communication Disorder

- WHO model for disease consequence
  - Disorder  Impairment
  - Disability  Handicap

- Auditory disorder
  - Anatomic abnormality may or may not change sense of hearing
    - Congenital abnormality or middle ear pathology

- Hearing impairment
  - Abnormal function of auditory system
    - Abnormal audiogram

- Hearing disability
  - Effect of an impairment on everyday hearing ability
    - Hearing speech in noisy restaurant
    - APHAB hearing disability inventory

- Hearing Handicap
  - Impairment/ disability that limits psychosocial functioning
  - Non-auditory problems resulting from impairment or disability
    - Social isolation or depression
    - HHIE/A hearing handicap inventory
The Patients

- 250 million worldwide
  - Most frequent sensory deprivation

- 3rd most prevalent chronic condition
  - hypertension & arthritis
  - primarily presbycusis
  - 30% cerumen & otitis media

- Hg loss effects 10-12% US pop
  - 2 million over age 70

- 25-40% 65+y/o = Hg imp
- 40-66% 75+ y/o = Hg imp
- 80+% 85+ y/o = Hg imp

“Compared to all the other health problems I have had to endure, multiple sclerosis, cancer, lupus....hearing loss is the most devastating to me... It is isolating, maddening, and it makes me feel so stupid... I hate it!”

C.F. 79-year-old male
Hearing Loss Population by Age Group
Owners versus Non-owners (2000)

Not just a Medicare problem
Average Age of New Users

- 1989: 66
- 1991: 68.4
- 1994: 67.8
- 1997: 66.3
- 2000: 68.8
- 2004: 69.3
Little Change in Market Penetration by Age Since 1989

The chart illustrates the percentage of individuals owning hearing instruments across different age groups from 1989 to 2000. It shows minimal change in market penetration across age groups, with a notable increase in the 85+ age group from 1991 to 2000.
How/why are elderly patients different?

Hearing aid patients

Hearing aid advertisements

http://www.audeoworld.com/
How they often present

Denial, distrust, confused, misinformed, anxious, embarrassed, low self-confidence, restricted social participation, frustration, reduced quality of social interactions
Psychological, social, emotional implications

- Isolation
- Self-efficacy
- Fear/ anger
- Depression/ anxiety
- Embarrassment
- Fatigue
- Tension and stress
- Negativism
- Less alertness to environment

- Danger to personal safety
- Rejection by others
- Reduced general health
- Loneliness
- Impaired memory
- Less adaptability to learning new tasks
- Lessened ability to cope
- Reduced overall psychological health

Kochkin and Rogin, 2000
Consequences of HL Experienced by Older Adults:

- Negative impact on communicative behavior
  - Alter psychosocial behavior

- Strain family relations
  - Limit enjoyment of daily activities

- Interfere with ability to live independently and safely
  - Interfere with long distance contacts on the telephone, potentially jeopardizing safety and security

- **Interfere with medical diagnosis, treatment, and management**
  - Interfere with therapeutic interventions across all disciplines including social work, speech-language therapy, physical, or occupational therapy

(Weinstein, 2000)
We don’t fix the ears, but the life the ears belong to.

- Focus on residual hearing not the loss
- Personality of the patients
- Functional communication abilities
- Realistic expectations
- Patient’s lifestyle
Hearing Screenings

• Routine examination in identification of hearing loss can assist in diagnosing and differential diagnosis (e.g., Alzheimer’s disease, dementia, depression) and can promote quality of life.

• Acknowledges that HL among older adults is amenable to medical, surgical, or audiologic intervention.

• U.S. Preventive Services Task Force recommends that elderly persons be periodically evaluated regarding their hearing, referred for any abnormalities, and counseled regarding the availability of devices to remedy HL.
  • Welcome to Medicare visit

• Only 9% of internists offer hearing testing to patients 65 yrs or older. (Yueh, et al., 2003; JAMA)
Hearing Screening

3 commonly accepted criteria for community health screening program:

1. the burden of disease must be significant enough to justify the effort of screening
2. an effective treatment must be available for the detected condition
3. an accurate, practical, and convenient screening test must exist.

Yueh, et al. (2003) JAMA
Hearing Screening

• Patients are usually unaware of the presence of hearing loss.

• Physicians may overlook presbycusis in a quiet examination room, since early symptoms are more apparent in poor acoustical or noisy environments.

• Diagnosis of hearing loss MUST be confirmed with formal audiometric testing – the diagnostic criterion standard.
  
  Yueh, et al. (2003) JAMA

• Hearing screeners
  – Hand held device
  – Paper-pencil inventory
    – HHIE/A screener
    – Five minute hearing test
  – Single question format
    • “How is your hearing”
      – If “positive”, then >70% correlation to mild loss or greater
“Normal” Transmission and Transformation of Sound

**Acoustic**
1) Sound vibrations strike the eardrum.
2) The auditory ossicles vibrate and the footplate of the stapes moves at the oval window.
3) Movement of the oval window causes the fluid inside the scala vestibuli and scala tympani to move.

