



Strategic Global Application of Core Competencies in Audiology

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Core Competencies

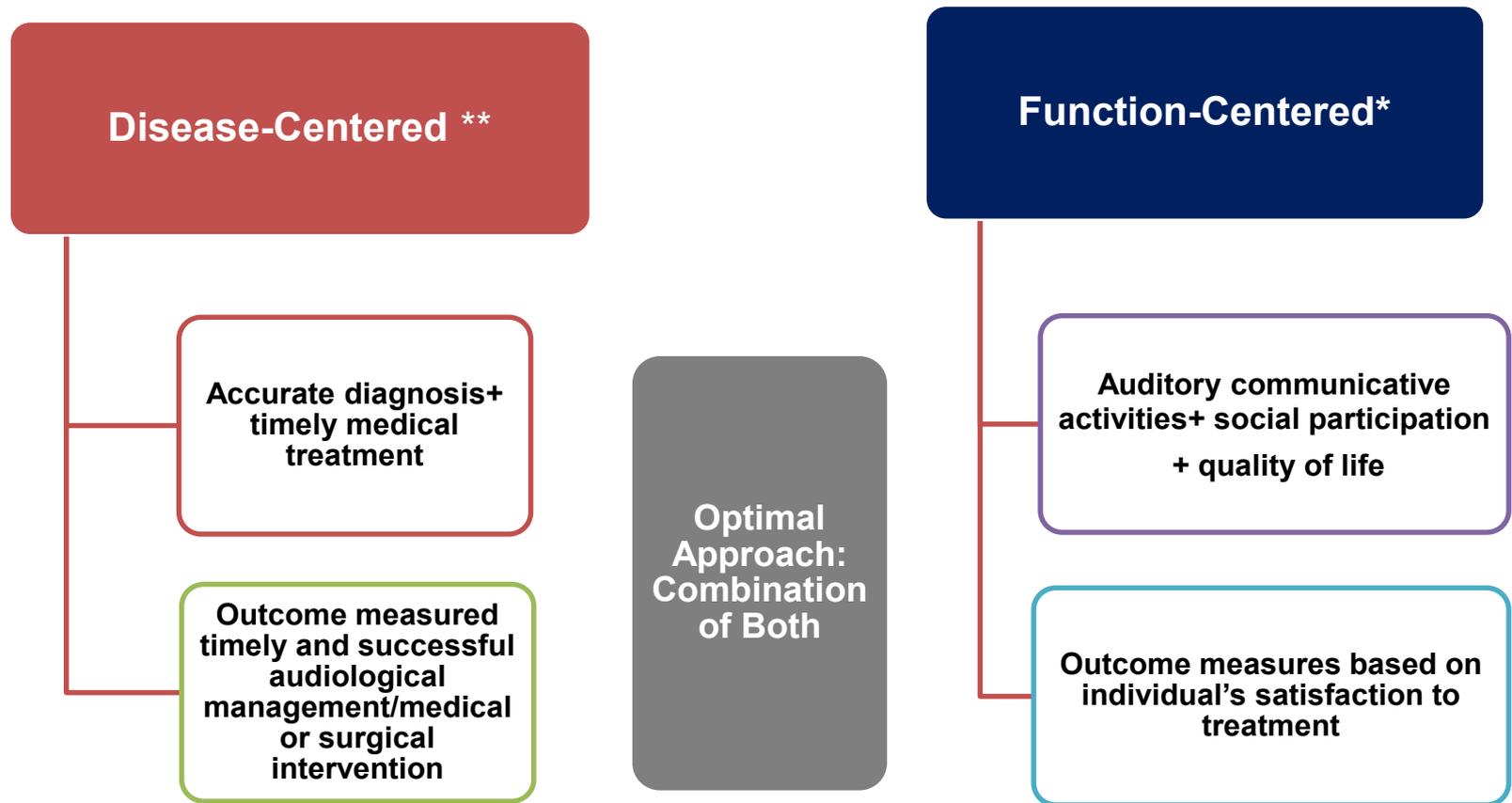
- **Common definition across all healthcare services:**
 - ***The ability to perform a skill or skills to a specific standard on competency***
 - ***Apply the appropriate knowledge and attitudes to achieve optimal job performance***
 - ***A continuous approach to learning includes pre-service education, in-service training, and continuing professional education.***

