Advanced Bionics

The Journey to Better Hearing:

An Introduction to Cochlear Implants

A Sonova brand

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Objectives

- After this course, learners will be able to identify the differences between a hearing aid and a cochlear implant.
- After this course, learners will be able to describe the referral recommendations and process for a cochlear implant candidate.
- After this course, learners will be able to list the benefits of the different solutions available to cochlear implant recipients.

ACLN • CERTIFIED • CENTER • OF • EXCELLENCE

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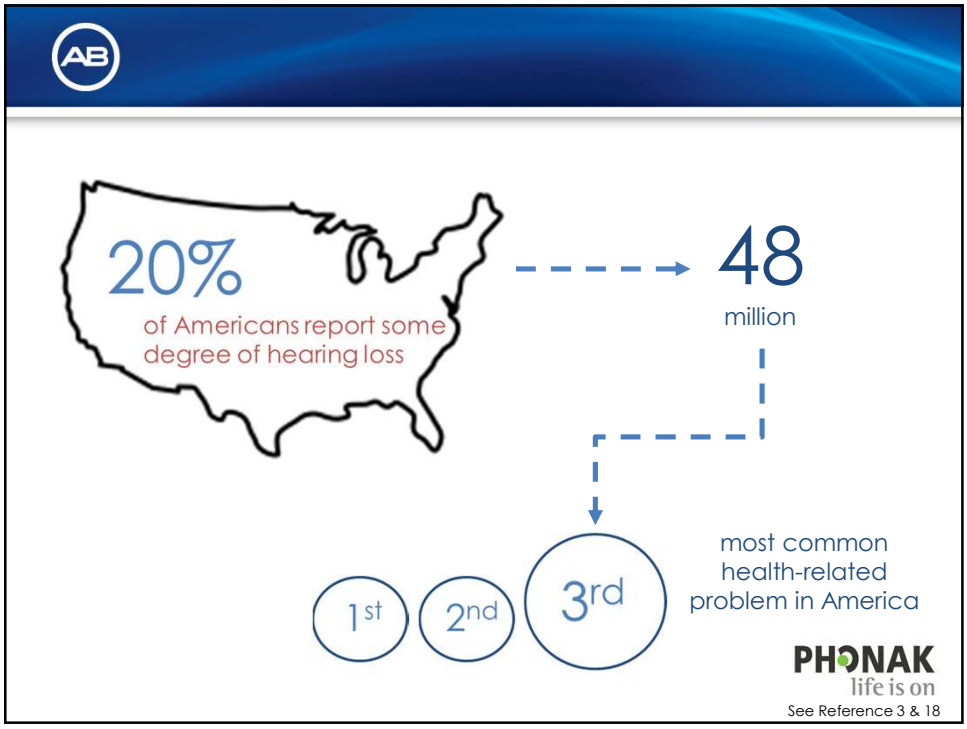
20%
of Americans report some degree of hearing loss
48
million
1st
2nd
3rd
most common health-related problem in America
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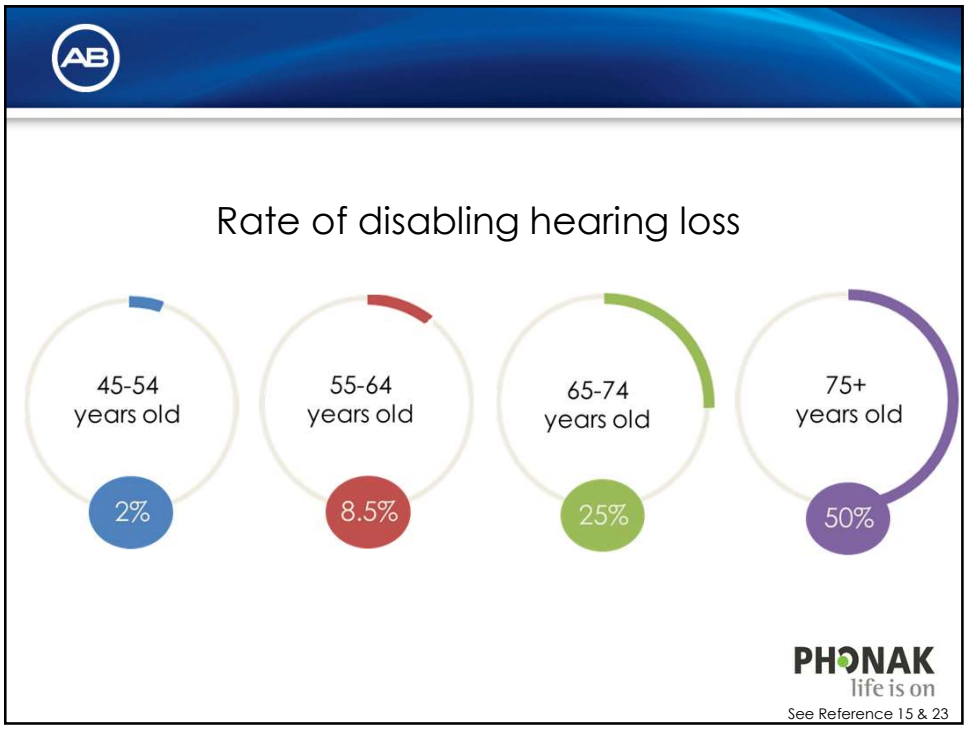
See Reference 3 & 18


Rate of disabling hearing loss
45-54 years old
2%
55-64 years old
8.5%
65-74 years old
25%
75+ years old
50%
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See Reference 15 & 23

1 in 7

School-age children

(age 6-19)
have some degree of hearing loss

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See Reference 5 and 20

Hearing Aids

Cochlear Implants

See Reference 4 & 24

~324,200
CIs implanted worldwide
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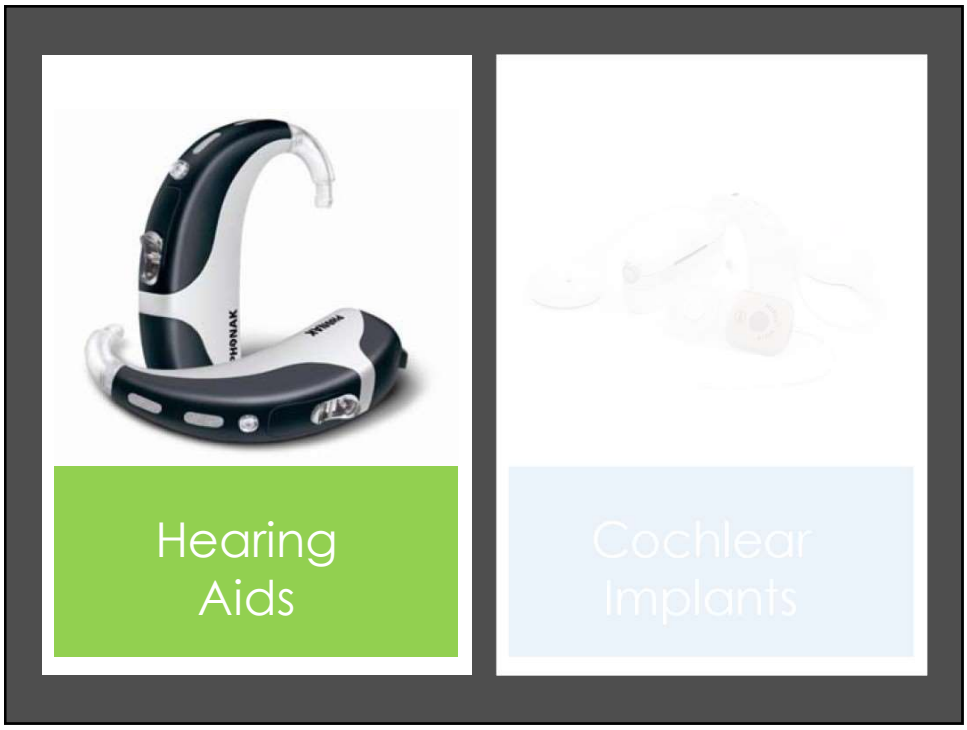
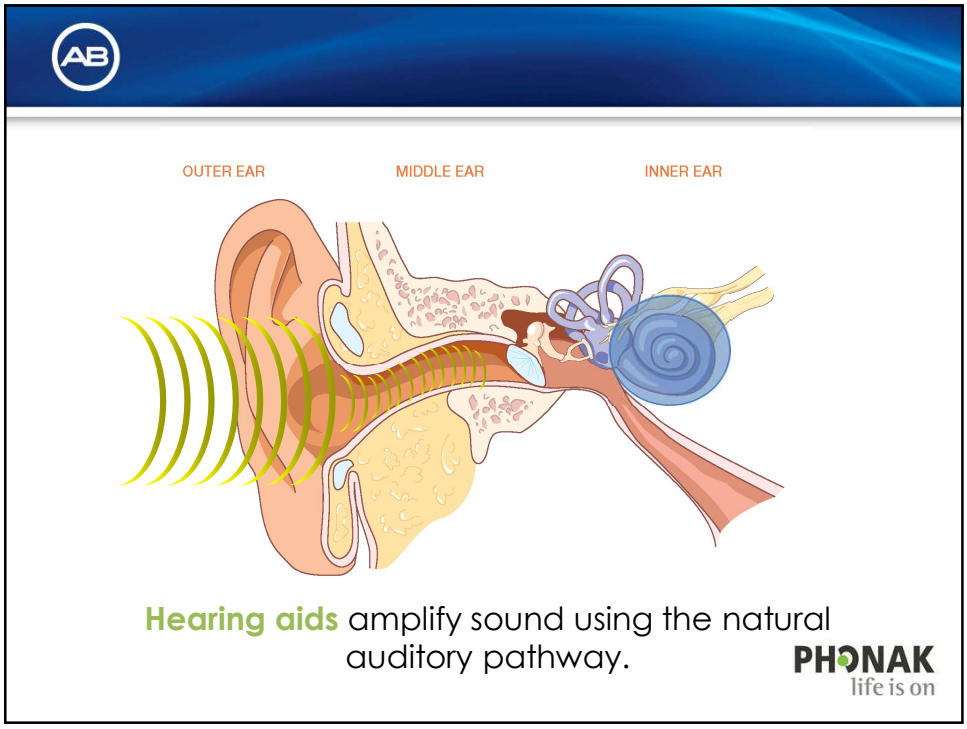
life is on
See Reference 22


Hearing Aids
Cochlear Implants



Hearing aids amplify sound using the natural auditory pathway.

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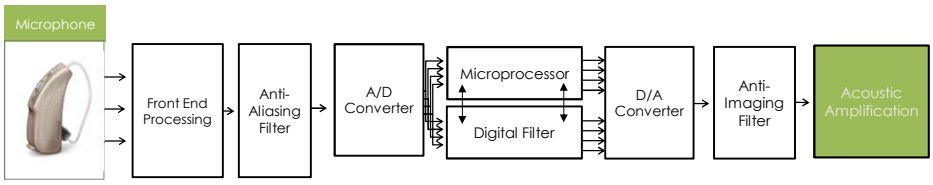
Hearing Aid Signal Processing

Acoustic Signal Processing



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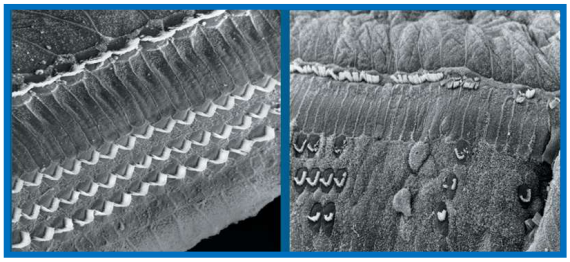
Inner Ear Damage



Without Hearing Aids →

With Hearing Aids →

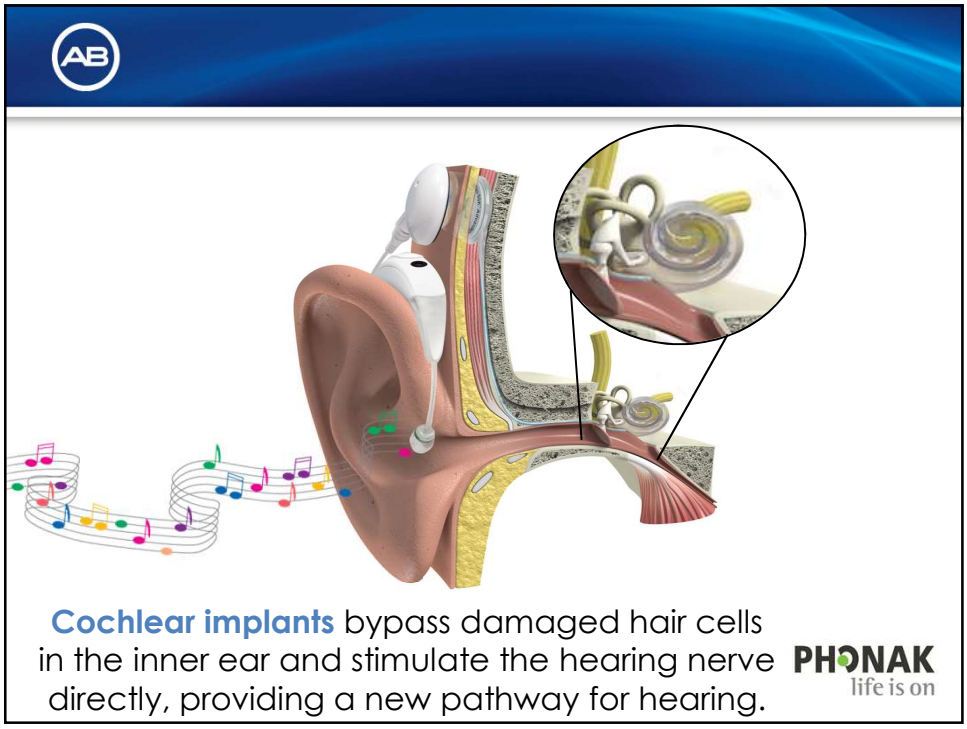
SIDEWALK

SIDEWALK PHONAK life is on

See Reference 26

Hearing Aids

Cochlear Implants



Cochlear implants bypass damaged hair cells in the inner ear and stimulate the hearing nerve directly, providing a new pathway for hearing.

