VA Bilateral Cochlear Implant Candidacy Protocol

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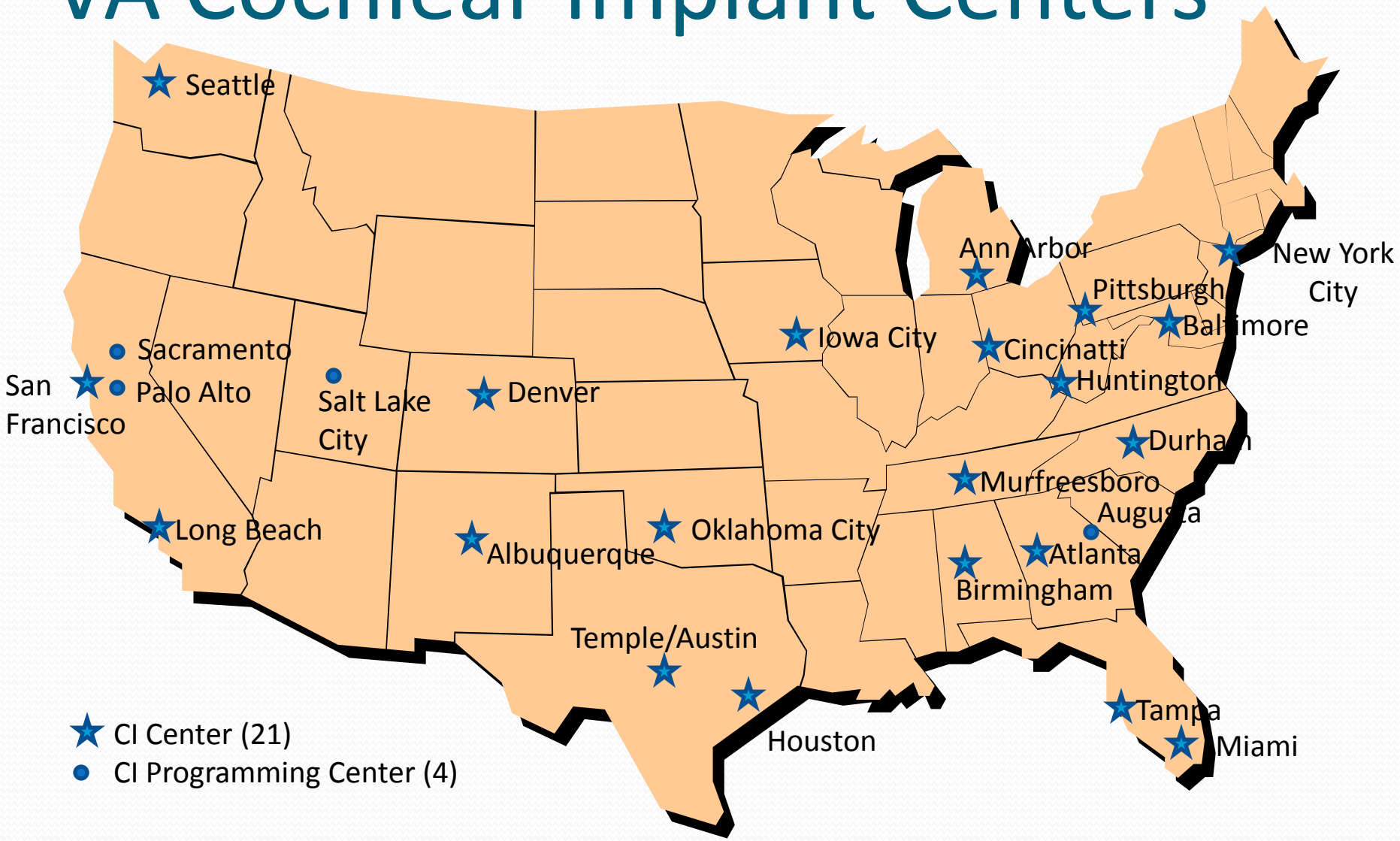
VA Cochlear Implant Centers



Bilateral Cochlear Implants

- VA CI Advisory Board reviews all requests for 2nd cochlear implant.

- Question - Who might benefit from bilateral cochlear implants?

Bilateral CI Workgroup

- Sherri Smith, Ph.D.
- Mitzi Walkup, M.A.
- Maureen Wargo, M.A.
- Nancy Cambron, Au.D
- Cliff Hume, Ph.D., M.D.
- Tom Roland, M.D.

