Better Defining Best-Aided Condition: The Role of Hearing Aids on Cochlear Implantation Qualification Rates

Anthony M. Tolisano MD, Bethany Baumgart AuD, Cherysse Lanns AuD, Johanna Whitson AuD, J. Walter Kutz MD, Brandon Isaacson MD, Jacob B. Hunter MD
Disclosures

Brandon Isaacson has a financial relationship with Advanced Bionics and Med-el, while Jacob Hunter has financial relationships with Advanced Bionics and MED-EL.
Introduction

• FDA criteria for cochlear implantation qualification varies.
• Private insurers require ≤60% on open set sentence tests.\(^1\)
• CMS requires ≤40% on open set sentence tests.\(^2,3\)
• Requires testing under “best-aided conditions.”
Introduction

• 2012 survey on sequential CI (centers across US/Canada)$^4$
  • 56% hearing aid +/- CI was necessary
  • 25% CI alone
  • 5% no aids required
Objective

To describe the effect of hearing aid type used for cochlear implantation evaluation on qualification rates in an effort to better define best-aided condition.
Methods

Adult patients evaluated for CI from 2013-2018

Demographics
- Age
- Gender
- Race/Ethnicity
- Primary spoken language
- Marital Status
- Insurance Status

Hearing aid utilization
- Duration of amplification
- Age of current hearing aid
- Type of current hearing aid
- Duration of discontinuation
- Hearing aid type used for CI eval
Data Analysis

• Unpaired t-tests used to compare continuous variables.

• Fisher’s exact or Chi-square used for categorical data.

• Odds ratios calculated for dichotomous variables.
Results

Consecutive CI Evaluations over 5 years:

638

- Included: 609
- Excluded: 29
  - 5 pediatrics
  - 24 missing HA data
<table>
<thead>
<tr>
<th>Age, years</th>
<th>Mean (Range)</th>
<th>65.5 (18.6-92.3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender, n (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>267 (43.8)</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>342 (56.2)</td>
<td></td>
</tr>
<tr>
<td>Race, n (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unknown</td>
<td>96 (15.8)</td>
<td></td>
</tr>
<tr>
<td>Known</td>
<td>513 (84.2)</td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>457 (89.1)</td>
<td></td>
</tr>
<tr>
<td>Black</td>
<td>31 (6.0)</td>
<td></td>
</tr>
<tr>
<td>Asian</td>
<td>14 (2.7)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>11 (2.1)</td>
<td></td>
</tr>
<tr>
<td>Ethnicity, n (%)</td>
<td></td>
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</tr>
<tr>
<td>Unknown</td>
<td>66 (10.8)</td>
<td></td>
</tr>
<tr>
<td>Known</td>
<td>543 (89.2)</td>
<td></td>
</tr>
<tr>
<td>Hispanic</td>
<td>48 (8.8)</td>
<td></td>
</tr>
<tr>
<td>Non-</td>
<td>495 (91.2)</td>
<td></td>
</tr>
<tr>
<td>Language, n (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unknown</td>
<td>3 (0.5)</td>
<td></td>
</tr>
<tr>
<td>Known</td>
<td>606 (99.5)</td>
<td></td>
</tr>
<tr>
<td>English</td>
<td>560 (92.4)</td>
<td></td>
</tr>
<tr>
<td>Spanish</td>
<td>17 (2.8)</td>
<td></td>
</tr>
<tr>
<td>Sign</td>
<td>9 (1.5)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>20 (3.3)</td>
<td></td>
</tr>
<tr>
<td>Marital status, n (%)</td>
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<td></td>
</tr>
<tr>
<td>Unknown</td>
<td>91 (14.9)</td>
<td></td>
</tr>
<tr>
<td>Known</td>
<td>518 (85.1)</td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>365 (70.5)</td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>84 (16.2)</td>
<td></td>
</tr>
<tr>
<td>Widowed</td>
<td>38 (7.3)</td>
<td></td>
</tr>
<tr>
<td>Divorced</td>
<td>31 (6.0)</td>
<td></td>
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<tr>
<td>Insurance, n (%)</td>
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<td></td>
</tr>
<tr>
<td>Government</td>
<td>384 (63.1)</td>
<td></td>
</tr>
<tr>
<td>Private</td>
<td>179 (29.4)</td>
<td></td>
</tr>
<tr>
<td>Military</td>
<td>31 (5.1)</td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>15 (2.5)</td>
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</tr>
</tbody>
</table>
Total Cochlear Implantation Evaluations: 609