Core Competencies in Hearing Healthcare Delivery

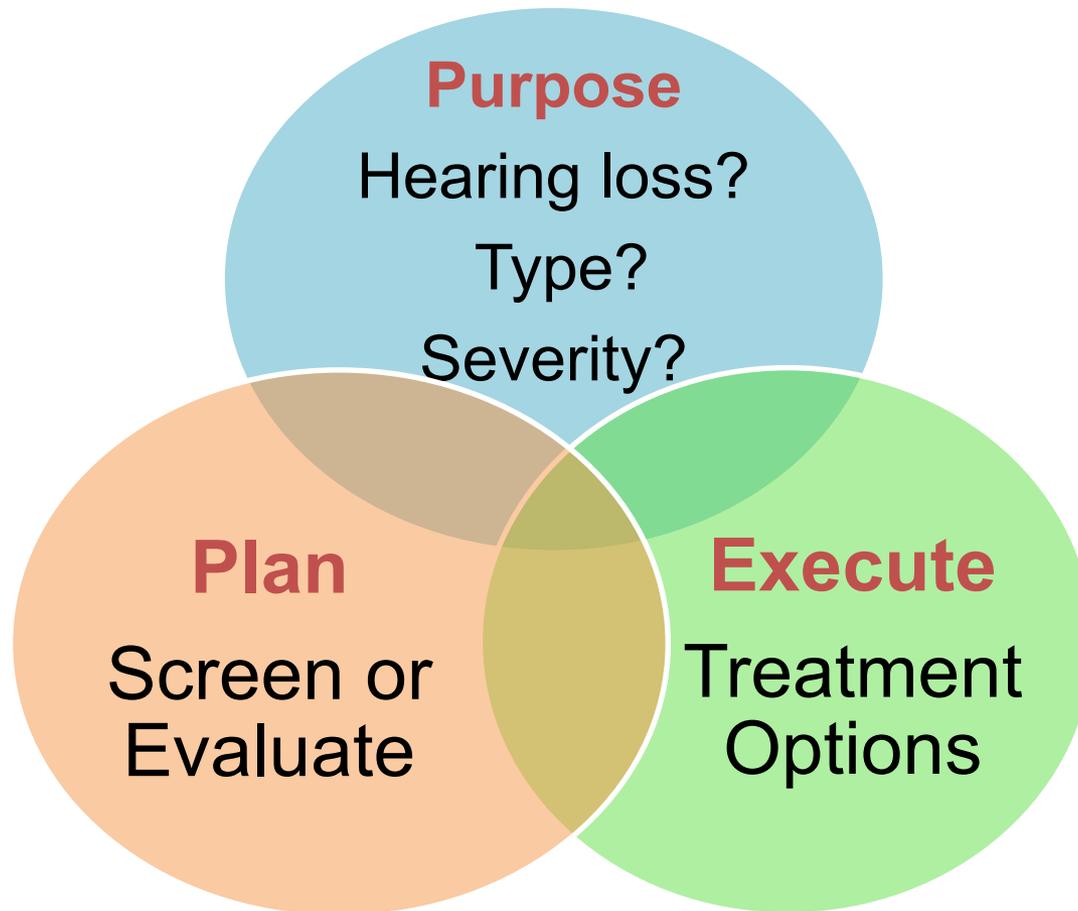
- **Goal: Maximize hearing impaired individual's hearing and communication abilities**
- ***Required skills based on Standards of Practice****
 - **Audiologists should be capable of**
 - ◆ **Providing systematic and comprehensive assessment of an individual's hearing and communication difficulties**
 - ◆ **Evaluating an individual's hearing loss and treatment needs**
 - ◆ **Providing appropriate treatment/management directions to include**
 - **Appropriate referral based on findings**
 - **Auditory rehabilitation, and counseling**
 - **Minimizing the psychosocial and quality-of-life consequences of permanent hearing loss.**

** recommended by ASHA & AAA*

Classification of Hearing Care Services



Hearing Care Services



Comprehensive Assessment of Hearing and Communication

■ Pragmatic model based on competencies

- Case history
- Screening
- Evaluation
- Treatment and management
- Appropriate referral

Case History

Audiologist /Practitioner Led

- Traditional medical model
- Professional assumes the 'expert' role
- Focuses on symptoms and problems
- Less focus on patient's communication needs

Patient-Centered

- Common ground from which patient/client and practitioner can work together
- Two experts-
 - ◆ Patient is expert on his/her communication needs
 - ◆ Audiologist is expert in the science and treatment of hearing loss