Bilateral CI's- Evidence-Based Practice

Meta-analyses of bilateral CI studies:

- Murphy & O'Donaghue, 2007
- Sammeth, 2007
- Ching et al, 2007
- Schafer et al, 2007

Two ears are better than one!

Benefits of Bilateral Hearing

- Better speech understanding in quiet
- Better speech understanding in noise
- Better localization ability
- Better sound quality perception
- Better music perception

Benefits of Bilateral Cochlear Implants

- Better ear is always implanted
- Allows bilateral cortical stimulation
- Restores binaural hearing

Offeciers, et al, 2005

CI bilateral workgroup's conclusion:

Veterans might benefit from 2nd implant if they cannot receive benefit from a hearing aid in the nonimplanted ear.

Bimodal (HA+CI) vs. Bilateral (CI+CI)

- Next question:

  When would someone benefit from a 2nd implant if they have aidable hearing in the nonimplanted ear?

- Ching et al. 2007 – Metanalysis on bimodal (HA+CI) vs. bilateral (CI+CI)

Benefits of bimodal (HA+CI)

- HA can provide better low frequency information which is important for:
  - Speech in Noise
  - Music
- No additional surgery
- Cost

Ching et al., 2007

Bimodal vs. Bilateral

- Cannot conclude which bimodal users would be good bilateral CI candidates:
  - Little uniformity across studies
  - Studies did not include subjects with greater residual hearing (avg. PTA was 90 dB HL or less)
  - Very little attempt was made to balance loudness between hearing aid and cochlear implant .

Ching, et al, 2007

Goal is hearing in both ears

"The evidence to date supports the recommendation of providing binaural/bimodal fittings as the standard of care for recipients of unilateral cochlear implants who have residual hearing in the nonimplanted ear."