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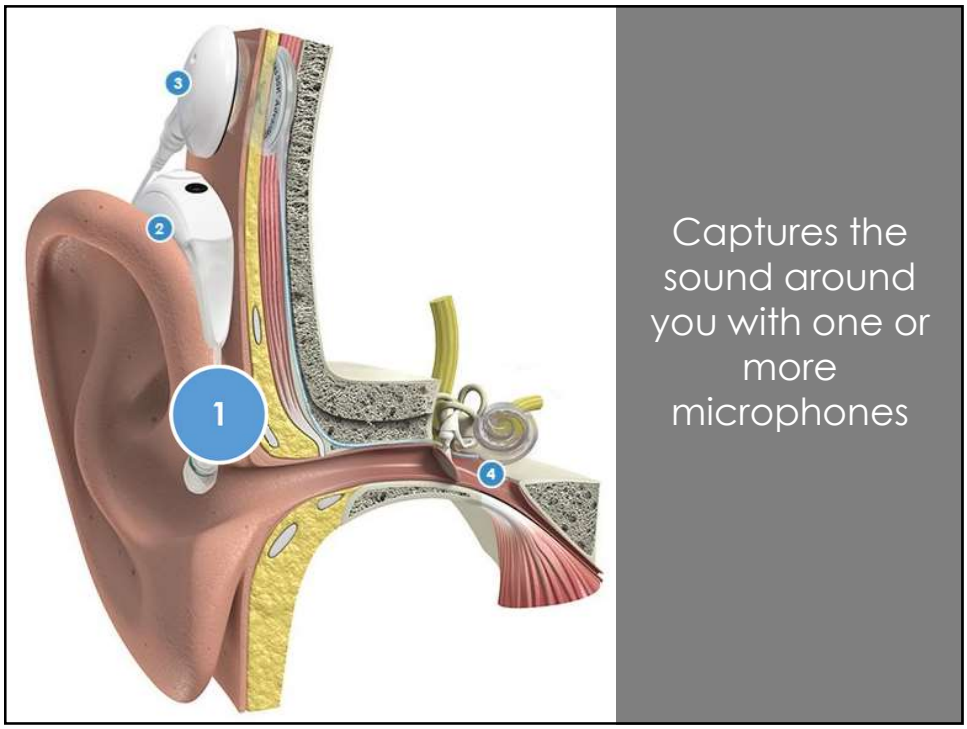
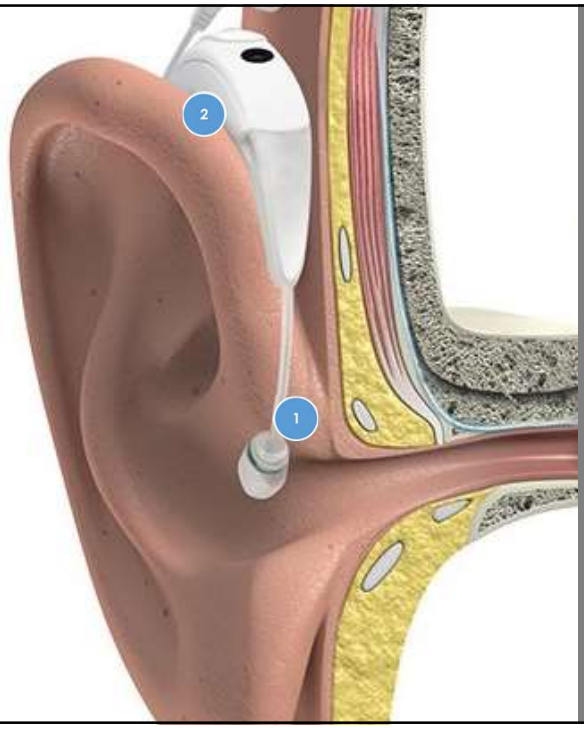


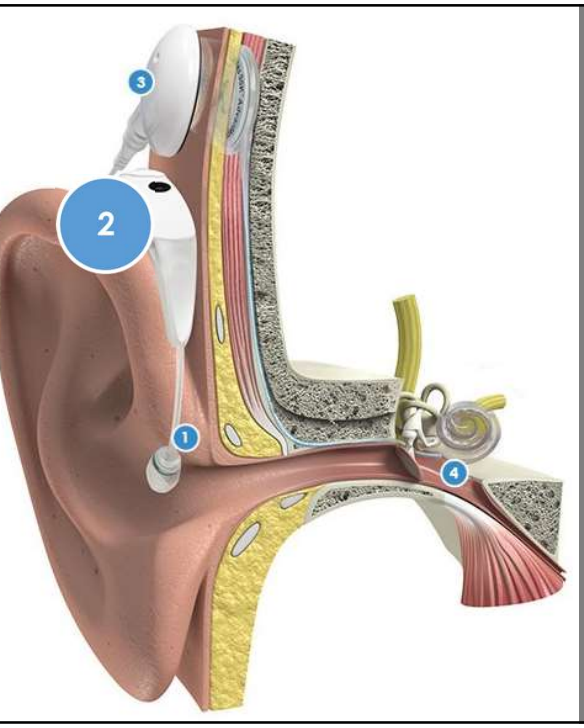
Captures the sound around you with one or more microphones



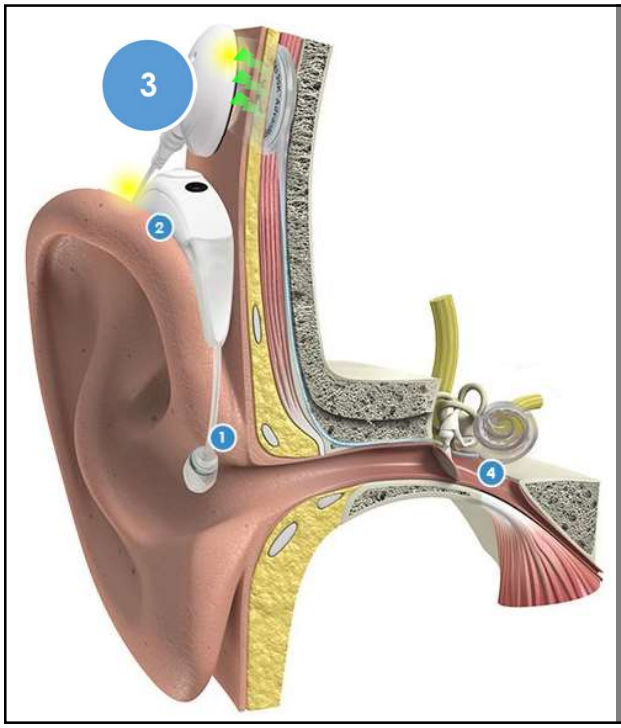
T-Mic™ 2:

the only in-the-ear microphone for better sound quality, performance, and natural phone use

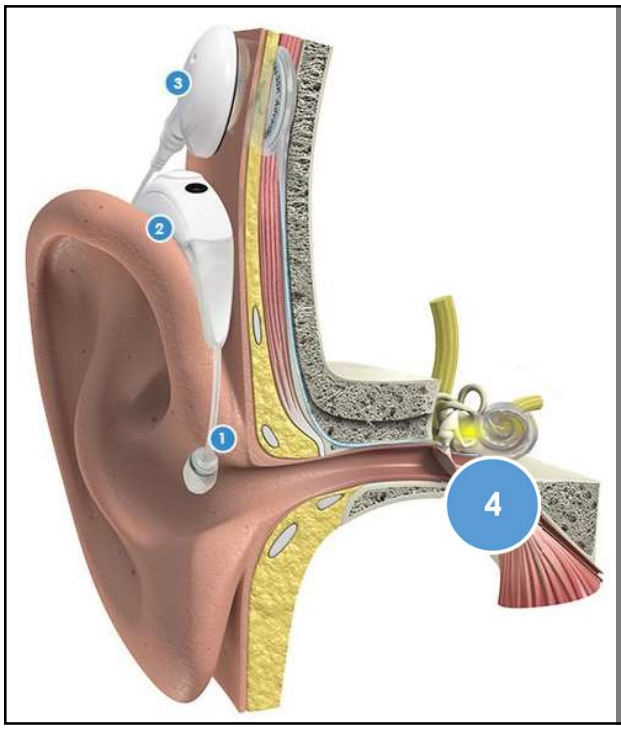
See Reference 13 & 17



Captured sound is processed

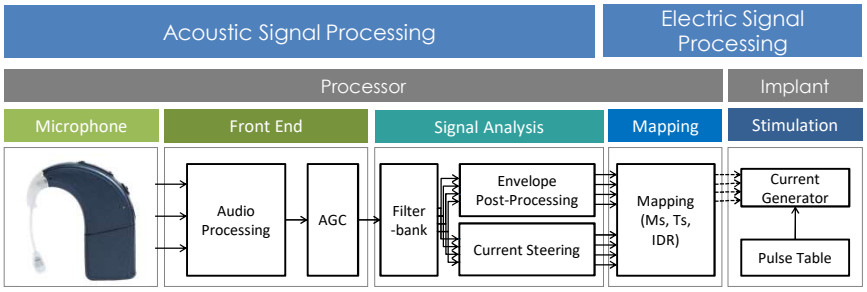


Processed sound is transmitted through the headpiece to the internal implant



Sound is sent through an electrode directly to the hearing nerve

Cochlear Implant Signal Processing



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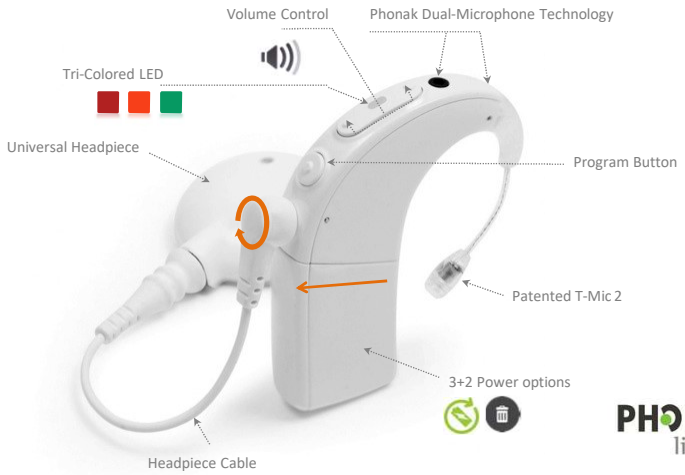
External Device