**Mechanical**
2) The auditory ossicles vibrate and the footplate of the stapes moves at the oval window.

**Hydraulic**
3) Movement of the oval window causes the fluid inside the scala vestibuli and scala tympani to move.

**Electrical**
4) Fluid movement against the cochlear duct sets off nerve impulses, which are carried to the brain via the cochlear nerve.

http://www.gnresound.com/videoTour.html
The Problem: The Aging Auditory System

• “The most critical risk factor for the auditory system is age.” (Moscicki, et al. 1985)

• **Outer ear:** excessive hair growth, loss of elasticity, dryness, thinning, collapsed ear canals

• **Middle ear:** TM stiffer, thinner, less vascular; atrophy of the middle ear muscles/ossicular ligaments, ossification of the ossicles.

• **Inner ear and neural pathways:** undergoes dramatic changes with age with corresponding effects on pure-tone thresholds and word recognition tests. (i.e., hair cell loss, loss of ganglion cells, decrease in cochlear nerve fibers)
Aging of the Inner Ear

There is a big difference between *hearing* and *understanding*.

Damaged inner ear (outer & inner hair cells) can lead to:

- Hearing impairment for pure-tones
- Reduced frequency resolution
- Reduced temporal resolution
- Impairment of speech detection

(Binnie, 1991)
Normal inner & outer hair cells

Impaired inner & outer hair cells
Healthy stereocillia

Impaired stereocillia
Online resources

Simulated hearing test

http://www.freehearingtest.com/images/testnew2.swf

Hearing loss simulation

From the trenches....

- Hearing aid fittings:
  - Ear impressions: The thin portions of skin in the ear canal become dry and prone to trauma and breakdown.
  - Wax: increases with age, from increased activity of cerumen glands and the presence of thicker, longer hair follicles.
  - Plastic/ cosmetic surgery: structural change of pinna and ear canal.
Health-related Quality of Life (HRQoL)

• HRQoL encompasses the physical, emotional and social dimensions of a condition. (Gill & Feinstein 1994)
  – Document the burden of chronic disease, track health changes over time, assess effects of treatment (Hays et al 2000)

• 36 item Short Form Health Survey (SF-36) (Ware & Sherbourne, 1992) generic HRQoL survey.
  – Permits comparing effects on HRQoL of one condition (i.e. hearing) against other medical conditions and disabilities (i.e. macular degeneration).

• Historically, few studies have assessed hearing impairment with generic HRQoL measures.
Impact of hearing loss on HRQoL

• Dalton et al, The Gerontologist, Col. 43, No.5, 2003, 661-688
  - N=2,688, ages 53-97 (mean =69y/o), 42% male
  - Severity of hearing loss is associated with reduced QoL
    • Moderate to severe hearing loss significant for:
      - Higher hearing handicap
      - Self-reported communication difficulties
      - Impaired ADLs and IADLs (Activities of Daily Living)
      - Decreased function of SF-36 in both Mental and Physical Component Summary, as well as 6 of 8 individual domains.
Acceptance is the first step…

• Tendency to dismiss hearing loss as either unimportant or an inevitable aspect of aging.

• Only 22% mild loss and 56% moderate loss report a hearing handicap on the HHIE-S (Cruickshanks et al 2003)
  • However, *self-reported communication difficulties* rose to 59% and 82% respectively with same population.
II. Treatment

• The Products
  – Hearing Aids
  – Hearing Assistive Technologies
  – Audiological Rehabilitation

Hearing aid

Edith Miner (left) of LaCrosse, Wis., uses a homemade “megaphone” as she sings to her 105-year-old mother, Edith Pahl, during a sing-along at the Bethany-Riverside nursing home. The singing was part of the home’s annual Old-Time Church Revival.
Hearing Aids

- From “oh my gosh….”
to “OH MY GOD…..”
Hearing Assistive Technologies
Myths about HAs and AR

1. Hearing aids restore hearing to normal.

2. Hearing aids eliminate all communication problems.

3. All hearing-aid users can achieve adequate speech recognition with hearing aids alone.

4. Most people with hearing aids do not like how they sound.
What they want in their hearts

- Invisible device
- Filters out unwanted noise
- Never breaks down or runs out of batteries
- Hear like they did in childhood
Hearing Aid Technology

- Past problems now solved (kinda)
  - Background noise
  - Whistle/feedback
  - Repair rates
  - Telephone use
  - Too conspicuous

- Advanced digital signal processing
  - Directional microphones
  - Dynamic feedback reduction
  - Wax, moisture, trauma #1
  - Auto tele-coil
  - Miniature behind-the-ear
Considerations for HA Fittings to elderly patients

- Type, degree, and configuration of HL
- Daily listening environments
- Cognitive issues
- Motivation
- Realistic Expectations
- Vision acquity
- Manual dexterity issues
  - battery insertion/removal
  - hearing aid insertion/removal
- Overall patient-oriented goals

- Non-compliance to hearing aid use
  1) Perception that hearing loss is not severe enough
  2) Cost
  3) Perceived negative images associated with hearing aid use
III. Outcomes

• Quantifying the Obvious:
  • National Council on Aging (NCOA) “users of hearing aids on average are more socially active and avoid extended period of depression, worry, paranoia and insecurity compared to non-users with hearing loss.” (January 2000)

• Treatment Efficacy:
  • > 50% positive changes and reported benefits:
    – Relationships at home, feelings about self, life overall, relations with family, participate with groups, social life, relationships at work (Kochkin & Rogin 2000)
Treatment Effectiveness, Efficacy and Effects of Hearing Aids

Effectiveness: Do hearing aids work?
• Unquestionably yes!
• HA use clearly demonstrated to improve physical, emotional, mental and social well-being.