- Any HA use? (549 Yes, 57 No)
  - Length HA use?
    - Known (209), Unknown (340)
  - Both ears (339)
    - Current HA use?
      - Yes (466)
        - Age of current HA?
          - Known (50), Unknown (86)
      - No (136)
Years, Mean (Range)
16.6 (0.1 to 60)
Total Cochlear Implantation Evaluations: 609

- Unknown 3
  - Any HA use?
    - Yes 549
      - Length HA use?
        - Known 209
          - Known 179
        - Unknown 340
          - Unknown 287
    - No 57
      - Current HA use?
        - Yes 466
        - No 136
          - Length of Discontinuation?
            - Known 50
            - Unknown 86
Total Cochlear Implantation Evaluations: 609

Unknown 3

Any HA use?

Yes 549

No 57

Current HA use?

Yes 466

No 136

Length HA use?

Known 209

Unknown 340

Both ears 339

One ear 127

Age of current HA?

Known 179

Unknown 287

Length of Discontinuation?

Known 50

Unknown 86
Years, Mean (Range)
3.4 (0.1 to 18)
Years, Mean (Range)
4.3 (0.2 to 30)
Hearing Aid Type Used for CI Evaluation

- Personal: 62%
- Loaner: 28%
- Personal & Loaner: 8%
- Tested twice: 2%
<table>
<thead>
<tr>
<th></th>
<th>Current Hearing Aid Use</th>
<th>Personal Aids Used for Eval</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>% OR (95% CI)</td>
<td>p-value</td>
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<tr>
<td>White</td>
<td>79.4 1.68 (0.91 to 3.11)</td>
<td>0.0965</td>
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<tr>
<td>Non-Married</td>
<td>69.6 Ref</td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>80.6 1.62 (1.04 to 2.51)</td>
<td>0.0312</td>
</tr>
<tr>
<td>Un-Married</td>
<td>71.9 Ref</td>
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<tr>
<td>Private</td>
<td>77.7 0.95 (0.62 to 1.47)</td>
<td>0.8324</td>
</tr>
<tr>
<td>Public</td>
<td>76.9 Ref</td>
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</table>
### Cochlear Implant Qualification

<table>
<thead>
<tr>
<th></th>
<th>%</th>
<th>OR (95% CI)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HA use ever?</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>78.7</td>
<td>2.50 (1.42 to 4.40)</td>
<td>0.0016</td>
</tr>
<tr>
<td>No</td>
<td>59.6</td>
<td>Ref</td>
<td></td>
</tr>
<tr>
<td><strong>Current HA use?</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>79.0</td>
<td>1.62 (1.06 to 2.49)</td>
<td>0.0273</td>
</tr>
<tr>
<td>No</td>
<td>69.9</td>
<td>Ref</td>
<td></td>
</tr>
<tr>
<td><strong>HA used for CI eval?</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personal</td>
<td>79.5</td>
<td>1.50 (0.99 to 2.27)</td>
<td>0.0574</td>
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<tr>
<td>Loaner</td>
<td>72.1</td>
<td>Ref</td>
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</table>
Conclusions

• Most patients undergoing cochlear implantation evaluation have previously been fitted for hearing aids and are current hearing aid users.

• History of hearing amplification and current amplification predict cochlear implant qualification.

• Hearing aids fitted at the time of cochlear implantation evaluation may result in lower qualification rates and warrants additional study.
References