Internal Device

Naída CI Q90



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Solution Portfolio

Naída™ CI Bilateral Solution

Naída™ Link CROS Solution

Naída™ Link Bimodal Solution

Naída™ CI All-In-One Solution

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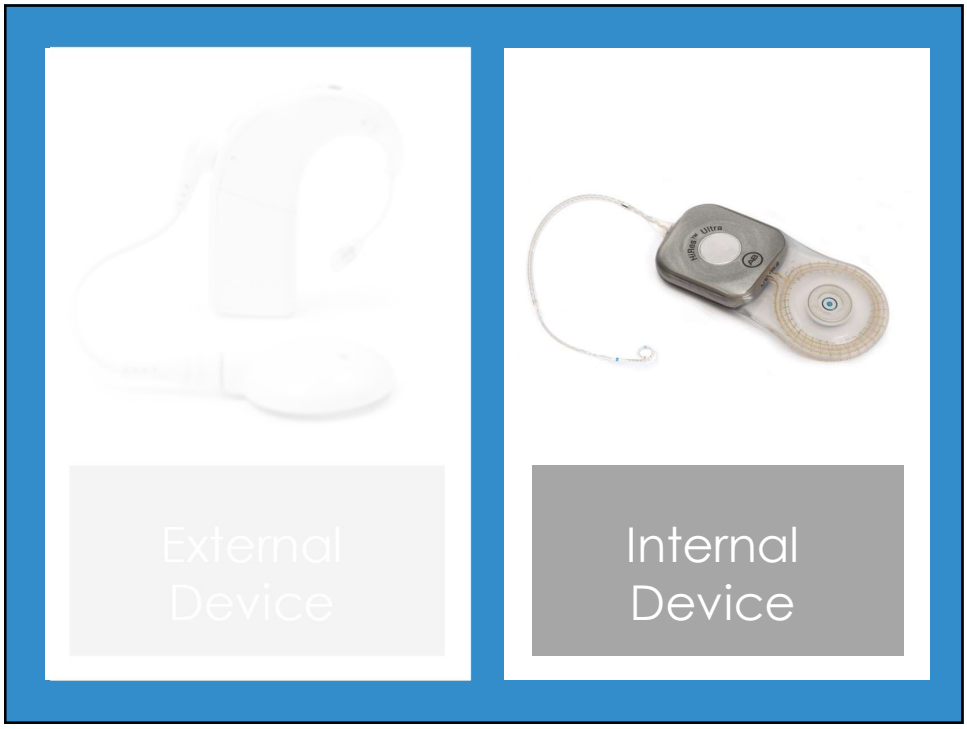
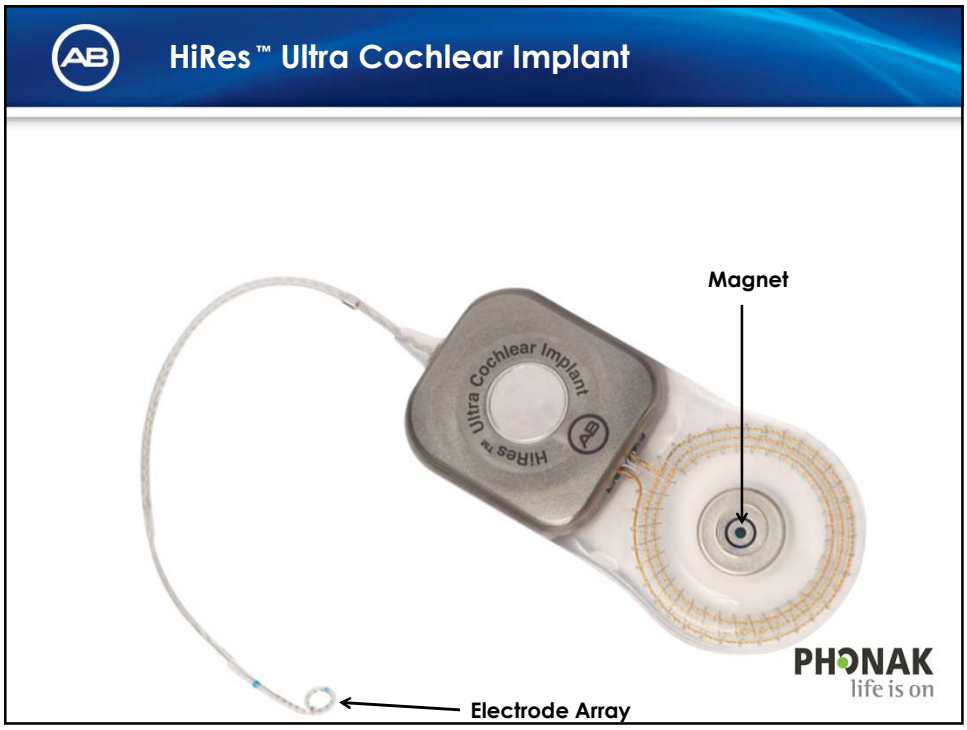

External Device
Internal Device


HiRes™ Ultra Cochlear Implant
Magnet
Electrode Array
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HiRes Ultra Electrode Arrays

HiFocus™ Mid-Scala Electrode

HiFocus™ SlimJ Electrode

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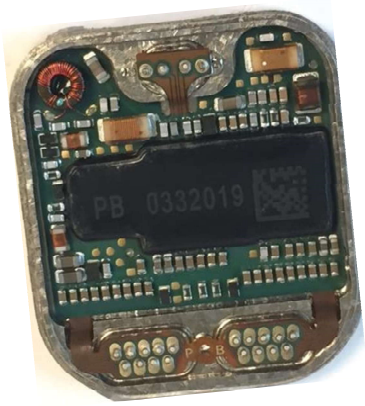
It's What's Inside That Counts



HiResolution™ Hearing Technology

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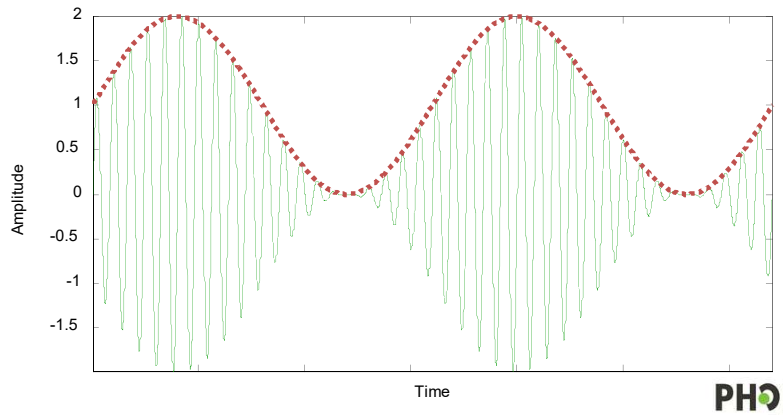
Sound Processing Strategies



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Sound Processing Strategies

Why This Matters

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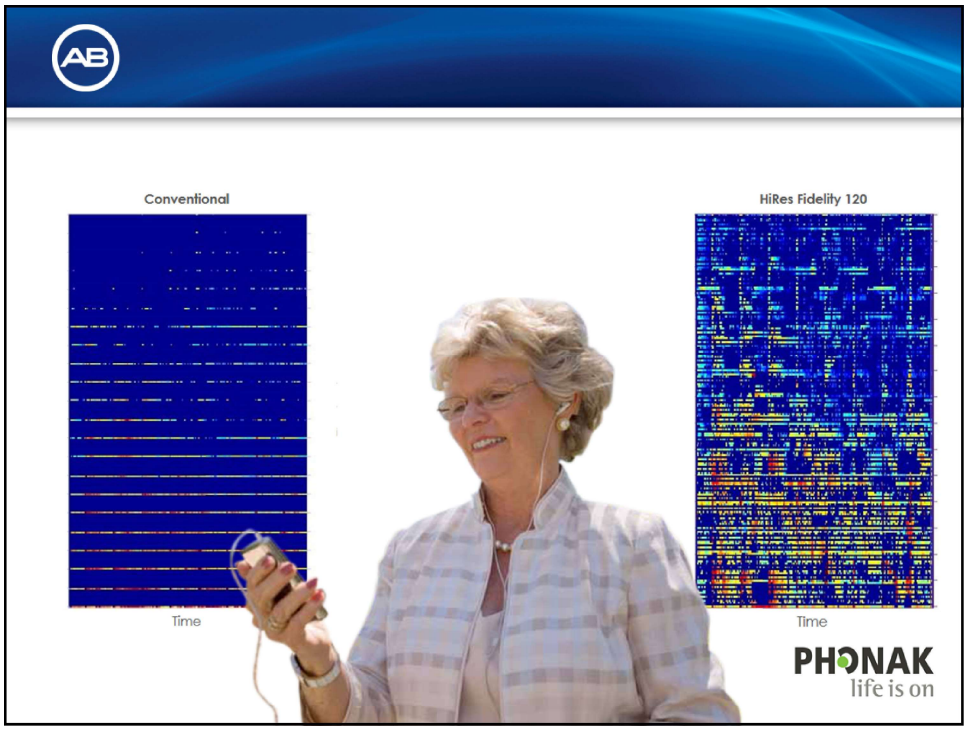
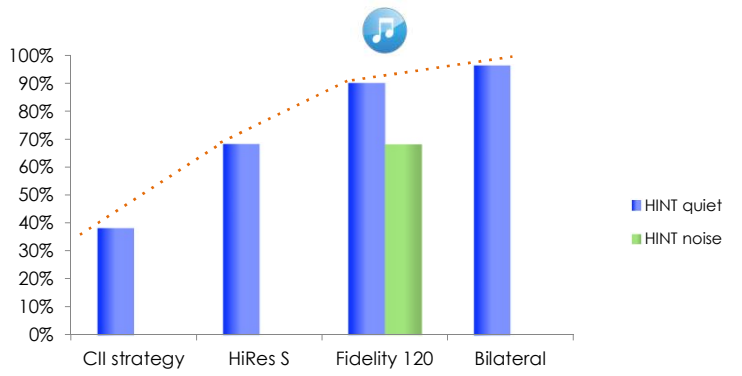
Strategies allow the output of the CI system to match, as closely as possible, the **acoustic input** from the environment



Performance Upgrades: the Jingle Bells Effect



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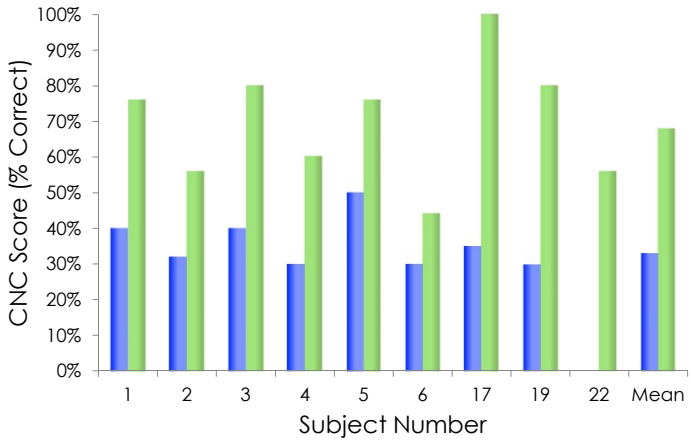
See Reference 12



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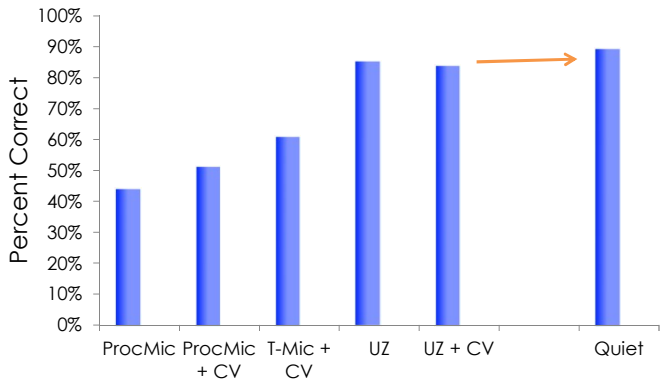
See Reference 14

AB & Phonak



Recipients hear almost as well in noise as they do in quiet

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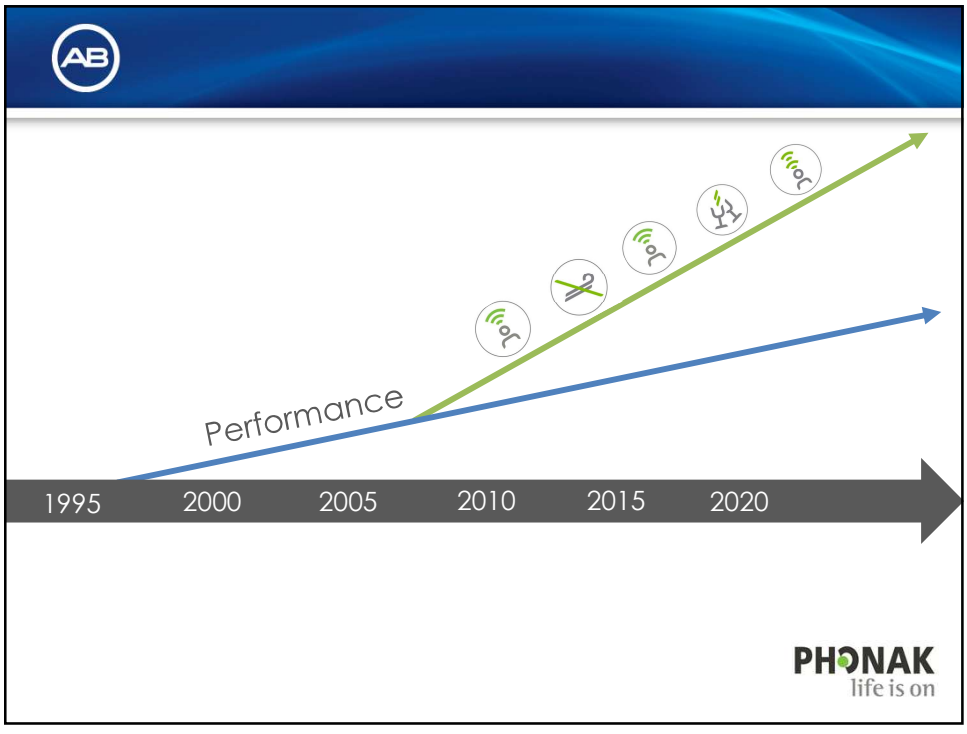
See Reference 29



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Cochlear Implants vs. Hearing Aids
Candidacy Guidelines
Portfolio of Solutions

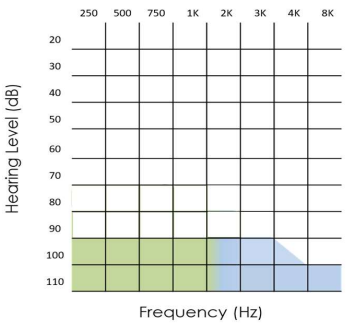
Cochlear Implants vs. Hearing Aids
Candidacy Guidelines
Portfolio of Solutions

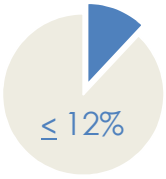
When to refer?

