Smartphone hearing screening in mHealth assisted community-based primary care

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Background

- **Burden of disabling hearing loss** greatest in developing world
- **Access** to ear and hearing care is unavailable
- **Lack of trained personnel**: 1 Audiologist for 0.5 to 6.25 million people
- Not available at **primary health care levels**
- **Expense** of audiological equipment
- Requirement for **trained personnel**

(WHO, 2013)
Background

Novel approaches and service delivery models needed

1. Generalist health care workers (CHWs)
   - Recent study in SA – Howe, Mash & Hugo, 2013
   - WHO primary ear and hearing care training manuals

2. Innovative technologies – “Soft touch, high tech”
   - mHealth
   - Capitalising on connectivity and personal computing
Mobile Hearing Solution
hearscreen Features

1. Calibration to standards
2. User-friendly interface
3. Quality assurance
4. Automation
5. Smart noise monitoring
6. Location-based referral
7. Light, mobile, battery
8. Data capture
9. Cloud data management
10. Low-cost solution
11. Clinically validated
Background

hearScreen™ validated for hearing screening

- **CONCLUSION:** The newly developed smartphone application can be accurately calibrated for audiometry with valid real-time noise monitoring, and clinical results are comparable to conventional screening. [Swanepoel et al. IJA, 2014]

- **CONCLUSION:** the hearScreen™ application is accurate and time-efficient... an inexpensive solution that can be used by lay persons with limited training due to automated test sequences and interpretation. [Mahomed-Asmail et al. Ear Hearing, In Press]
Research aims

- To describe the **clinical utility** and **perceived value** of a community-oriented primary care hearing screening program conducted by CHWs.

- 2 phases:
  1. Community screenings
  2. CHW perceptions
Phase 1: Community screenings

Data collection period: 12 weeks
820 children (2-15 years) and adults (16-85 years) screened
Phase 2: CHW perceptions
Results

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<thead>
<tr>
<th></th>
<th>REFER</th>
<th>1 kHz noisy</th>
<th>2 kHz noisy</th>
<th>4 kHz noisy</th>
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</thead>
<tbody>
<tr>
<td><strong>Children</strong> (25 dB; n=108)</td>
<td>12.0%</td>
<td>52%</td>
<td>22%</td>
<td>5%</td>
</tr>
<tr>
<td><strong>Adults</strong> (35 dB; n=598)</td>
<td>6.5%</td>
<td>13%</td>
<td>6%</td>
<td>1%</td>
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</tbody>
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- Noise exceeding MPANLs - significant effect on child screen at 1kHz (p<.01) only
- Age significantly affected adult referral rates (p<.01) – Adults <45 yoa 4.3% vs ≥45 yoa 13.2%
- No significant gender effects
- Test duration: Children 47.4s (SD 20.0); Adults 47.0s (SD 28.8)
## Results

<table>
<thead>
<tr>
<th>Themes</th>
<th>Illustrative Quotes</th>
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| **Community need and satisfaction** | “...happy with hearing screenings because they need to know about their ears”  
“...want hearing screenings for toddlers.”  
“...want the audiologist to follow up on hearing screenings through home visits.”          |
| **Need for community education**    | “Most welcome hearing screening but others do not understand the need.”  
“Some do not want their hearing screened because they are afraid to be consulted.”         |
| **CHWs’ commitment to provide services** | “…important for the community to detect hearing problems and we need to know more about hearing.”  
“Hearing screenings should go out into the community in the form of a campaign so that a large number can be screened”  
“…important for the community to detect hearing problems at an early stage.” |
Conclusion

• Generalist CHWs successfully screen for hearing loss.
• Automated test sequences, integrated noise monitoring, and data management makes this possible.
• CHWs displayed positive attitudes and commitment.
• Bring hearing health to underserved communities at a primary care level.

[Yousuf et al. In Press, J TELEMED TELECARE]
Thank you!!!