NOTE: Three-fold increase in client satisfaction and compliance was observed

https://idainstitute.com/tools/self_development/get_started/patient_journey/

Path to (near) Perfect Screening Program

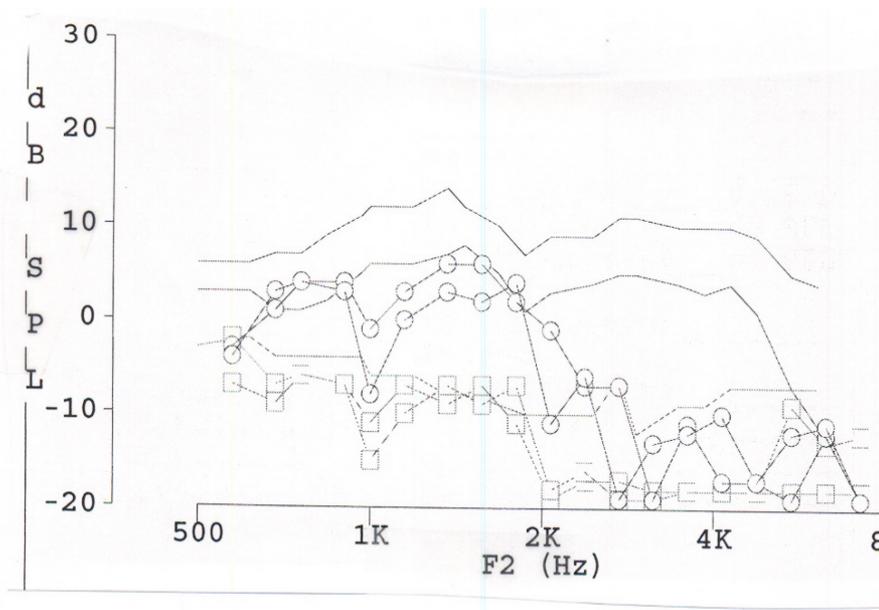
- **Ultimate Goal: All participants yield a correct and reliable result in the first test.**
 - ◆ **All of the people who have a positive test result really have the disorder (a “true positive” result).**
 - ◆ **There are no positive test results in people who do not have the disorder (no “false positive” results).**
 - ◆ **All of the people who have a negative test result do not have the disorder (a “true negative” result)**
 - ◆ **People who have the disorder do not have a negative test result (no “false negative” results).**