Ching et al, 2007

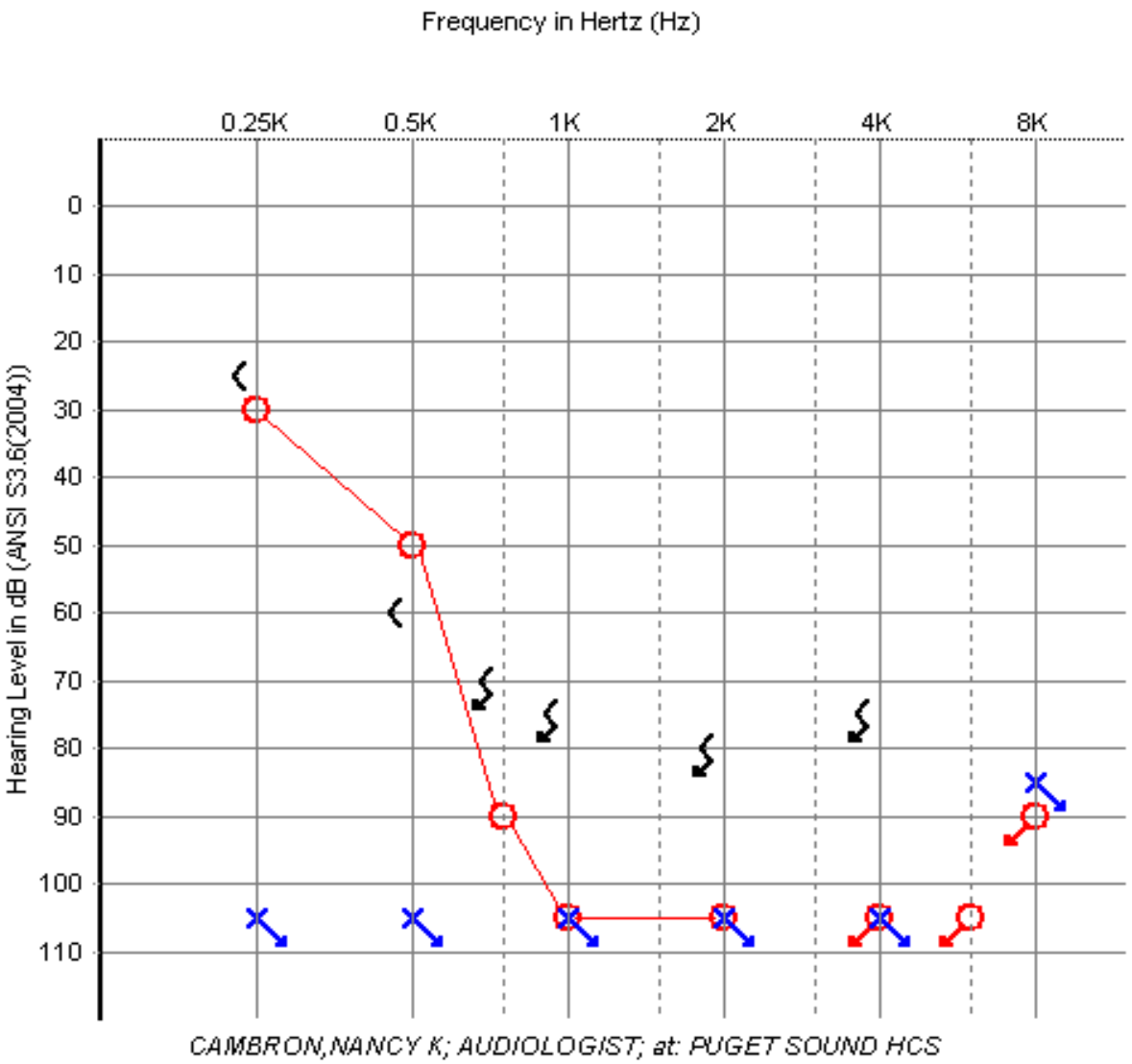
Bimodal vs. Bilateral

"A reasonable criterion for bilateral implantation ought to require that significantly more benefits can be obtained from bilateral implantation than from other forms of intervention."

Ching et al, 2007

Case Study

- Veteran with CI in left ear for 8 years; discontinued using hearing aid in right ear.
- Should we implant right ear?
- Common sense might say “yes”, but let’s look at the evidence.


Frequency in Hertz (Hz)
0.25K
0.5K
1K
2K
4K
8K
Hearing Level in dB (ANSI S3.6(2004))
0
10
20
30
40
50
60
70
80
90
100
110
CAMBRON,NANCY K; AUDIOLOGIST; at: PUGET SOUND HCS

Case Study

HINT-Q sentences in Sound Field:

CI only (RE plugged): 31%/40%

RE only (unaided): 11%/9%

CI + RE unplugged: 88%/100%

The whole is greater than the sum of its parts!!!

Revised Protocol Requirements

- No ceiling or floor effects
- Test scores with enough headroom to accurately document speech perception improvements over time, with improvements in technology, mapping, etc.
- Time efficient protocol
- Determine if a binaural advantage exists and the contribution from each ear
- Measure that allows comparison with prior data

Presentation Level??

Firszt et al., 2004:

- CI users performed the same at 60 & 70 dB SPL
- 60 dB SPL is more representative of everyday speech; 70 dB SPL is difficult to sustain
- Recommended presenting at 60 dB SPL vs. 70 dB SPL

CI Speech Perception Testing

Current Practice

Fabry, et al, 2009 surveyed 13 high volume CI centers

- 100% use CNC word lists
- 100% administer sentence tests
  - 50% use HINT sentence test only
  - 50% use HINT + another sentence test (CID, CUNY, AzBio)
- 77% use 60 dB SPL and 23% use a 70 dB SPL presentation level

AzBio Sentence Test

- Male & Female speakers
- 20 sentence list
- Conversational fashion (not Clear Speech)
- More challenging test than HINT
- Used for many research protocols and by large CI centers

Comparison between HINT, AzBIO, CNC and BKB-SIN

- CNC scores evenly distributed without floor or ceiling effects
- Ceiling effect evident with HINT testing
  - 28% subjects scored 100%
  - Poor relationship between HINT and CNC scores
- AzBio showed more evenly distributed scores
  - Only 1 subject scored 100%
  - AzBio scores better agreement with CNC and BKB-SIN results than HINT scores