Pediatrics
Adults

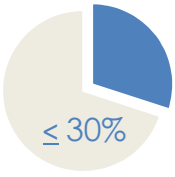
AB's FDA-Approved Criteria for Pediatrics:

- 12 months – 17 years of age
- Profound bilateral SNHL
- Trial with appropriately-fit hearing aids
- Little or no benefit from appropriately-fit hearing aids





Difficult open-set word recognition test



Open-set sentence test

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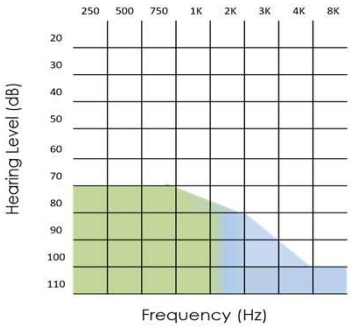
See Reference 1

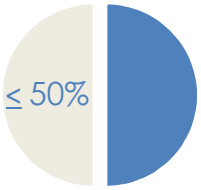
Pediatrics

Adults

AB's FDA-Approved Criteria for Adults:

- 18 years of age or older
- Severe-to-profound bilateral SNHL
- Postlingual onset of severe-to-profound SNHL
- Limited benefit from appropriately-fit hearing aids





Open-set sentence recognition (HINT sentences)

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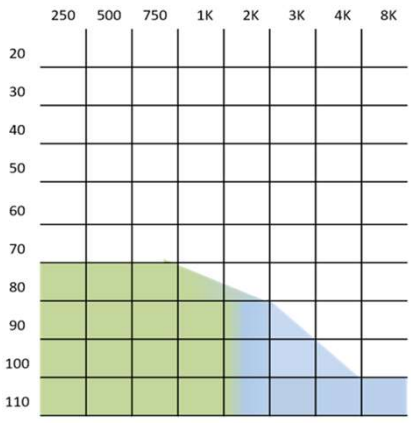
See Reference 1



Audiometric data

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Quality of life

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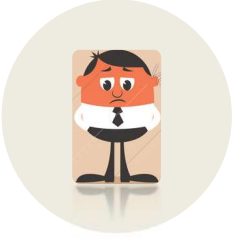

Communication abilities

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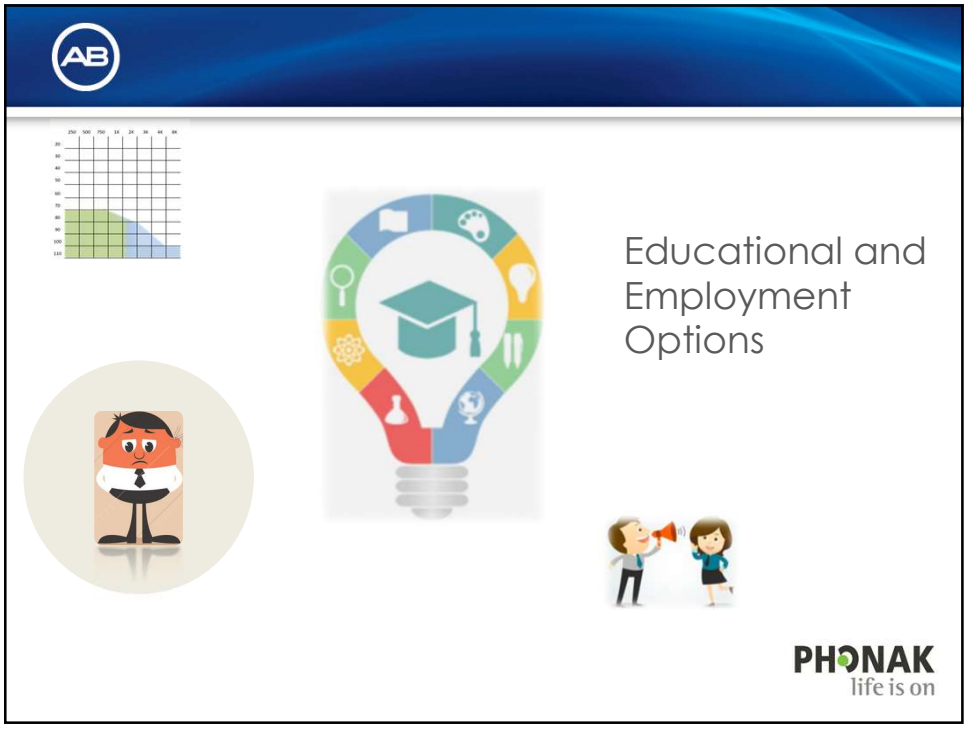
Educational and Employment Options
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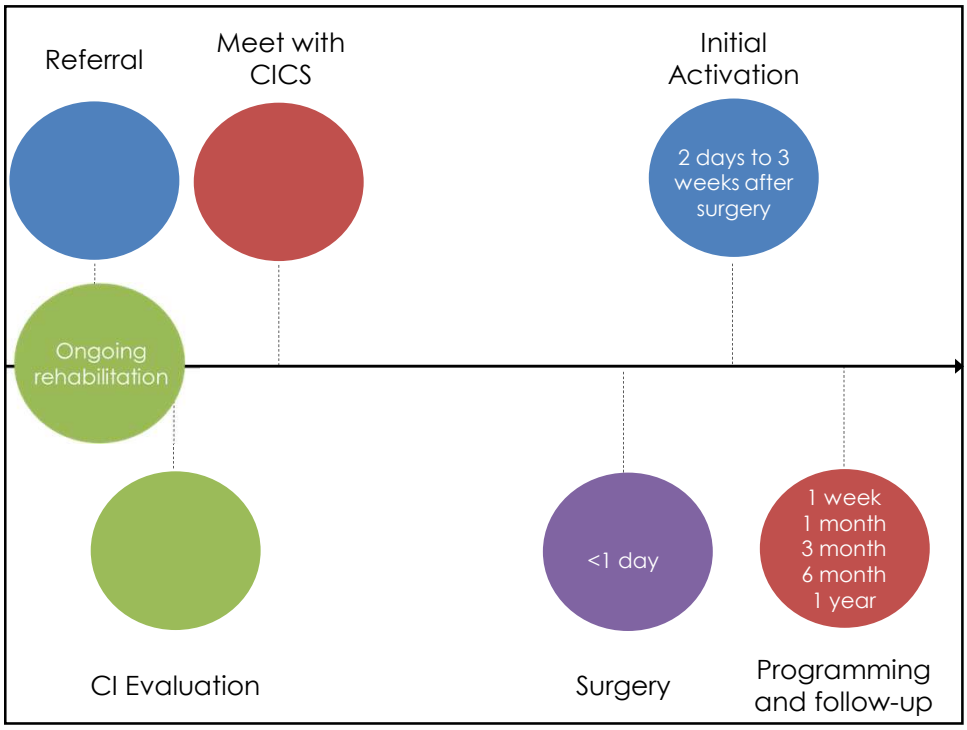
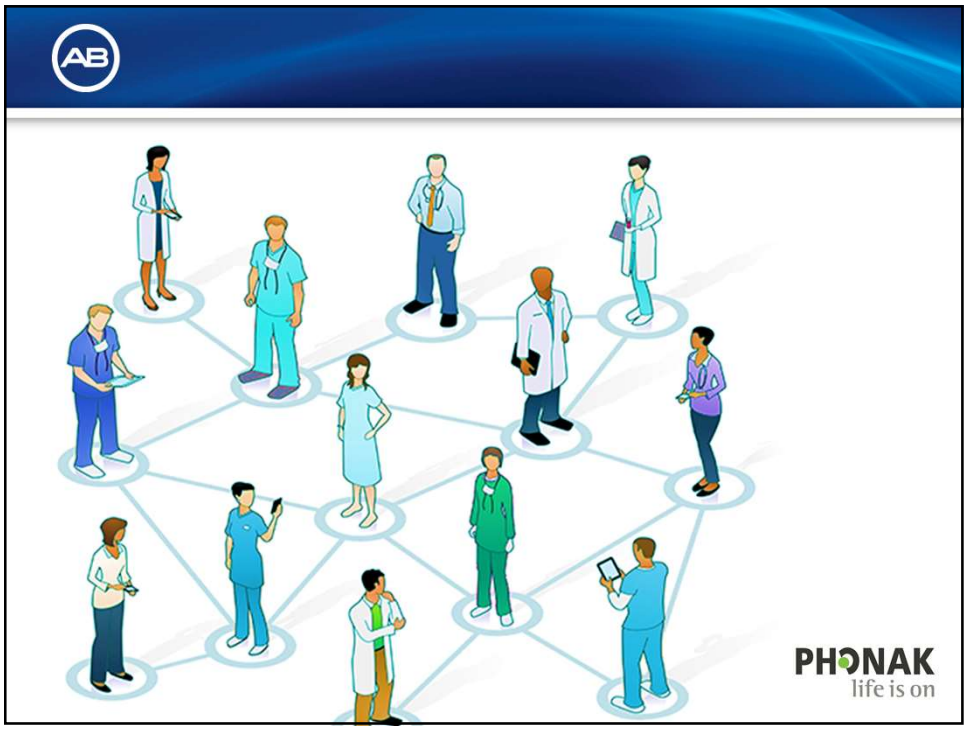
Next steps


Referral
Meet with CICS
Initial Activation
2 days to 3 weeks after surgery
Ongoing rehabilitation
<1 day
1 week
1 month
3 month
6 month
1 year
CI Evaluation
Surgery
Programming and follow-up