Efficacy: Does one HA work better than another?
• maybe, sometimes, seldom….

Effects: In what way does the use of HA’s alter behavior?
• *Viagra* for the ears
• reduces stress/ fatigue, improves intimacy, self-concept, self-confidence, outlook on life, social life, etc
From the literature....

Cox, Alexander, & Gilmore (1991):
• Perceived benefit from HAs as reported by older adults with impaired hearing:

  – Improvements in communication:
    • Improved communication in easy-listening conditions
    • Easier to communicate
    • Improved speech understanding in reverberant conditions, with background noise, and with reduced visual cues

  – Improvements in psychosocial function:
    • Improved emotional function
    • Improved social function
    • Improved psychosocial function as perceived by the spouse of the hearing impaired
    • Improved cognition
    • Improved affect
Audiological Rehabilitation

• Role of the audiologist is to facilitate the reduction in communication disability and psychosocial handicap associated with a given hearing impairment via an acceptable intervention, such as hearing aids or other hearing assistive technologies.
Goals of Aural Rehabilitation:

1. Promote an understanding of HA’s, their care and maintenance and promote realistic expectations regarding their capabilities.
2. Maximize sensory input by providing the best possible visual and auditory signal.
3. Understand the psychological and social problems resulting from hearing impairment.
4. Resolve the psychological and social problems resulting from hearing impairment.
5. Maximize sensory integration by making the best use of amplified auditory signal and the visible signal.
6. Promote the use of cognitive processes necessary to derive meaning from incomplete sensory messages.
7. Promote an understanding of how to create a positive communication environment.
8. Develop within the individual assertive and interactive ways of communicating and repairing breakdowns.
9. Empower the person with disabling and handicapping hearing impairment.

(Weinstein 2000)
Kricos (2000)

• One of the most prominent features of AR outcomes research has been inter-subject variability.

• Reasons for variability: non-audiological factors:
  - Personality
  - Self-efficacy for AR
  - Age
  - Gender
  - Race/ethnicity
  - Education
  - Socioeconomic status
  - Other health problems
  - Motivation during therapy
  - Support from significant others
  - Communication demands/ opportunities

• Must consider individual’s domestic/social background to design an AR program that will meet their listening and communication needs.
Kricos (2000)

• Because AR involves learning new information, such as techniques of caring for and using HA’s, an understanding of the influence of aging on memory and learning is critical.

• Motivation is one of the most important variables affecting the success of AR.
Kricos (2006)

• Ways age may impact AR outcomes:
  – Vision problems
  – Reduced manual dexterity
  – Cognitive compromises (Smith, Kricos, and Holmes; 2001 and 2002)

• Many aspects of cognition are unperturbed by aging; however, others may decline with age:
  – Information processing speed
  – Divided attention skills
  – Ability to switch rapidly between multiple auditory inputs
  – Sustained attention
  – Selective attention
IV. The Profession
Doctor of Audiology

• Doctoral degree entry model

• Audiologist vs. H.I.S.

• Perception/ experience of elderly patient

• Point of entry
  – Geriatrics/ PCP/ ENT/ Au.D.
Bill Wilkerson Center

• Division of Audiology
  – 58 year history in Nashville
    • Merged with Vanderbilt in 1998
  – 20,000 patient visits annually (3 sites)
  – Nationally-known Balance Function Laboratory
    • Risk of Falls Assessment program
  – 2000+ hearing aid fittings annually
    • Largest HA assistance program in country
  – Extensive Auditory Prosthesis Implant program
    • Cochlear implants, Baha, Auditory Brainstem Implants
  – National Center for Childhood Deafness
Case study #1
(1 year ago, same ears, very different patient)

- 69-year-old female
- One year ago lived 100% independently and worked full-time
- Diagnosed with Leukemia 6 months ago (started chemotherapy at that time)
- Gradual hearing loss for last 6 months
- Now lives with her daughter and wheelchair bound
- VBWC with one hearing aid (told she was deaf in the other ear)
- Now fit with two new BTE hearing aids appropriate for her and her hearing loss

Word recognition scores: 70% R
90% L
Case study #2
(best for hearing, not always best choice)

- 89 year-old female
- Has lived in assisted-living for some time
- Previous hearing aid user (current hearing aids no longer strong enough)
- Only wants to hear better in the dining hall with friends
- Manual dexterity and memory loss caused issues with adjusting to new BTE hearing aids.
- Now fit with new ITE hearing aids – exactly as she had before (except newer features)
Thank you!

• Questions?
• Thoughts?

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