OAE Screening in Healthcare Settings: A Pilot Project

Terry E. Foust, AuD
William Eiserman, PhD
Lenore Shisler, MS
Why screen in healthcare settings?

- Up to 50% lost to follow up rates
- Late onset or progressive hearing
Methods

- One community health center and two school based primary care health centers
- Training provided by consulting audiologist
- 4 trained screeners (medical assistants)
- Screening sequence during visits
- Data collected over 10 month period
Demographics

• 846 children screened
• Initial project focus age 0 – 3, clinics expanded to include children up to 60 months and those with parental or provider concern
• Clinics primarily serve children whose families are 150% or less of the US federal poverty level
• 63% identified Hispanic ethnicity
Demographics

- 714 (84%) physicals/immunizations/well child exams
- 71 (8%) visited the clinic for specific ear/hearing related concerns, primarily otitis media
- 46 (5%) visited the clinic due to non-ear related illnesses.
- 15 (2%) undocumented reason for visit
Initial Pass/Refer Rates

Well Child Subjects
- 86% Pass
- 10% Refer
- 4% Could not test

Illness Visit Subjects
- 74% Pass
- 13% Refer
- 13% Could not test

Ear/Hearing Visit Subjects
- 6% Pass
- 85% Refer
- 9% Could not test
Final Outcomes

- 3 (.4%) permanent hearing loss
- 688 (81%) Initial pass rate
- 810 (96%) Overall pass rate
- 23 (3%) follow result still unknown
- 4% Could not test
Cases of Permanent Hearing Loss

<table>
<thead>
<tr>
<th>Case #1: Bilateral mild/moderate hearing loss</th>
<th>Case #3: Bilateral moderate hearing loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>• 5 years old</td>
<td>• 38 months old</td>
</tr>
<tr>
<td>• Newborn hearing screening result unknown</td>
<td>• Confirmed pass newborn screening</td>
</tr>
<tr>
<td>• Parent concern</td>
<td>• Parent concern and request for hearing test</td>
</tr>
<tr>
<td>• Screened during well child visit (pre-K)</td>
<td>• Screened during well child visit</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Case #2: Bilateral moderate hearing loss</th>
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<tbody>
<tr>
<td>• 9 years old</td>
</tr>
<tr>
<td>• Newborn hearing screening result unknown (born out of country)</td>
</tr>
<tr>
<td>• Parent concern</td>
</tr>
<tr>
<td>• In speech therapy at school</td>
</tr>
<tr>
<td>• Younger sibling screened as well child check, child screened by parent request</td>
</tr>
</tbody>
</table>
What worked well

- Team planning and assessment
- Hands on practice at initial training
- Support in clinic setting
- High rate of completion of follow up screenings
- Standardized training materials in print and video – including education, steps to screening, screening protocols and forms
Challenges

- *Determining when to screen during visit*
- *Affecting patient flow*
- *Time for follow up screens*
- *Reimbursement issues*
Implications

- Ensuring all children in the practice are screened periodically
- Expand to additional primary care sites
- Gather reimbursement date (rapidly changing)
Follow up questions:

• *Can OAE screening be used effectively in healthcare settings?*
• *Can OAE be used effectively to screen children beyond 0-3?*
• *Should OAE be used in screening children older than 3?*
Should OAE be used in screening children older than 3?

• We really hear with our brain

• Clinically, hearing evaluation is not complete unless it includes procedures for evaluating how the brain processes relatively sophisticated sounds such as speech

• ABR and OAE are audiologic tests that evaluate the function of the ear and are important in the diagnosis of hearing loss.