Reference: <https://www.ncbi.nlm.nih.gov/pubmedhealth/PMH0072602/>

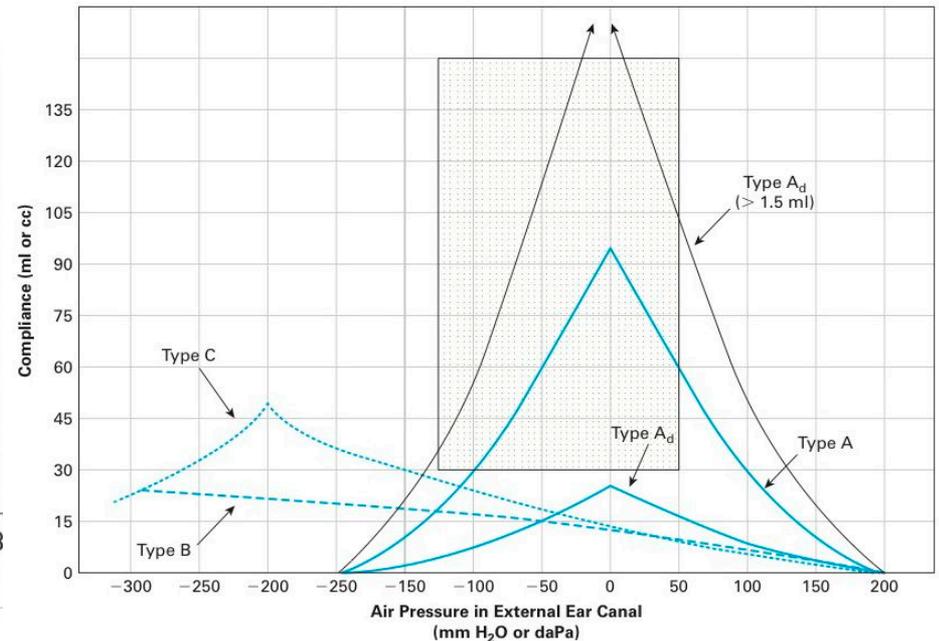
Screening For Auditory Disorders

Select the most sensitive screening test for the target disorder

OAEs for Cochlear Disorders



Tympanometry for Middle Ear Disorders



Screening For Middle Ear Disorder

- All of the people who have a positive test result have ME disorder (this is called a “true positive” result). OAEs and tympanometry generally meet this criterion.
- There are no positive test results in people who do not have a ME disorder (no “false positive” results) Tympanometry generally meets this criterion.
- All of the people who have a negative test result do not have a ME disorder (they would have a “true negative” result) OAEs and tympanometry generally meet this criterion.
- People who have a ME disorder would not have a negative test result (there would not be any “false negative” results). OAEs and tympanometry generally meet this criterion.

Incorporating -*Jugaad*

Oxford English Dictionary definition of Jugaad:

Hindi Word: A flexible approach to problem-solving that uses limited resources in an innovative way.



How Can We Do More With Less?

- **Identify constraints– *Sound booth and/or professional experts***
- **Develop variations without reducing accuracy, e.g., *Objective auditory assessments***
- ***Utilize tools currently available***
 - ◆ ***Case history screening: Does not need a sound booth***
 - ◆ ***Otoscopy: Does not need a sound booth***
 - ◆ ***Automated audiometry: Does not need a sound booth***
 - ◆ ***Tympanometry: Does not need a sound booth***
 - ◆ ***OAE recording: Does not need a sound booth***
 - ◆ ***Field professional, Nurses, Medical assistants, Hearing care technicians can be trained to perform these tests***

Hearing Evaluation

- **Objective of the evaluation**
 - **Detect auditory dysfunction**
 - **Identify degree, configuration and type of hearing loss**
 - **Assess impact on communication**
- **Traditional “Gold Standards”**
 - **Pure tone air & bone conduction audiometry: Limitations**
 - ◆ **Sound treated booth**
 - ◆ **Expensive equipment**
 - ◆ **Calibration uncertainty**
 - ◆ **Insensitivity to auditory dysfunction**
 - ◆ **Poor relation to communication impairment**
 - **Speech audiometry in quiet**
 - **Aural immittance measures**

Pure Tone Audiometry ... Not a Gold Standard

- **Accurate calibration is crucial**
- **Measurement uncertainty from earphones placement**
- **Ear canal differences in the patients**
- **Inadequate sample of hearing thresholds, 8 frequencies/19,980 frequencies = 0.0000000025%)**
- **Insensitive to cochlear dysfunction**
- **Affected by multiple listening variables, e.g.,**
 - **Young age**
 - **Cognitive status (e.g., attention, memory, processing speed)**
 - **Motivation**
 - **Language**
- **Too simple: not a test of “hearing” or listening ability**
- **Poor relationship with hearing handicap and communication**

Alternative Options

- **Prediction of hearing loss without an audiogram**
 - **Can you potentially predict the degree of loss hearing loss from a self-test questionnaire?**
- **Automated smart phone based applications**
- **Self-test questionnaires**
 - **Starting point**
 - **To provide a rapid understanding of the person's hearing status.**

Internet-Based Technologies

- **Current revolution in health-care delivery has contributed to advances in hearing-care delivery**
- **87% of global population have access to mobile telephones**
- **Consumers will have direct access to potentially**
 - **Self-screen and identify**
 - **Self-diagnose**
 - **Self fit hearing aids**
 - **Access rehabilitation services**

Predicting Hearing Levels Without an Audiogram

■ Garrison & Bochner of NTID

- Developed computer application to predict audiogram using speech based material
- Simple 5 minute self-administered screening sentences via laptop computer or mobile devices
- Testing uses adaptive strategies and each of the stimulus sentence is contingent upon earlier response
- Researchers combined the scores with age
- Derived pseudo audiogram using statistical methods
- Comparisons with conventional audiogram found 94% agreement

Pure Tone Threshold Estimation?