Gifford, et al, 2008

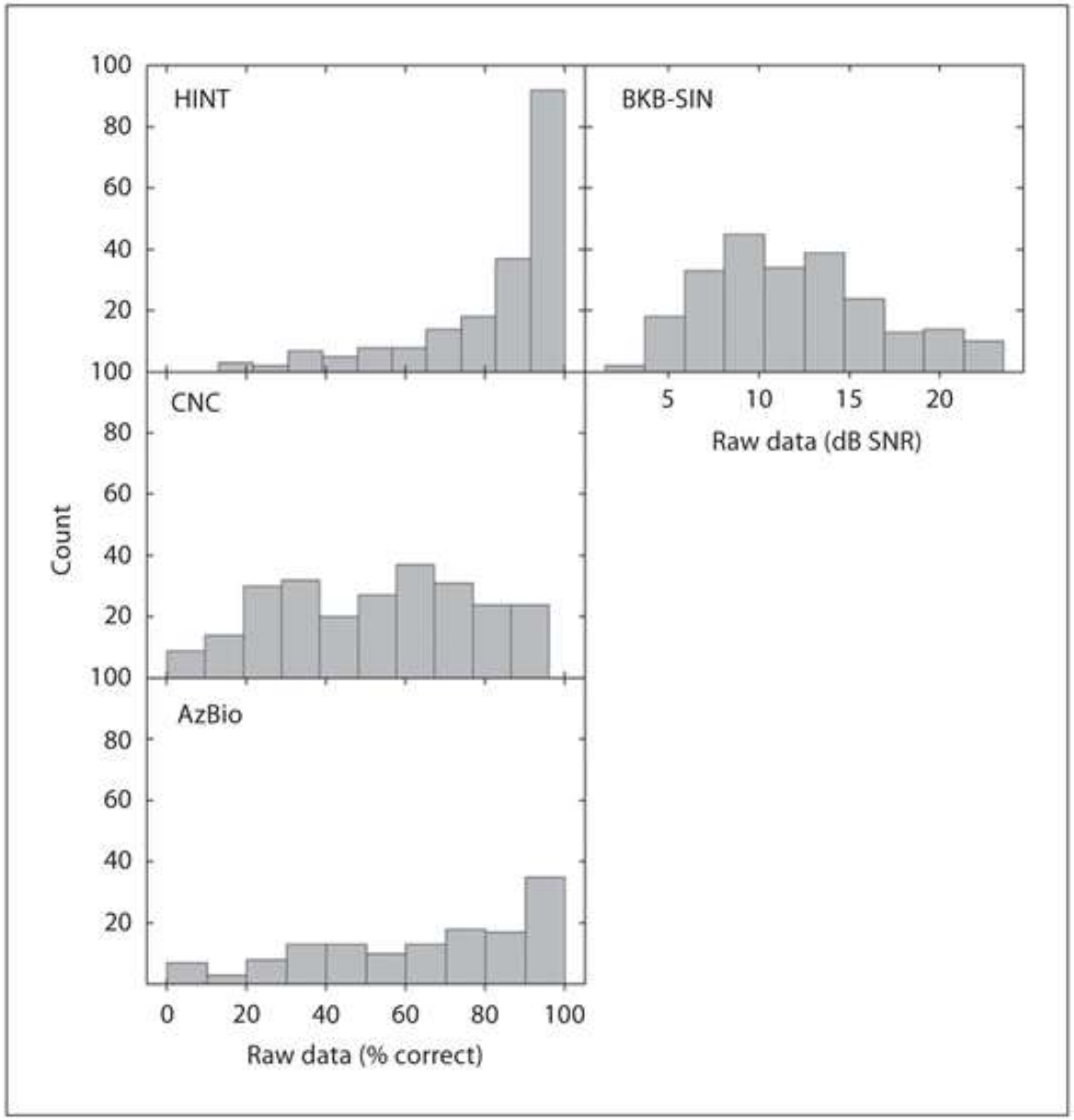


Fig. 3. Distribution histograms for the HINT, CNC, AzBio, and BKB-SIN scores as shown in figure 2. Skewness factors were −1.44, −0.11, −0.59, and 0.45 for the HINT, CNC, AzBio, and BKB-SIN scores, respectively.

Gifford et al, 2008

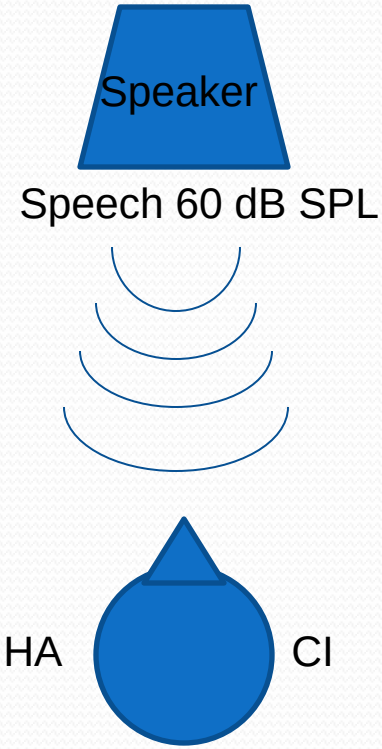
Proposed Protocol for Bilateral Implantation Candidacy

