Hearing Loss & Hearing Assistance Technologies

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https://www.youtube.com/watch?v=j8E2oKMy3o

Learning Objectives

• Describe basic components of the auditory system
• Describe functional communication disabilities associated with hearing loss
• Identify technologies available to maximize communicative function for hard of hearing individuals
• Employ appropriate communication strategies with hard of hearing clients
How Many People Have Hearing Loss

• 10% of the population
• Over age 65: 30 - 60%
• Age 45-64: 14%
• Age 18-44: 3%
• Under 18 years 2%

The Auditory System

• Environmental Monitor
  – distance
  – location
  – danger
• Facilitates Communication
  http://www.youtube.com/watch?v=3yQzm_36DMY

The Auditory System
Tour of the Ear

- Outer Ear
- Middle Ear
- Inner Ear
- Central Auditory Pathway

Disorders

- Outer Ear
- Middle Ear
- Inner Ear
- Central Auditory Pathway

Congenital Atresia
This image was obtained from a 52 year old adult male patient with Down's Syndrome and a history of long-standing bilateral chronic middle ear disease.
Presbycusis

- A decline in hearing as a part of the aging process
  - results from degeneration along the entire auditory pathway
  - reduced hearing sensitivity
  - reduced speech clarity

Measuring Hearing

- Audiometer simulation
  https://www.counselor.com/Controls/Pages/Public/Index.aspx?page=Simulator/Audiometer
Consequences of Hearing Loss

- Psychosocial/Health
  - reduced participation in life activities
  - depression
  - withdrawal
  - social isolation
  - family/marital discord
  - financial loss
  - Reduced QOL

- Occupational
  - difficulty on telephone
  - difficulty in meetings
  - safety threatened with inability to hear alarm

- Medical
  - Poorer provider communication
  - Health outcomes
    - cancer, diabetes
Challenges with Hearing Loss

- Overcoming Clarity
  - hearing loss in different frequency regions
  - damage to inner hair cells = poor speech clarity
- Overcoming Noise
  - noise = masking
  - reverberation = distortion of the signal
- Overcoming Reduced Dynamic Range
  - Need for amplification of speech signal
  - Reduced tolerance for loudness

Hearing Aid Components

- Battery
- Volume Control
- Microphone
- Amplifier
- Receiver/Speaker

Hearing Aid Types

- Behind the Ear (BTE)
  - earmold
  - power
  - flexibility
  - telephone coil
In-the-Ear
- More or less cosmetically acceptable
- handles fairly high gain
- easier to get in and out

In-the-Canal
- More discrete
- Can have T coil or use telephone acoustically
- Requires little finger/hand dexterity

Completely in the Canal (CIC)
- Currently very popular
- virtually invisible
- can’t have T coil
- use on phone normally
- high maintenance
- takes advantage of natural gain from auricle and EAM
Open Fit
Small size BTE (OTE)
Uses “thin” tube
Nearly invisible
Off the shelf or custom mold
No T coil, memories
Made for baby boomers

Hearing Aids/Hearing Loss Simulation
Examples:
• [http://facstaff.uww.edu/bradleys/radio/fm/](http://facstaff.uww.edu/bradleys/radio/fm/)

Hearing Aid Development/Features
• Programmability
• Multiple Memories
• Linear vs. Wide Dynamic Range
• Digital vs. Analog
• Directional Microphones
• Data Logging, Data Learning
• Integration with Remote Microphones, Inputs
• Thin tube, small cases
• $$$$$$ Prices $$$$$$
• Frequency Shifting
• Iphone enabled hearing aids, bluetooth enabled devices
Assistive Devices for Hearing Impairment

Devices to Enhance Hearing Ability

Signaling and Alerting Devices

Assistive Listening Devices

• Why fit?
  – Improve distance from signal to microphone
  – Improve S/NR at microphone
• Hearing aid compatibility
• Fitting based on analysis of functional abilities

FM for classroom instructors

• [http://www.youtube.com/watch?v=M4lBkdRereE](http://www.youtube.com/watch?v=M4lBkdRereE)
Wireless Connection

- Cell phone to hearing aid
- Reduced electromagnetic interference
- Adapted for reception from other audio sources

Captel phone

- https://www.youtube.com/watch?v=Wuq5FemVtCM

Substitution of Audition

- Conversion of speech signal to text or sign language
Alerting Devices
• Alerting Devices
  – smoke detector
  – siren alarm
  – doorbell
  – baby cry
  – telephone ring
  – motion sensor
  – alarm clock
• Reception
  – shaker
  – strobe light
  – flashing light
  – visual display
  – amplified sound
  – hearing ear dog

Mrs. N’s HAT demo…

Communication Strategies to Use with Hard of Hearing Listeners
• Get the listener’s attention before you speak
• Talk face to face, remind them to watch you
• Speak at a normal level, clearly and slowly
• Don’t chew or smoke when speaking
• Reduce background noise e.g. radio, TV
• When misunderstood you should rephrase, not repeat
• Clue the listener in to your topic e.g. “I’m talking about…”
• Use assistive listening devices when available…keep a “Pocketalker” handy!
Thank You

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