Team Approach


PHONAK
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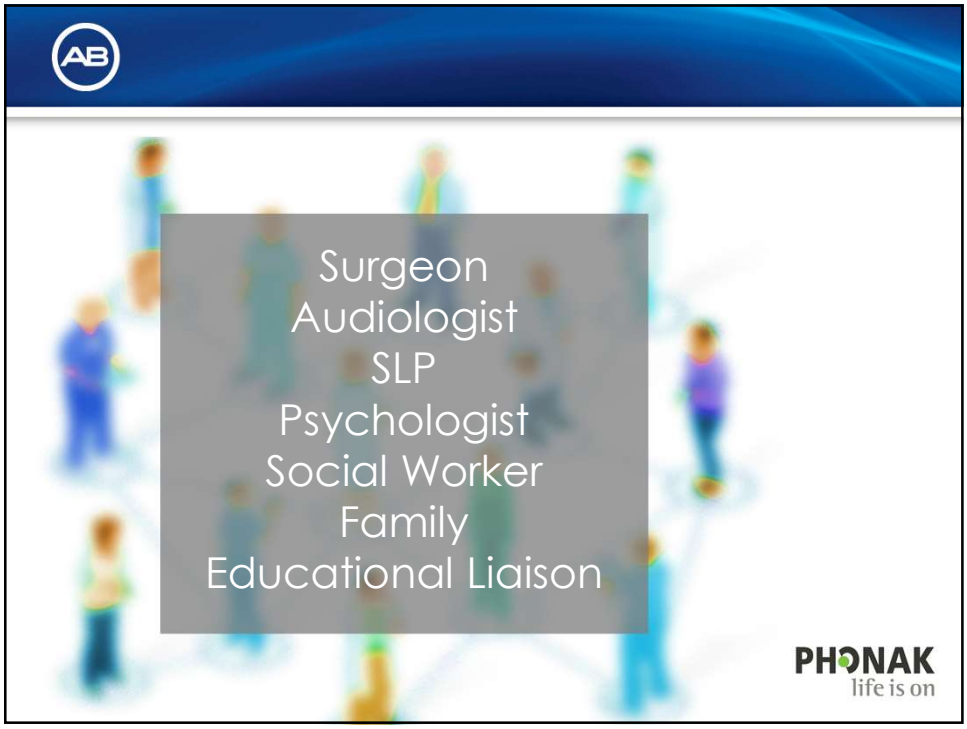
Surgeon
Audiologist
SLP
Psychologist
Social Worker
Family
Educational Liaison
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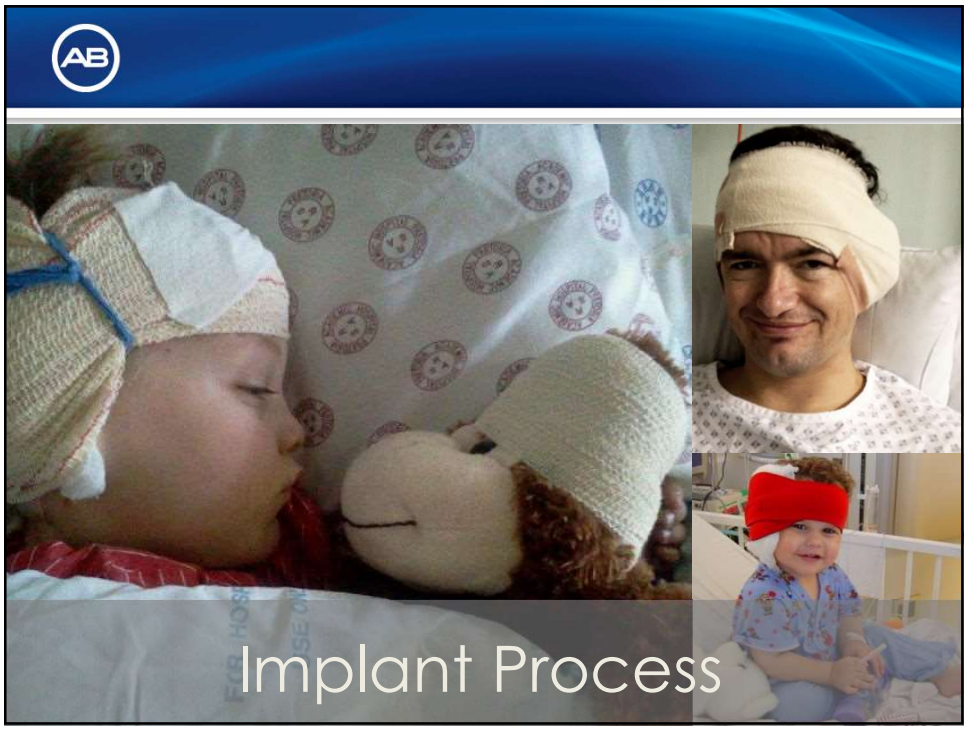
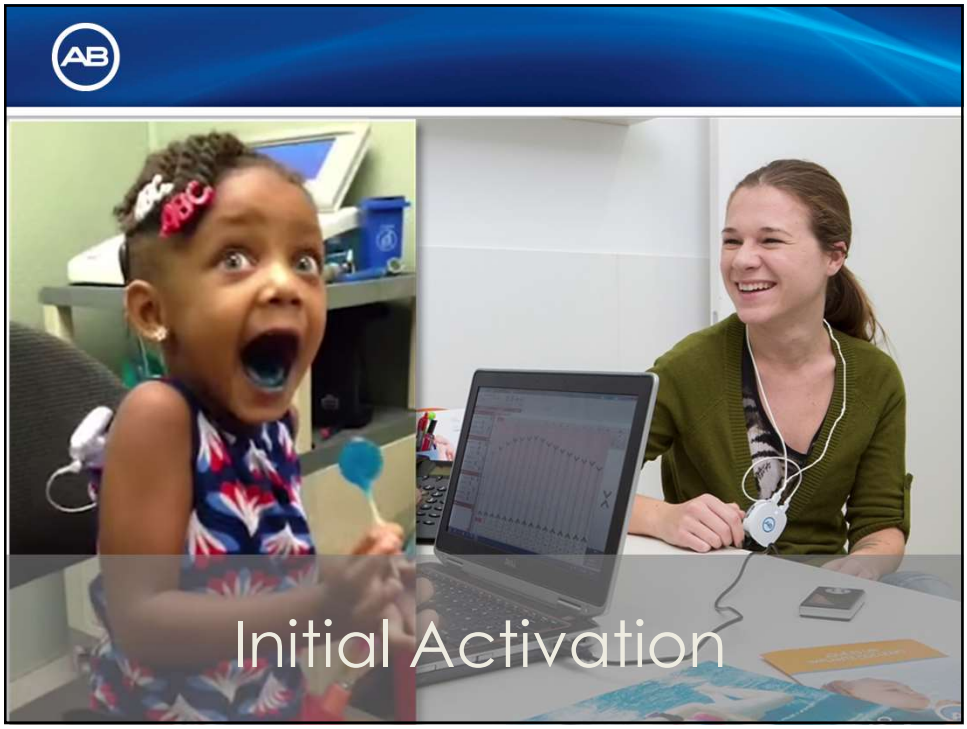

Implant Process



Initial Activation

Programming
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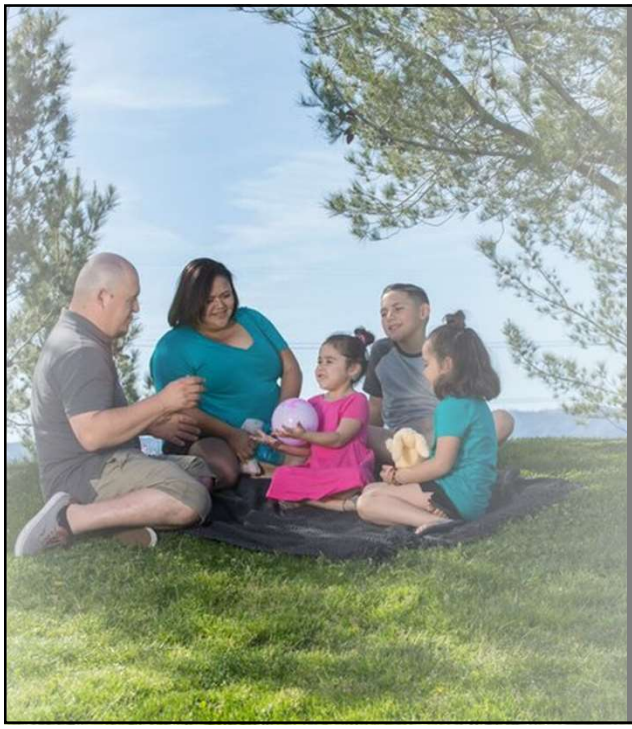
Best
Practice



Benefit and Success

Support and Mentorship

AB Cochlear Implant Consumer Specialists (CICS)

Bionic Ear Association (BEA): (866)-844-HEAR
hear@AdvancedBionics.com

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Cochlear Implants vs. Hearing Aids
Candidacy Guidelines
Portfolio of Solutions

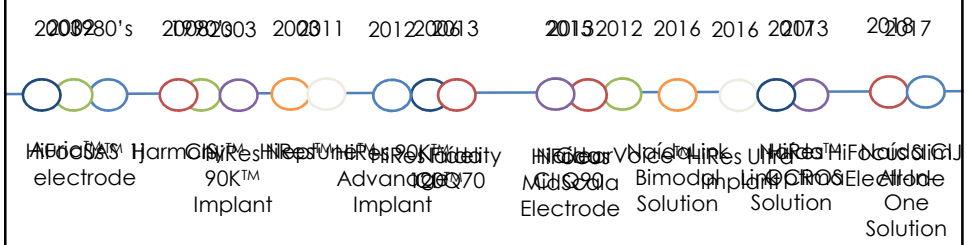
Cochlear Implants vs. Hearing Aids
Candidacy Guidelines
Portfolio of Solutions

Innovation

Collaboration

Customization

Sound Processing Strategies



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Commitment to Innovation

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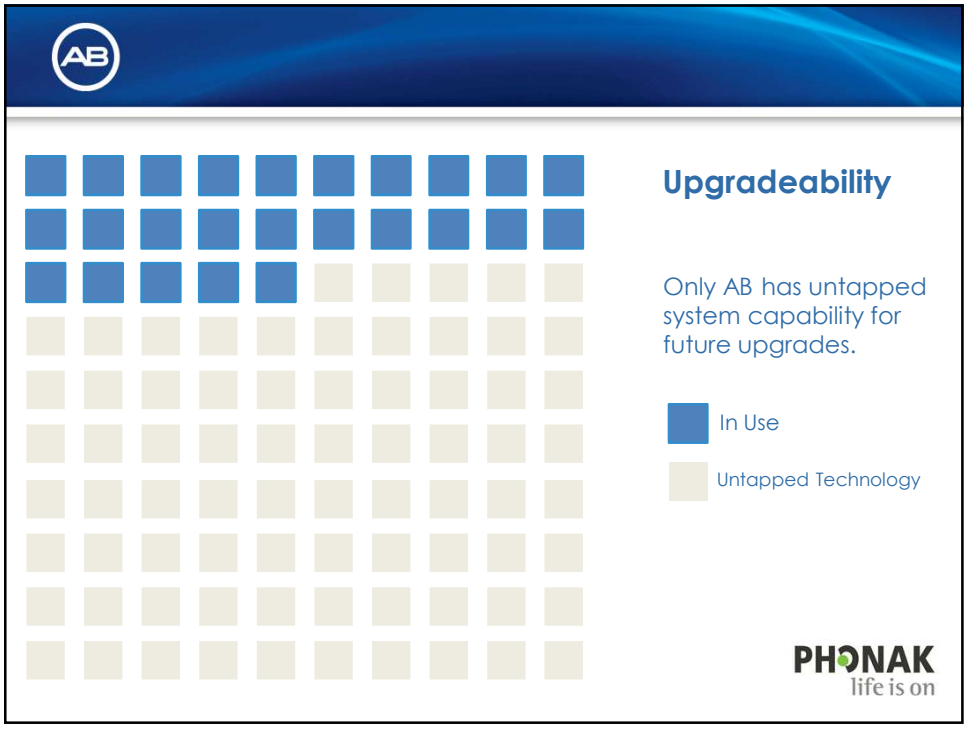
Upgradeability
Only AB has untapped system capability for future upgrades.
In Use
Untapped Technology
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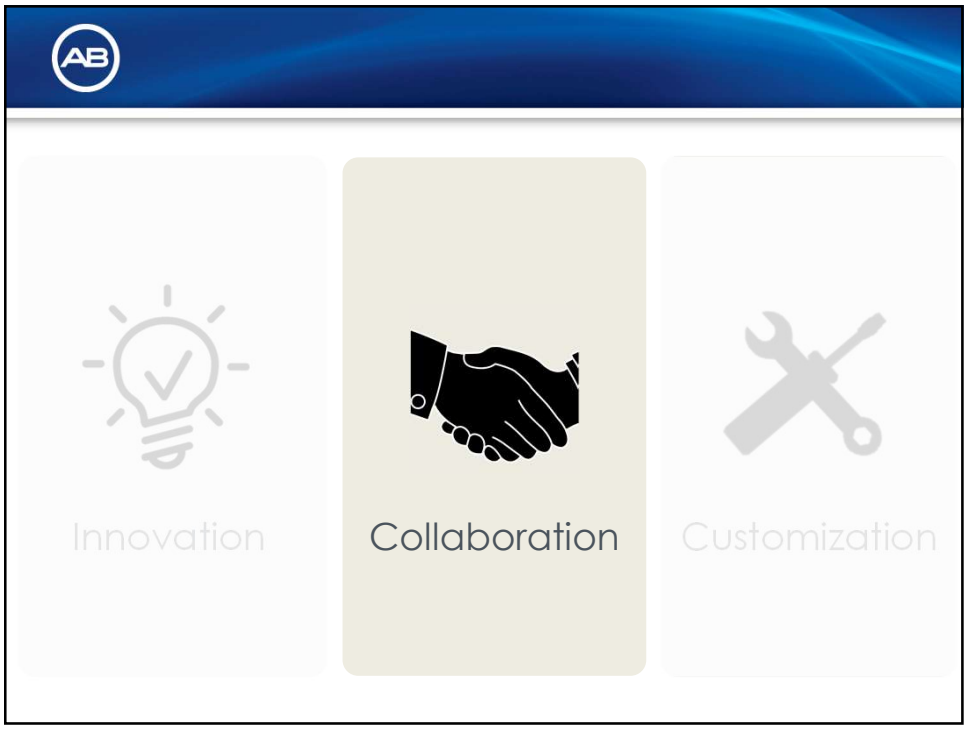
Innovation
Collaboration
Customization