• Pure tone testing does test further along the process of hearing and provides an observation behavioral response to sound
Thoughts on utilizing OAE Screening in children over 3:

“Pure tone hearing screening utilizing an audiometer is associated with multiple practical problems, particularly in preschool and young school age (e.g. kindergarten) children. Unacceptably high refer rates for pure tone hearing screening, up to 70% in the preschool population (Hall & Swanepoel, 2010) may result from a combination of factors ….. that sometimes preclude a valid screening outcome.”
Thoughts on utilizing OAE Screening in children over 3:

“Over all refer rates (either or both ears) are lower for distortion product OAE’s are lower (12.5%) than for pure tone audiometry (17%) reducing the number of children who require rescreening or medical referral. OAE’s are very sensitive to both middle and inner ear disorders, yest not affected by the child’s ability to understand instructions or to attend to sounds. “

(Hall and Swanepoel, 2010)
Is there other work being done looking at using OAE to screening children older than 3?

- **OAE screening programs for children 3-5 in Florida** (Jay Hall)
- **Use of Otoacoustic Emissions in Elementary Schools** (Michele Cramer, Beverly Ray, and Thierry Morlet Kresge Hearing Research Laboratory, LSUHSC)
Responding to the question

Can OAE be used effectively with older children (3-5)?

What is being discussed:

• Do you lose something from not doing pure tone audiometry?
• Do you gain something by doing OAE?
Hearing Screening  - Definition

**Definition:**

To identify from apparently healthy persons, those individuals for whom there is a greater probability of having a disease or condition, so they may be referred for further evaluation. (ASHA Technical Report on Audiologic Screening, )

*Screening does not diagnose a hearing loss – it simply identifies those children who need further evaluation*
Early Childhood Community Based Hearing Screening Programs:

1. *Are post hospital based newborn screening activities/programs*

2. *Are community based (early childhood settings, preschool, primary care medical provider based)*

3. *Train and utilized lay screeners (screening is not provided by professionals)*

4. *Are the settings and context out of which the question arose*
### OAE/Pure Tone Considerations

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<tr>
<th><strong>OAE</strong></th>
<th><strong>Pure Tone</strong></th>
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<tr>
<td>Physiological measure of outer hair cell function</td>
<td>Provides information about the entire auditory system, indicator of the child’s ability to listen and respond</td>
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<tr>
<td>Has other auditory pathway implications</td>
<td>Considered a “true” hearing test</td>
</tr>
<tr>
<td>May miss cases of Auditory Neuropathy (AN)</td>
<td>May identify AN with children who are developmentally appropriate for testing</td>
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## OAE/Pure Tone Considerations

### OAE
- No task for child to learn
- No developmental or cognitive restrictions
- No issue with language barriers
- Results not interpreted by lay screener
- Objective physiological measure
- Can be completed in relatively noisy environment
- Research and studies published supporting use as first line hearing screening

### Pure Tone
- Must learn task and cooperate
- Must be developmentally and cognitively able to participate
- Language barriers may be issue
- Results interpreted by screener - skill of the screener to accurately interpret response may be an issue
- Subjective judgment by examiner
- Need a quiet environment (meet ANSI standards (ANSI 1977))
- Long held as the gold standard in hearing screening
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<tr>
<td>Average test time is fast (7 seconds to 3 minutes average)</td>
<td>Average test time longer (7 minutes)</td>
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<tr>
<td>Pass/fail result provided by machine for lay screeners</td>
<td>Pass/fail determined by screener observation</td>
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<tr>
<td>Is being used in many early childhood settings</td>
<td>Cannot screen children who due to age, cognitive and/or developmental level are unable to cooperate and learn task</td>
</tr>
<tr>
<td>One piece of equipment can test all ages</td>
<td>Portable audiometers are relatively inexpensive and fairly uncomplicated</td>
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<tr>
<td>Cost of equipment may be more expensive</td>
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# OAE/Pure Tone Considerations

## OAE
Has spread significantly to many early childhood settings (see ECHO project data and papers)

Increasing numbers of early childhood, preschool and healthcare provider settings have OAE equipment

## Pure Tone
Has been the standard for many years but has not reached “critical mass” in screening to date

Most early childhood, healthcare provider settings do not have pure-tone audiometry