Clinical Practice Patterns: Advanced Noise Management for Children with Cochlear Implants

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Disclosures

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Background

• Adaptive noise management technology and advanced signal processing schemes improve speech perception in noise for children with hearing loss [1-4]

• A recent clinical practice survey suggests there is a significant variability in programming and validation practices for cochlear implants (CI) in the pediatric population [5]
What are current clinical practice trends for providing children with cochlear implants with advanced noise management features?

- How are trends impacted by clinician experience?
- How are trends impacted by clinician comfort with particular manufacturers?
Methods

Electronic survey via REDCap [6]

The following questions pertain to the provision of automatic directional microphones only. These dual microphones automatically switch between omnidirectional and directional modes depending on the sound environment. While these features are intended to be activated in a recipient’s primary program, they can also be provided on an additional program that one can switch to manually.

Which of the following best describes your approach/philosophy for incorporating automatic microphone directionality into recipients’ programs? (select all that apply)

- I incorporate them into the recipient’s main/ everyday program.
- I incorporate them as a secondary program for the recipient and/or parent to select at will.
- I typically give recipients only one program that does not include automatic directional microphones.
- I typically give recipients only one program that always includes automatic directional microphone.

What factors do you consider when providing children with automatic microphone directionality? (select all that apply)

- Age (chronological or developmental)
- Cognitive factors related to the ability to switch programs when needed
- Academic considerations
- Parental capability/ support
- Listening environment types encountered frequently
- Duration of experience with using the processor
- Dexterity
- I never or rarely provide programs with automatic directional microphones
- Other

- Various automatic and manual noise management features
  - Age feature typically provided
  - Child-specific factors impacting decision making
  - Ranking of most important features for school-aged children
- Devices spanning four manufacturers (Advanced Bionics, Cochlear Americas, Medel, and Oticon Medical)
Respondents

- 160 clinicians from 35 US states and 5 Canadian Provinces (91.5% female)
- 63.9% Hospital setting

<table>
<thead>
<tr>
<th>Years of Clinical Experience</th>
<th>N= 119</th>
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<tbody>
<tr>
<td>1-3 years</td>
<td>15 (12%)</td>
</tr>
<tr>
<td>4-6 years</td>
<td>26 (22%)</td>
</tr>
<tr>
<td>7-10 years</td>
<td>26 (22%)</td>
</tr>
<tr>
<td>11-15 years</td>
<td>18 (15%)</td>
</tr>
<tr>
<td>16-20 years</td>
<td>20 (17%)</td>
</tr>
<tr>
<td>20+ years</td>
<td>14 (12%)</td>
</tr>
</tbody>
</table>

Comfort/Experience with Manufacturers

- Advanced Bionics
- Cochlear
- Medel
- Oticon Medical

Graph showing % Respondents by rank and comfort/experience with manufacturers.
Manual Directional Microphones

- Everyday/Main Program: 55%
- Secondary Program: 11%
- Do not provide: 34%

Child-Specific Factors:

- Chrono/Devo Age: 79.5%
- Cognitive Ability: 76.7%
- Parental Capability: 68.5%
- Listening Environments: 67.1%
- Duration of Experience: 57.5%
- Academic Considerations: 56.2%
- Dexterity: 28.1%
- Never/Rarely Provide: 19.2%
Automatic Advanced Signal Processing *

* Automatic noise cancellation, wind noise cancellers, impulse noise cancellers, etc.

- Everyday/Main Program: 70%
- Secondary: 23%
- Do not provide: 7%

Child-Specific Factors:
- Listening Environments: 74.6%
- Chrono/Devo Age: 73.1%
- Parental Capability: 52.2%
- Cognitive Ability: 50.7%
- Academic Considerations: 44.8%
- Duration of Experience: 47%
- Dexterity: 14.2%
- Never/Rarely Provide: 7%

* Nationwide Children's Hospital
When your child needs a hospital, everything matters.
Primary Program - Mean Age at Feature Activation

- **Concha-Level Mic**: 4 to 9 years old
- **Automatic Directional Mic**: 4 to 9 years old
- **Automatic Noise Reduction**: 1 to 4 years old
- **Automatic Sensitivity Monitor**: 1 to 4 years old
- **Automatic Dynamic Range**: 1 to 4 years old
- **Wind Noise Canceller**: 1 to 4 years old
- **Impulse Noise Canceller**: 1 to 4 years old

*Conch-Level Mic Correlation Analysis*
- AB Experience- Spearman r = 0.26, p = 0.005
- Cochlear Experience- Spearman r = -0.29, p = 0.002
Rankings of Features For School-aged Children

Most Important:
- Automatic Noise Reduction • 2 (1,3)
- Automatic Directional Mic • 2 (1,4)
- Concha-Level mic • 3 (1,5)

Next Important:
- Manual Directional Mic • 5 (4,6)
- Binaurally Coordinated Directional Mic • 5 (4,6)

Less Important:
- Soft Sound Booster • 6 (4,7)
- Reverb Canceller • 6 (4,8)

Least Important:
- Ear to Ear Streaming • 7 (5, 8)
- Modifiable Automatic Gain • 7 (3, 9)
Conclusions

• Variability exists in the provision of different advanced noise management features and depends on:
  • Child-specific factors
  • Clinician experience
  • Clinician comfort with specific devices/programming

• Overall trend towards automaticity
Acknowledgements

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References