The Simple Way to Hear More

PHONAK

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The Simple Way to Hear More

Industry Innovation Leader for Cochlear Implant Technology

PHONAK

Industry Innovation Leader for Hearing Instrument Technology

PHONAK
life is on

Innovation

Collaboration

Customization

The Simple Way to Hear More

Advanced Bionics

Naída CI Hearing Solutions

CI candidates

CI candidates with no hearing | CI candidates with some hearing

PHONAK life is on

Naída CI Hearing Solutions

CI candidates

CI candidates with no hearing | CI candidates with some hearing

Naída CI Bilateral Solution

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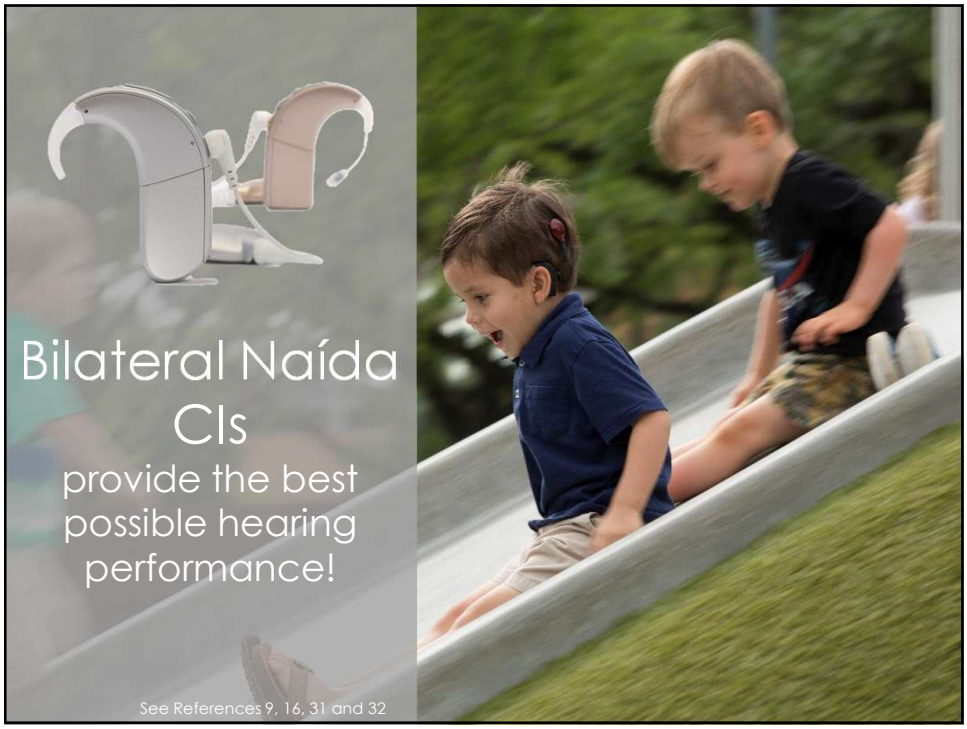
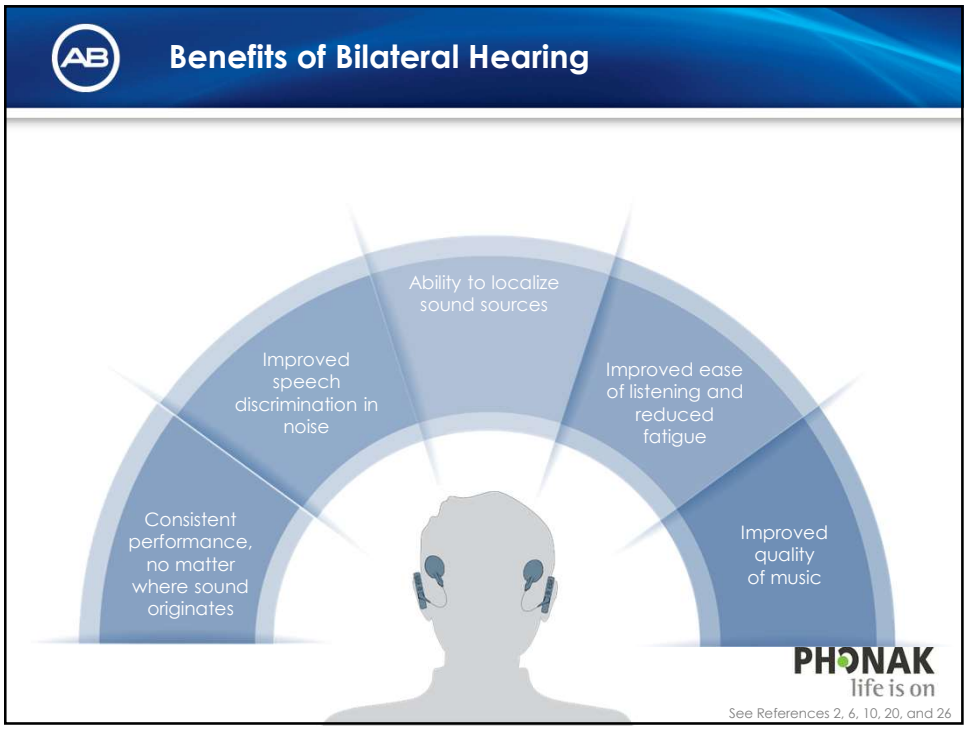

Bilateral Naída CIs
provide the best possible hearing performance!
See References 9, 16, 31 and 32


Benefits of Bilateral Hearing
Ability to localize sound sources
Improved speech discrimination in noise
Improved ease of listening and reduced fatigue
Consistent performance, no matter where sound originates
Improved quality of music
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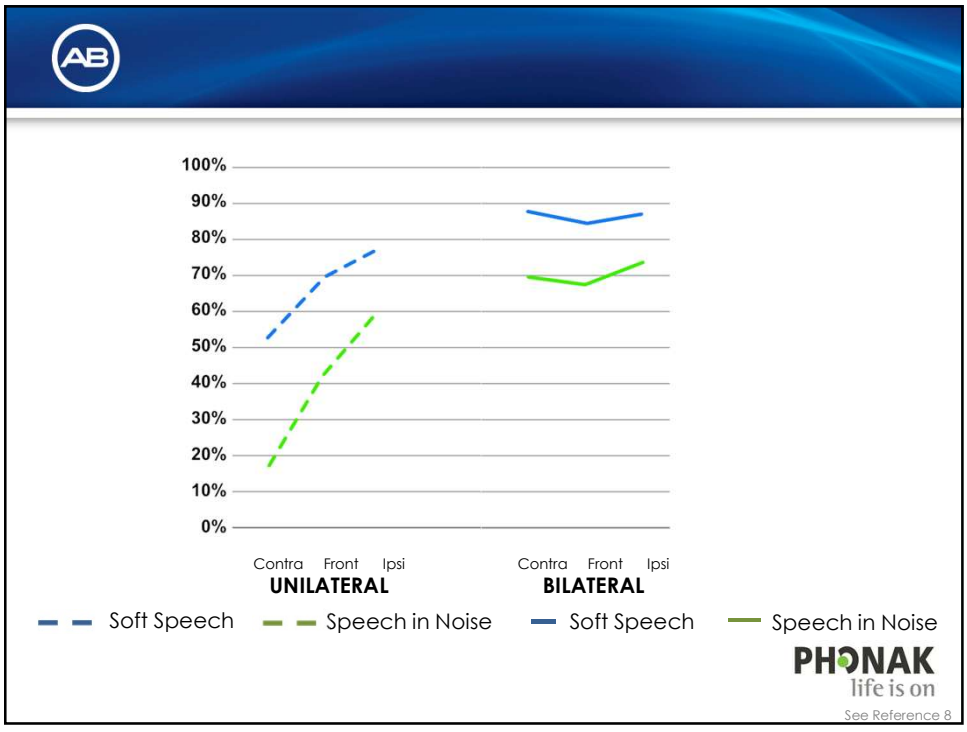
See References 2, 6, 10, 20, and 26

Binaural VoiceStream Technology™


100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Contra Front Ipsi
UNILATERAL
Contra Front Ipsi
BILATERAL
Soft Speech
Speech in Noise
Soft Speech
Speech in Noise
PHONAK
life is on
See Reference 8

"Now that I'm implanted in both ears, I feel so balanced. It's just phenomenal."

Jake M., Bilateral AB Recipient

"I can carry on a conversation in the midst of chaos, and I don't have to strain or pull the person I'm talking to closer to my ear."

"It is much easier to hear in noisy environments. I am more confident in social situations."

Mike R., Bilateral AB Recipient

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Naída CI Hearing Solutions

CI candidates

CI candidates with no hearing | **CI candidates with some hearing**

Naída CI Bilateral Solution

Naída Link CROS Solution

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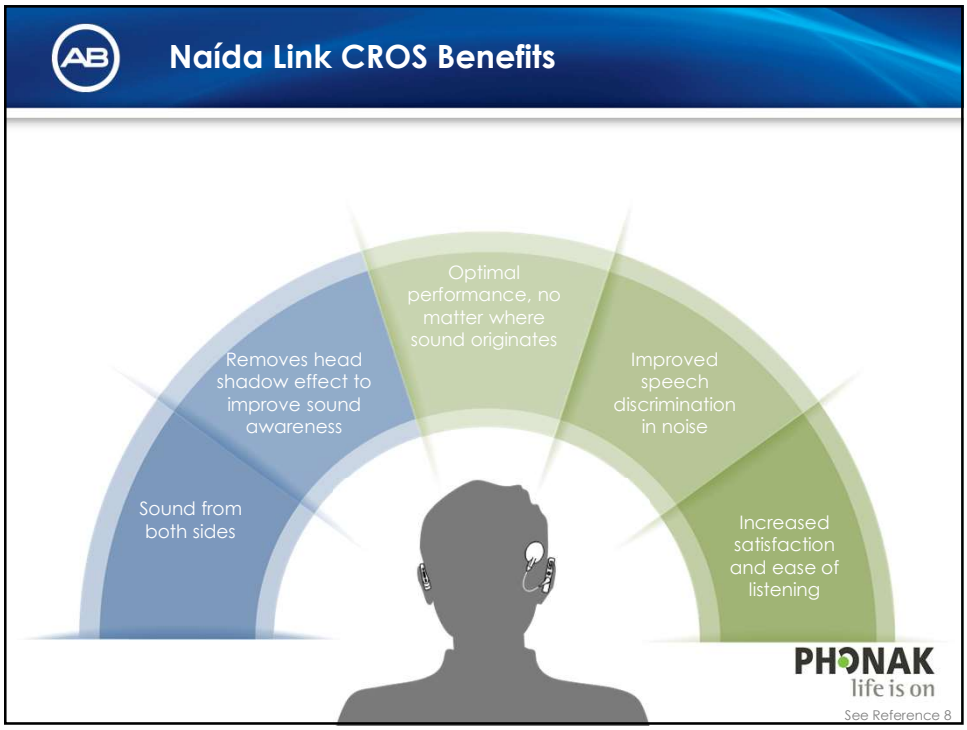
Naída Link CROS
provides unilateral recipients with the best hearing in quiet and noise without the need to reposition. *
* See Reference 22


Naída Link CROS Benefits
Optimal performance, no matter where sound originates
Removes head shadow effect to improve sound awareness
Improved speech discrimination in noise
Sound from both sides
Increased satisfaction and ease of listening
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See Reference 8

Matching Microphone Modes

Naída Link CROS microphone matches state of Naída CI microphone

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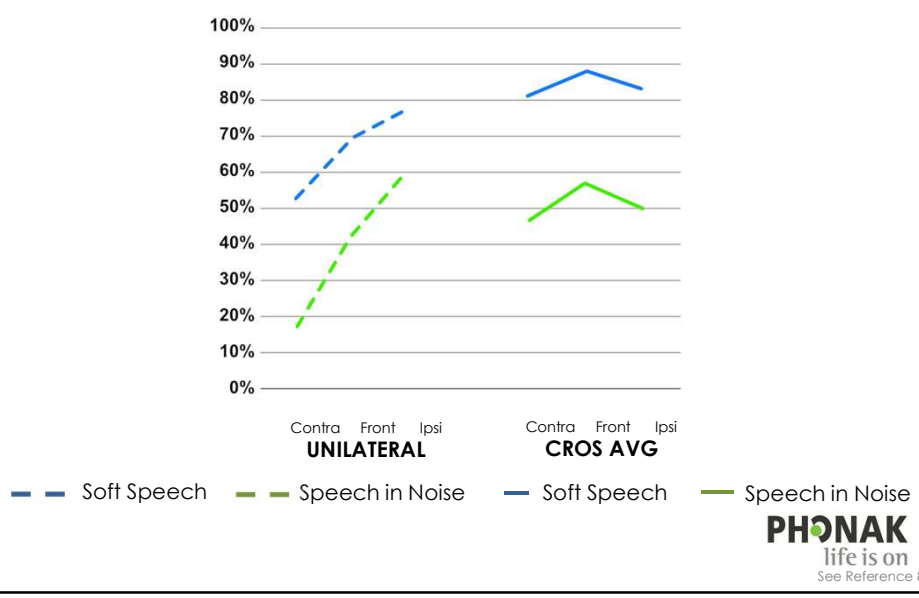

PHONAK life is on

See Reference 8

"I have never seen him so excited while speaking on the phone! He's able to use the phone even from the non implanted side with the CROS- this is just great!"

"It is so much easier to not think about where I am sitting and still hear folks."

"My friends encourage me to use CROS because I hear so much better with it."