Masalski et al



- **Compared conventional pure tone thresholds with calibrated mobile device**
- **Result:**
 - ◆ **Demonstrated high compatibility with pure-tone audiometry**
 - ◆ **Potential application in hearing monitoring**
 - ◆ **Screening tests**
 - ◆ **Epidemiological examinations on a large scale.**

Modern Technologies: General



- Inevitable consequence of information technology
- Computers, cell phones & internet have facilitated advances in technology based services and products
 - Mobile-based hearing screening/measurement options
 - Smartphone app technologies for calibration and hearing aid fittings
 - Offline and internet-based platforms for auditory training and rehabilitation

Modern Technologies: Automation in Diagnostic Audiology



- **Automated audiometry**
 - Pure tone audiometry: Air conduction
 - Pure tone audiometry: Bone conduction
 - Speech audiometry
- **Automated analysis in objective audiometry**
 - OAEs
 - Tympanometry (gradient)
 - Acoustic reflex detection
 - Auditory brainstem response
 - Auditory steady state response
 - Cortical auditory evoked response

Facts to Findings:

Mark Twain: Get your facts first, and then you can distort them as much as you please.

- **Does your assessment identify if the individual has a hearing loss as result of a disease process that requires medical care?**
 - If so, do you have the appropriate network to refer the individual for medical care?
- **Can you confidently estimate the magnitude of hearing loss?**
 - Is the magnitude of function consistent with that observed during case history intake?
- **If there is a disconnect between the magnitude of the hearing loss and the hearing concerns of the individual?**
 - If so are you equipped to deal with this type of problem?

Facts to Findings

- **If the diagnosis is consistent with presenting case history ...**
 - **Are you equipped to provide hearing assistance technologies and rehabilitation?**
 - **If the diagnosis requires cochlear implants, are you part of a team within which you can make an appropriate referral or do you have the professional network to make the referral?**
- **If the type and degree of loss is not familiar to you ...**
 - **Do you have a network of professionals (e.g., audiologists, otolaryngologists, neurologists) who may be able to assist you with managing the individual?**

Cautions!

- **Do the tests have the potential to misdiagnose?**
- **Do the professionals possess educational competencies based on Standards of Care?**
- **Do the professionals understand the limitations of technology?**
- **Is the approach ...**
 - **Cost-effective**
 - **Financially sustainable**
 - **Safe**
 - **Evidence based**
- **Is the ultimate goal best possible patient care?**

Resources & References

- *Jhpiego; Fogarty et al. 2012 The Health Impacts of Pre-Service Education: An Integrative Review and Evidence-Based Conceptual Model.*
- https://idainstitute.com/tools/self_development/get_started/patient_journey/
- <http://galster.net/wp-content/uploads/2012/11/Galster-2012-Audiology-Practices-Apps-for-Audiology.pdf>
- Garrison, W. M. & Bochner, J. H. (2015). Applications of the NTID speech recognition test (NSRT®). *International Journal of Audiology*, 54(11), 828-837.
<http://www.tandfonline.com/eprint/94TtddWi8NsJgvniwcVA/full>
- Garrison, W. M. & Bochner, J. H. (2017). An application for screening gradual-onset age-related hearing loss. *Health*, 9, 715-726. <https://doi.org/10.4236/health.2017.94051>

Resources & References

- Validated Smartphone-Based Apps for Ear and Hearing Assessments: A Review. *JMIR Rehabilitation and Assistive Technologies*, Bright, T., & Pallawela, D. (2016). 3(2), e13. <http://doi.org/10.2196/rehab.6074>
- eHealth and the hearing aid adult patient journey: a state-of-the-art review: *Paglialonga A, Cleveland Nielsen A, Ingo E, Barr C, Laplante-Lévesque A. BioMedical Engineering OnLine. 2018 Jul 31; 17: 101*
- *Masalski M, Grysiński T, Kręcicki T. J Med Internet Res. 2014 Jan 15; 16(1):e11. Epub 2014 Jan 15*
- [Accuracy of Smartphone Self-Hearing Test Applications Across Frequencies and Earphone Styles in Adults.](#) Barczik J, Serpanos YC. *Am J Audiol.* (2018) Sep 13:1-11. doi: 10.1044/2018_AJA-17-0070



תודה
Dankie Gracias
Спасибо شكراً
Köszönjük Merci Takk
Grazie Dziękujemy Terima kasih
Děkojame
Ďakujeme Vielen Dank Paldies
Kiitos Täname teid 谢谢
Thank You Tak
感謝您 Obrigado Teşekkür Ederiz
Σας ευχαριστούμε 감사합니다
Bedankt Děkujeme vám
ありがとうございます
Tack