AUTOMATED AUDIOLOGY
AND TELEMEDICINE

Breaking Down Barriers to Diagnostic Audiometry

Are there Barriers to Diagnostic Audiology?

- Growth rate of HI patients outpacing that of audiologists
- Access to audiometry is primarily inbound generated
- Ability to provide diagnostic audiometry restricted by infrastructure and equipment requirements

Barrier or Opportunity?

- Viewpoint
  - Continue traditional methods?
  - Create new paradigm to meet new challenges?
- Requires willingness to change
  - Evaluate, i.e. public health vs military vs private practice
  - Explore solutions to meet specific demand
What needs to change?

“Hearing health professionals can be proactive and shape the new processes – or others will inflict change without us”

Ian Windmill

Necessity is the Mother of Invention

- Challenge: Addressing unmet need
  1. Minting more AuDs takes time
  2. Retirement and attrition are inevitable
  3. Can’t change population growth

- Opportunity:
  - Leverage technology to expand capacity

Necessity is the Mother of Invention

- Challenge: Addressing limited access
  1. Can’t duplicate traditional audiology workplace with sound booths, etc.
  2. Only seeing patients who can get to us limits our reach

- Opportunity:
  - Employ technology to expand access points
What can we change?

- Explore how we deliver services
  - Maintain high level of clinical excellence
  - Allow for optimal patient interaction
  - Expand points of service
  - Reach larger, more diverse groups
  - Contribute to increased productivity, revenue

Tele-audiology

- Leverage resources and access patients

Benefits of Tele-Audiology

- Increase efficiency
- Reduce “drop rate” from referrals
- Patient convenience
- Expand catchment area for practice without increasing satellite operations
Hearing Health Delivery

ENT Office

DOC

Satellite Office

Audiology Practice

Hub & Spoke Delivery

Delivery Models

- Real Time
  - Direct contact between patients and providers
- Store and Forward
  - Audiologist overreads test results

Considerations

- Video conference system
- IT support and connectivity
- Federal and state regulatory/license issues
- Reimbursement
- Provider liability
- Equipment
Needs Analysis

- Provide diagnostic testing based on sound audiological principals
- Be configurable by audiologist and operated by audiology or audiology extender, LOCALLY or REMOTELY
- Portable, compact
- Not require a sound booth

Otogram™ Technology

- The Otogram is an integrated, automated system, designed to perform a battery of audiological tests.

“‘The Otogram does not change the underlying principles or methods for audiometry, nor does it produce results different from manual audiometry’

– Aaron R. Thornton, PhD
Audiologist

Standard of Care

Conclusion: The Otogram is just as reliable as audiologists at determining hearing thresholds. We recommend that the Otogram can be safely used in a controlled clinical setting supervised by audiologists.
Otogram™ Test Battery

- Air/Bone Conduction
- with Masking
- Speech Threshold
- with Masking
- Speech Discrimination
- with Masking
- Stenger
- Additional options
  - Tympanometry
  - Acoustic Reflex
  - DP Otoacoustic Emissions

Otogram™ Languages

- English
  - American
  - British
  - Australian
- Spanish
- Russian
- Portuguese
- Italian
- Korean
- Vietnamese
- Arabic
- Cantonese
- Mandarin Chinese
  - Simple
  - Traditional

Ambient Noise Monitoring

- Patented system watches for excessive ambient noise levels
- Thresholds impacted by ambient noise levels are reported
- Allows test to be administered in a quiet room
Pure Tone Testing

- Manual Mode
- Original test
- Recheck

Speech Instruction

Speech Testing

- Words presented via insert earphones
  - Headphone Option
- Closed-Set paradigm
  - Open Set Option
- Picture pointing task
- Patient responses monitored
Monitoring: Stenger Test

- Otogram employs Stenger in presence of large interaural differences to rule out malingering
  - Automatic
  - Discrete
  - Reported

Standard Reporting Conventions

- Automated Audiometry & Telemedicine
  - Video otoscopy
  - Diagnostic evaluation
  - Counseling
  - Treatment/Programming
  - Follow-Up
Enables Expansion

- Building referral sites
  - ENT
  - PCP, Ophthalmology, Geriatrics
- Veteran’s contracts
  - Overflow testing
- Government programs
  - DOC
  - FAA

Reasons to utilize technology

- Access more patients
- Improve productivity
- Increase effective use of resources
- Improve profitability

Reasons not to utilize technology

- Enjoy doing tasks that have been automated
- Like driving to satellite offices
- Content with current practice growth rate
- Don’t want more money
Opportunity knocks... Technology answers!

<table>
<thead>
<tr>
<th>Traditional Method</th>
<th>Reimagined Method</th>
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<tbody>
<tr>
<td>Sound booth</td>
<td>Quiet room</td>
</tr>
<tr>
<td>Audiologist</td>
<td>Supervised audiology extender</td>
</tr>
<tr>
<td>Travel</td>
<td>Remote</td>
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<tr>
<td>Make $</td>
<td>Make $$$</td>
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</tbody>
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Increase access and capacity... ...Mission accomplished!

OTOTRONIX