- Optimize hearing aid fitting
  - Real ear measures to ensure adequate aided performance
  - Loudness balance between hearing aid and CI
  - Aided thresholds for warble-tones in the sound field

Speech Recognition in Quiet

- Material:
  - AzBio sentences
  - CNC words
- Presentation level: 60 dB SPL
- Conditions: CI, HA, Bimodal

Speech in Quiet



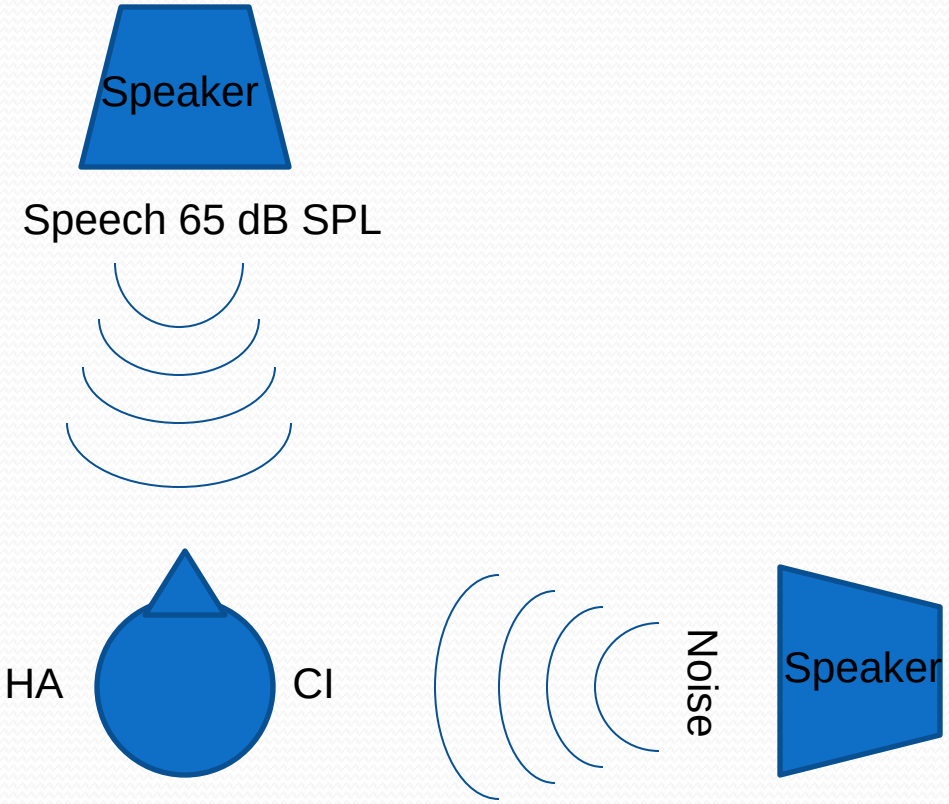
BKB-SIN

- 18 list pairs
- SNR changes from +21 dB to 0 dB
- Identify SNR loss
- Flexible presentation level and speaker array
- Quick and easy to administer and score

Sentence Recognition in Noise

- Material: BKB-SIN with speech presented at 0 degrees azimuth and noise 90 degrees toward CI
- Presentation level: 65 dB SPL speech
- Conditions: Bimodal, CI only, HA only
  - If time permits
    - Noise toward hearing aid
    - Speech and noise presented at 0 deg. azimuth

Speech in Noise



Adapted from Perreau et al, 2007

Questionnaires/Additional tests

- Dizziness Handicap Inventory – For patients with history of dizziness/vertigo
  - VNG
- Tinnitus Handicap Inventory – For patients with significant tinnitus
- CT Scan
- Spatial Hearing Questionnaire – Useful because it is difficult to assess localization in standard clinical soundbooth

Spatial Hearing Questionnaire

- Strong psychometrics
- Self report tool focusing on situations in which binaural hearing is important
- 24 items 10 minutes to complete
- Can be downloaded from University of Iowa website
- http://www.uihealthcare.com/depts/med/otolaryngology/clinics/cochlearimplant/spatialhearing/index.html

Bilateral CI Conference Call

- This is only the beginning, only just the start!
- Please email us prior to meeting with ideas
- Tune in to Conference Call on
  - **Friday, April 23 @ 11:00 am Eastern Time**
  - Call 1-800-767-1750
  - Access Code: 42194