Mother of Harsh T., CROS AB Recipient

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Naída CI Hearing Solutions

CI candidates

CI candidates with no hearing | **CI candidates with some hearing**

Naída CI Bilateral Solution

Naída Link CROS Solution

Naída Link Bimodal Solution

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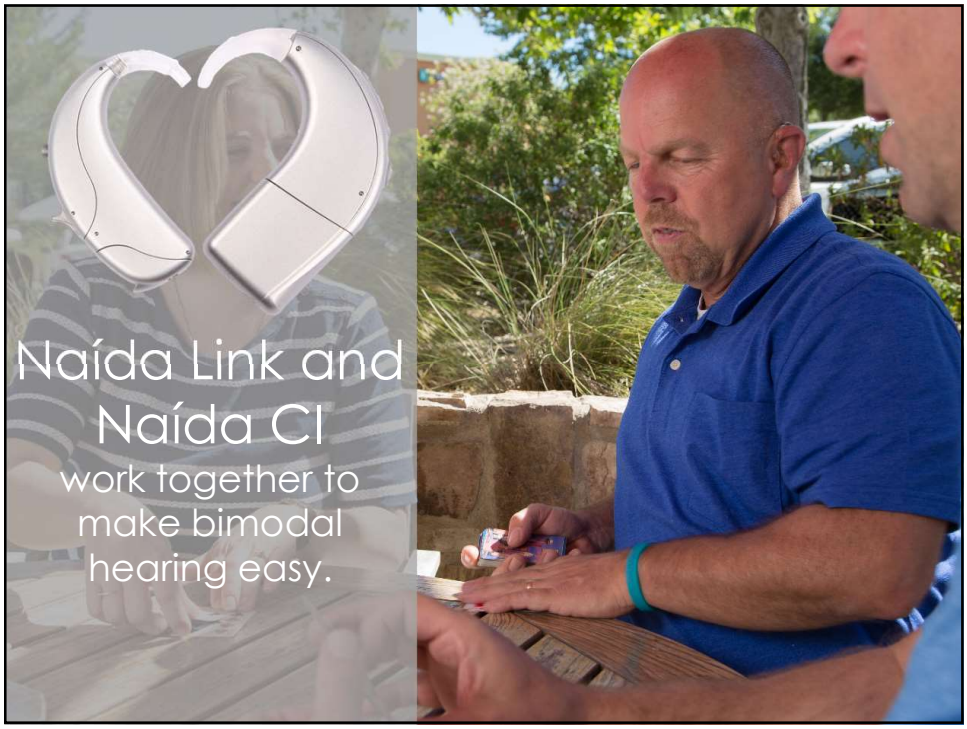
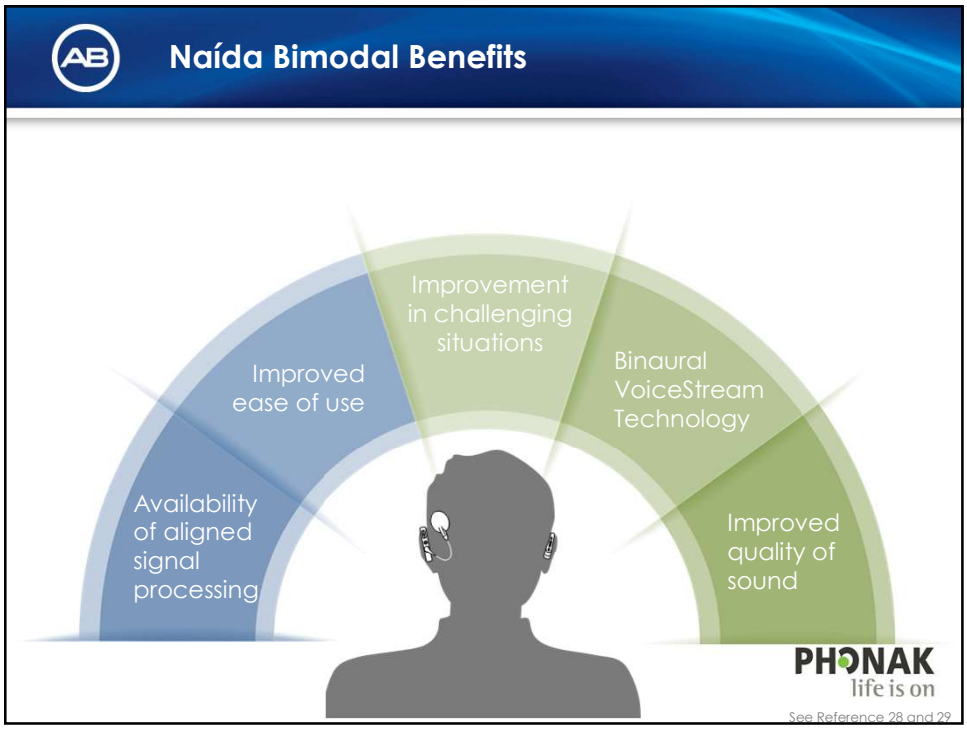

Naída Link and
Naída CI
work together to
make bimodal
hearing easy.


Naída Bimodal Benefits
Improvement in challenging situations
Improved ease of use
Binaural VoiceStream Technology
Availability of aligned signal processing
Improved quality of sound
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See Reference 28 and 29

Adaptive Phonak Digital Bimodal Fitting Formula

Alignment of Frequency Response → Alignment of Loudness Growth → Alignment of Dynamic Behavior

Provides optimized fitting with just one click!

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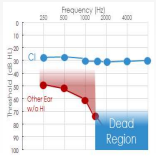
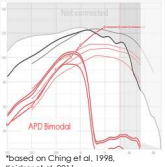
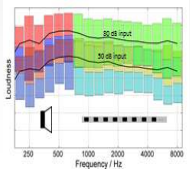
Aligned Signal Processing

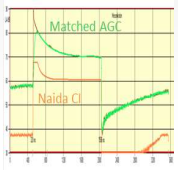
Alignment of Frequency Response	Alignment of Loudness Growth	Alignment of Dynamic Behavior
• Optimized bandwidth • Reduced gain in dead regions	• Optimized low frequency gain • Maximized effective audibility*	• Matched I/O curves	• Matched dynamic compression characteristics • Same dual-loop AGC

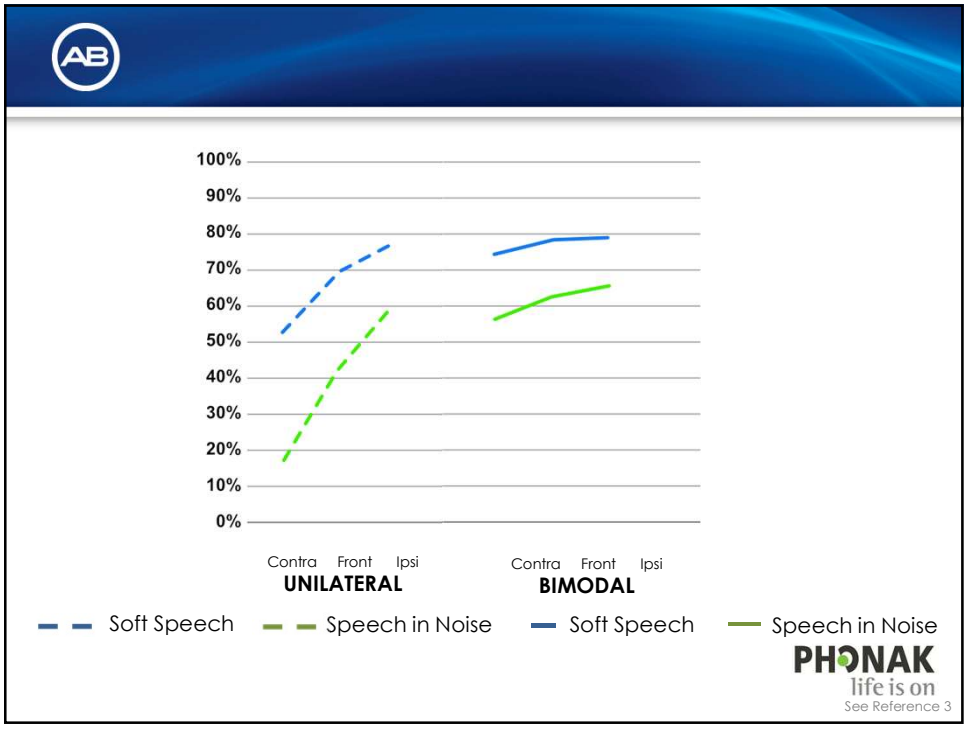




*based on Ching et al, 1998, Keidser et al, 2011






100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Contra Front Ipsi
UNILATERAL
Contra Front Ipsi
BIMODAL
Soft Speech
Speech in Noise
Soft Speech
Speech in Noise
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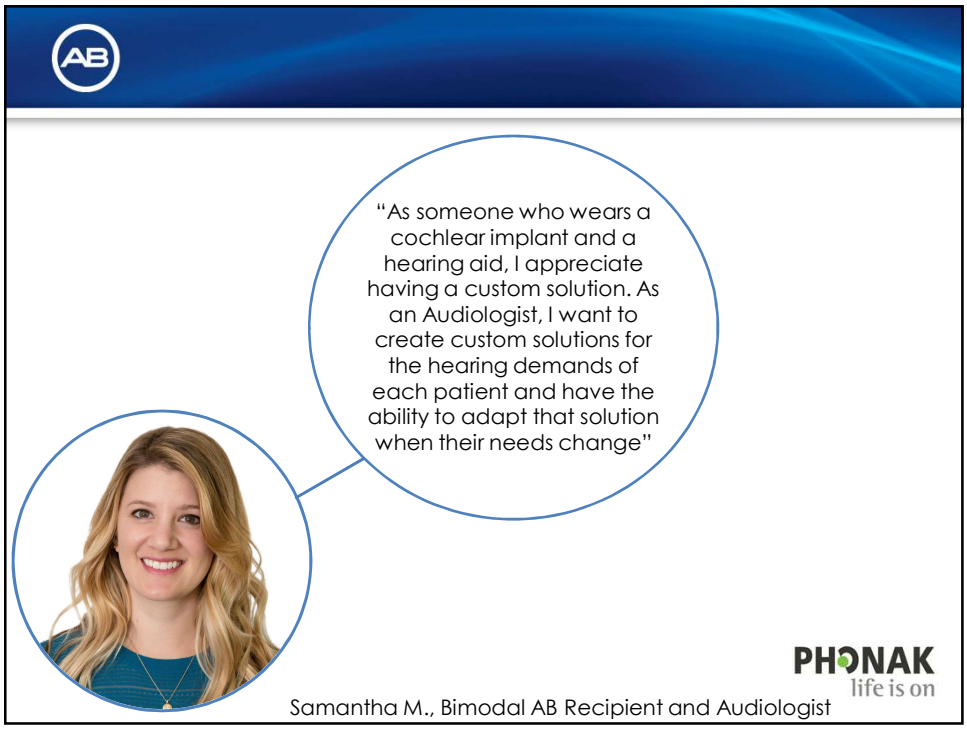
See Reference 3


"As someone who wears a cochlear implant and a hearing aid, I appreciate having a custom solution. As an Audiologist, I want to create custom solutions for the hearing demands of each patient and have the ability to adapt that solution when their needs change"
PHONAK
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Samantha M., Bimodal AB Recipient and Audiologist

"Wearing a hearing aid and a cochlear implant has been an answer to my prayers. The two devices communicate with each other and make it really easy to hear and to use. I get to keep using my favorite features in both ears and can even use the same remote control and accessories with both devices. I don't worry about my hearing anymore. I just enjoy the fact that I have my life back and can be a part of the conversation!"

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Steve D., Bimodal AB Recipient

Naída CI Hearing Solutions

CI candidates

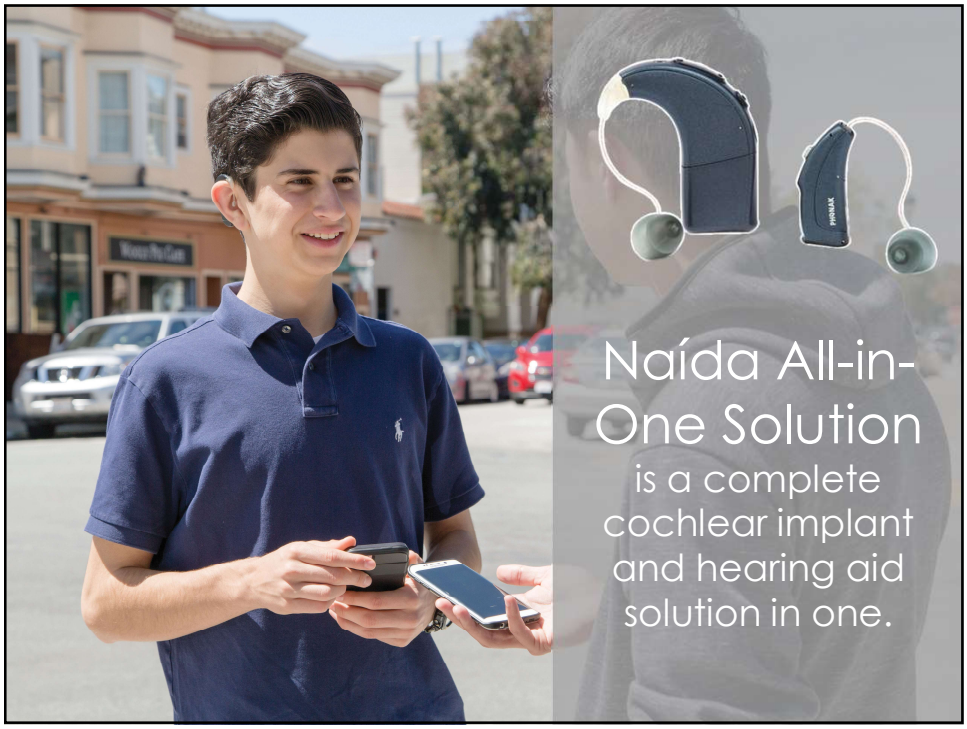
CI candidates with no hearing | **CI candidates with some hearing**

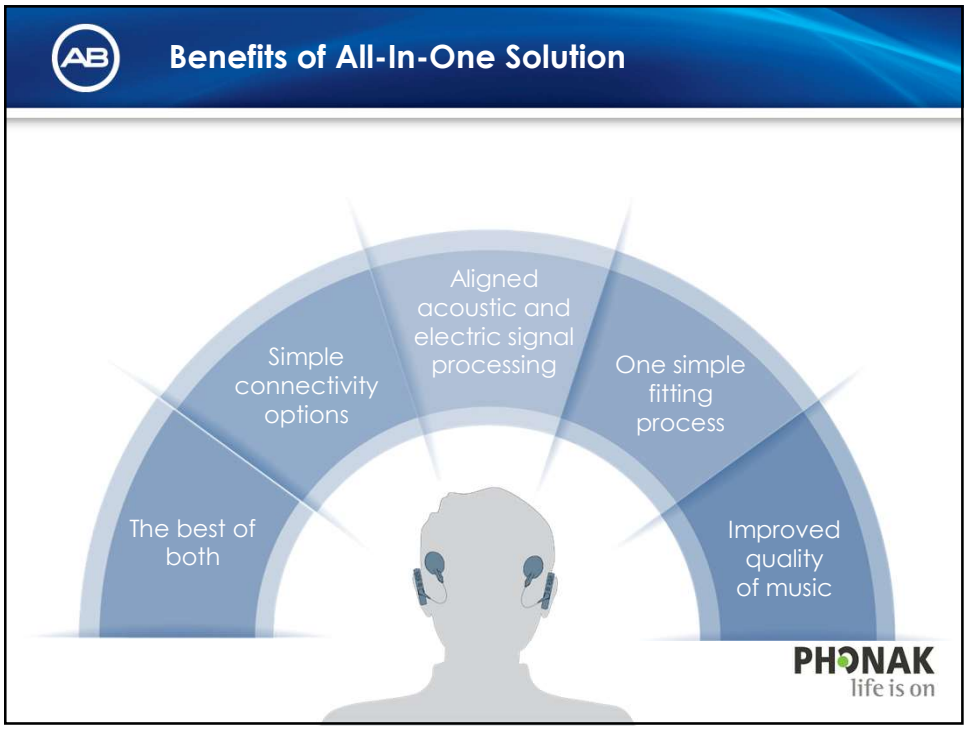
Naída CI Bilateral Solution

Naída Link CROS Solution

Naída Link Bimodal Solution

Naída CI All-In-One Solution


Naída All-in-One Solution
is a complete cochlear implant and hearing aid solution in one.


Benefits of All-In-One Solution
Aligned acoustic and electric signal processing
Simple connectivity options
One simple fitting process
The best of both
Improved quality of music
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All-In-One Sound Processor

Naída CI Q90

Naída™ CI Q90
Acoustic Earhook

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All-In-One Sound Processor

Naída CI Q90

Acoustic Mode provides low frequency amplification.

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All-In-One Sound Processor

Naída CI Q90

T-Mic 2
Microphone

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All-In-One Sound Processor

Naída CI Q90

Electric Mode is available if hearing changes over time.

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Davide S., All-In-One Solution AB Recipient

"I wear it while I am playing piano without suffering any distortion, and the high pitched sounds are now better defined."

"It makes the music sound richer and notes are a little more distinct."

Dwayne C., All-In-One Solution AB Recipient

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Naída CI Hearing Solutions

Naída CI Bilateral Solution

Naída Link CROS Solution

Naída Link Bimodal Solution

Naída CI All-In-One Solution

Learn More

Naída Link Bimodal Hearing Solution:
https://www.audiologyonline.com/ce/advanced-bionics/events/details/27557/the-latest-developments-from-ab-27557

Naída Link CROS Solution:
https://www.advancedbionics.com/us/en/campaign/screencast/naida-link-cros.html
https://www.audiologyonline.com/audiology-ceus/course/simple-way-to-hear-more-29837

Advanced Bionics Training Library:
https://www.advancedbionics.com/us/en/home/professionals/training-library.html

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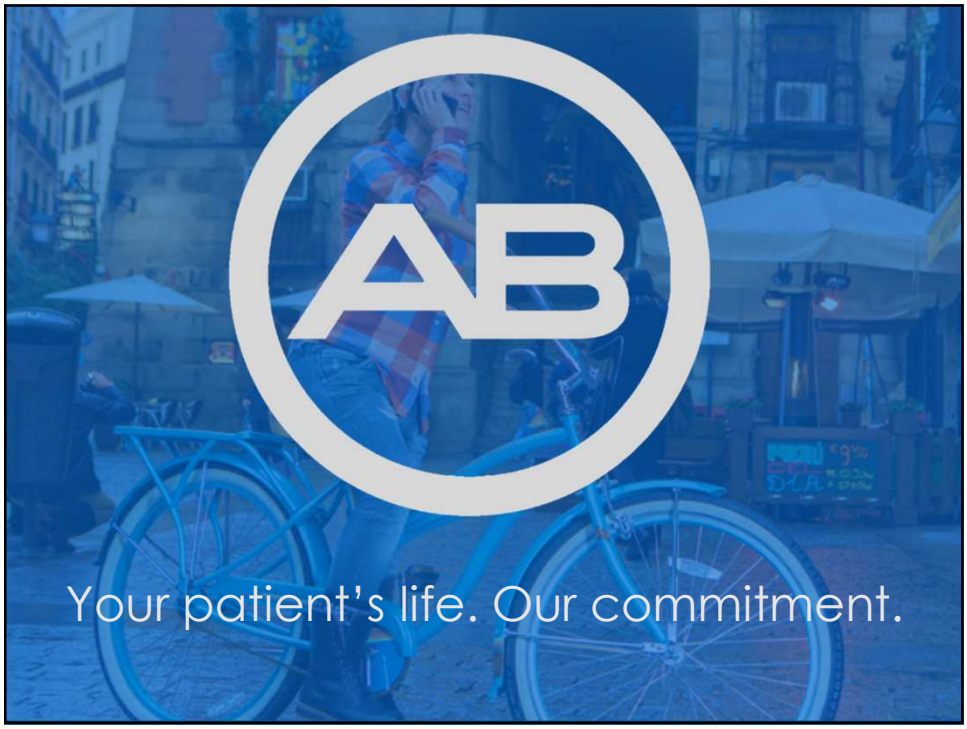
Reach out.
Tune in.
Stay Connected.

Why AB
Platform built for innovation and performance
Support and mentorship throughout the hearing journey
The most complete portfolio of solutions on the market
Premiere connectivity options to address challenging environments



References

1. Advanced Bionics. Instructions for Use, HiResolution™ Bionic Ear System
2. Basura GJ, Eapen R, Buchman CA. (2009) Bilateral cochlear implantation: current concepts, indications, and results. Laryngoscope 119(12):2395-2401.
3. Blackwell DL, Lucas JW, Clarke TC. Summary health statistics for U.S. adults: National Health Interview Survey, 2012 (PDF). National Center for Health Statistics. Vital Health Stat 10(260). 2014.
4. Carvalho, L. R. de L., Lichtig, I., & Couto, M. I. V. (2012). Evaluation of the benefit of amplification in children fitted with hearing aids. International Archives of Otorhinolaryngology, 16(2), 170–178.
5. Centers for Disease Control and Prevention (CDC). Identifying infants with hearing loss - United States, 1999-2007. MMWR Morb Mortal Wkly Rep. 59(8): 220-223.
Vohr B. Overview: infants and children with hearing loss—part I. Ment Retard Dev Disabil Res Rev. 2003;9:62–64.
6. Chang SA, Tyler RS, Dunn CC, Ji H, Witt SA, Gantz B, Hansen M. (2010) Performance over time in adults with simultaneous bilateral cochlear implants. Journal of the American Academy of Audiology 21(1):35-43
7. Cheng A., Rubin H.R., Powe N.R., Mellon N.K., Francis H.W., Niparko J.K. 2000. Cost-utility of the cochlear implant in children. JAMA, 204(7): 851–856

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References

8. Downing, S. (2017) NSR, A Feasibility Study for the Development of a Bimodal Hearing System, Data on File.
9. Dunn, C, et al. (2008) Comparison of Speech Recognition and Localization Performance in Bilateral and Unilateral Cochlear Implant Users Matched on Duration of Deafness at Age of Implantation. Ear and Hearing. 29 (3): 352–359
10. Dunn CC, Tyler RS, Witt S, Ji H, Gantz BJ. (2012) Sequential bilateral cochlear implantation: speech perception and localization pre- and post-second cochlear implantation. American Journal of Audiology 21(2):181-189.
11. Francis H.W., Chee N., Yeagle J., Cheng A., Niparko J.K. 2002. Impact of cochlear implants on the functional health of older adults. Larynoscope, 112(8Pt1): 1482–1488
12. Frisbee, S. (personal communication)
13. Frohne-Büchner C, Büchner A, Gärtner L, Battmer R, Lenarz T. (2004) Experience of uni- and bilateral cochlear implant users with a microphone positioned in the pinna. International Congress Series 1273:93 -96.
14. Gifford RH, Dorman MF, Shallop JK, Sydlowski SA. (2010) Evidence for the expansion of adult cochlear implant candidacy. Ear and Hearing; 31(2):186-94

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References

15. Hoffman HJ, Dobie RA, Losonczy KG, Themann CL, Flamme GA. Declining Prevalence of Hearing Loss in US Adults Aged 20 to 69 Years(link is external). JAMA Otolaryngology – Head & Neck Surgery. December 2016 online.
16. Koch DB, Soli SD, Downing M, and Osberger MJ. (2009) Simultaneous Bilateral Cochlear Implantation: Prospective Study in Adults. Cochlear Implants International (February 26), Cochlear Implants International, n/a. doi: 10.1002/cii.413
17. Kochkin S. (2010) MarkeTrak VIII: Consumer satisfaction with hearing aids is slowly increasing. The Hearing Journal 63(1): 19-32.
18. Kohlberg H, Sheffield S, Davis T, Sunderhaus L, Gifford R. (2015) Cochlear implant microphone location affects speech recognition in diffuse noise. Journal of the American Academy of Audiology 26:51 -58.
19. Lin FR, Niparko JK, Ferrucci L. Hearing loss prevalence in the United States.(link is external) [Letter] Arch Intern Med. 2011 Nov 14; 171(20): 1851-1852.
20. Luntz M, Egra-Dagan D, Attias J, Yehudai N, Most T, Shpak T. (2014) From hearing with a cochlear implant and a contralateral hearing aid (CI/HA) to hearing with two cochlear implants (CI/CI): a within-subject design comparison. Otology and Neurotology 35(10):1682-1690.
21. Mitchell RE, Karchmer MA. Chasing the mythical ten percent: Parental hearing status of deaf and hard of hearing students in the United States.(link is external) (PDF) Sign Language Studies. 2004;4(2):138-163.

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References

22. Mosnier I. , Flament J., Amar-Haziza D., Mathias N., Sterkers O. (2017). Benefits of using a Contralateral Routing of Signals (CROS) system in unilateral cochlear implant users. International Federation of Otorhinolaryngological Societies (IFOS2017), Paris, France. Poster.
23. National Institute on Deafness and Other Communication Disorders, 2012.
24. NIDCD Epidemiology and Statistics Program staff: (1) using data from the 1999-2010 National Health and Nutrition Examination Survey (NHANES); (2) applying the definition of disabling hearing loss used by the 2010 Global Burden of Disease Expert Hearing Loss Team (hearing loss of 35 decibels or more in the better ear, the level at which adults could generally benefit from hearing aids).
25. Raman G, Lee J, Chung M, Gaylor JM, Sen S, Rao M, Lau J, Poe DS, Neault MW. (2011) Effectiveness of Cochlear Implants in Adults with Sensorineural Hearing Loss. Agency for Healthcare Research and Quality, Rockville (MD).
26. Reeder RM, Firszt JB, Holden LK, Strube MJ. (2014) A longitudinal study in adults with sequential bilateral cochlear implants: time course for individual ear and bilateral performance. Journal of Speech Language and Hearing Research 57(3):1108-1126.
27. Roberts WM, Howard J, Hudspeth AJ. (1988) Hair Cells: Transduction, Tuning, and Transmission in the Inner Ear. Annual Review of Cell Biology 4:1, 63-92
28. Silburt HW, Holmes AE. (2015) Bimodal Programming: A Survey of Current Clinical Practice. American Journal of Audiology 24(2):243-9

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References

29. Veugen LC, Chalupper J, Snik AF, van Opstal AJ, Mens LH. (2016) Matching Automatic Gain Control Across Devices in Bimodal Cochlear Implant Users. Ear and Hearing:37(3):260-70.
30. Wolfe J, Morais M, Schafer E, Mills E, Goldbeck F, Marquis F, John A, Hudson M, Peters BR, Lianos L. (2013) Evaluation of speech recognition of cochlear implant recipients using a personal digital adaptive radio frequency system. J Am Acad Audiology. 24(8): 714-24.
31. Wolfe J, Schafer E Agrawal S, Koch, D (2015). Evaluation of Speech Recognition of Cochlear Implant Recipients Using Adaptive, Digital Remote Microphone Technology and a Speech Enhancement Sound Processing Algorithm. Journal of the American Academy of Audiology.
32. Zeitler D, et al. (2008) Speech Perception Benefits of Sequential Bilateral Cochlear Implantation in Children and Adults: A Retrospective Analysis. Otology & Neurotology. 29 (3): 314–325.

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