Accessing More of Life’s Conversations: Wireless Accessories for Individuals with Hearing Aids and Cochlear Implants

AzTAP’s 18th Assistive Technology Summer Institute
Agenda

- Advanced Bionics and Phonak
- Introduction to hearing loss
- Challenges associated with hearing loss
- Hearing aid vs. cochlear implant
- Wireless accessories to improve communication
At Sonova we envision...

A WORLD WHERE EVERYONE ENJOYS THE DELIGHT OF HEARING AND THEREFORE LIVES A LIFE WITHOUT LIMITATIONS

...Hear the World
The Power of Two Working Together as One

The innovation DNA of AB and Phonak have combined to deliver performance technologies that will change the way you hear.
Phonak

- 70 Years of Service
- U.S. Headquarters in Warrenville, IL
Advanced Bionics

- Founded in 1993
- Headquarters in Valencia, CA
- Global leader with operations in over 50 countries
- Sister companies innovating with Phonak under Sonova
- *Your Life. Our Commitment.*
We want to hear from you…
Introduction to Hearing Loss
Hearing Loss

Did you know?

Hearing is the first sense to develop in the womb.
About 360 million people are affected by hearing loss. Half of all cases could be avoided through prevention and medical treatment.

Even people with mild hearing loss experience difficulties, such as following a conversation or a business meeting, especially in a noisy environment.

Reasons why people lose hearing are:
- Age
- Exposure to noise
- Illness
- Medicine or drugs
Children have special hearing needs: By the age of three, they need to hear approximately 30,000 words each day to develop the language needed for success in school.*

Hearing Loss Facts

- About 1/3 of all people with hearing loss are of retirement age.
- The majority of people with hearing loss are of school-going or working age.
- Studies show that only 1 in 5 people who would benefit from a hearing aid actually uses one.
How do we hear?

Sound waves enter the ear canal and cause the eardrum and middle ear bones to vibrate. This sends an electrical signal from the inner ear, via the hearing nerve to the brain.
How do we hear?

Reasons for hearing loss

Outer ear:
- Cerumen, infections, perforations

Middle ear:
- Infections, fluid, otosclerosis, tumors

Inner ear:
- Aging, noise exposure, toxic medication, injuries, tumors
Cochlear hair cells
The Motion of Hearing
Conductive hearing loss
Sensorineural hearing loss
Typical warning signs of hearing loss

- Difficulty hearing from a distance
- Problems hearing speech in the presence of background noise
- Others find the affected person speaks too loudly
- Other people appear to mumble
- Family or neighbor complains that radio or TV is played too loudly
- Difficulty understanding soft speech or female and children’s voices
- Often having to ask people to repeat themselves
- Inability to hear common sounds in the household, such as alarm clock, water-tap dripping, etc.
Hearing loss in everyday life

Hearing loss can range from mild to profound.

<table>
<thead>
<tr>
<th>Frequency (Hz)</th>
<th>Low Pitched</th>
<th>High Pitched</th>
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<tbody>
<tr>
<td>125</td>
<td>m</td>
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<td>250</td>
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- **Normal hearing**
- **Mild hearing loss** (20–40 dB HL)
- **Moderate hearing loss** (40–60 dB HL)
- **Moderately-severe hearing loss** (60–75 dB HL)
- **Severe hearing loss** (75–95 dB HL)
- **Profound hearing loss** (95+ dB HL)

Partners for Better Hearing
Problems caused by hearing loss

- Hearing loss can cause changes to the body’s immune system
- Working people with hearing loss tend to have more sick leave than those with normal hearing

<table>
<thead>
<tr>
<th>Life factor</th>
<th>Impact</th>
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<tbody>
<tr>
<td>Health</td>
<td>• Fatigue due to listening effort (e.g. in noisy surroundings)</td>
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<td>• Frustration, depression</td>
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<td>• Anger</td>
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<td>• Increased frequency of illness and hospital visits</td>
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<td>• Impaired memory and ability to learn new tasks</td>
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<td>• Significantly increased risk of developing dementia</td>
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<td></td>
<td>• Diminished psychological and overall health</td>
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<td>Interpersonal</td>
<td>• Misunderstandings</td>
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<td>• Loneliness, social isolation</td>
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<td>• Reduced job performance and salary</td>
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<td>• Impact on travel, activities with friends, events</td>
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<tr>
<td>Safety</td>
<td>• Traffic</td>
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<td>• Alarms</td>
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</table>
Key facts about hearing loss

• 65% of people with hearing loss are younger than 65 years of age.

• People typically wait 5-7 years after first experiencing hearing loss symptoms before seeking help.

• Hearing loss is twice as common in adults with diabetes as in those without diabetes.

• Hearing loss is associated with a 24% increase in risk of cognitive decline compared to normal hearing.

• Untreated hearing loss is associated with an average annual income loss of $30,000 compared to normal hearing. Fitting a hearing aid reduces this deficit by more than 50% ($16,000)
Impact of Hearing Loss

Helen Keller (1880–1968)

“When you lose your eyesight, you lose contact with things.

When you lose your hearing, you lose contact with people.”
The importance of hearing

Every one of us hears the world and experiences sound differently – but the importance of hearing is clear.
What do you gain through hearing?

Ability to make memories, learn language, connect with others and more…
Positive effects of better hearing

“How much of a positive impact have hearing aid(s) had in these aspects of your life?”

- **81.1%** General quality of life has improved
- **69.7%** Relationship with partner has improved
- **35.5%** Love life has improved
- **38.3%** Physical health has improved

Hear the World Study, 2011. n(HI) – 915. Percent of top 3 boxes (a little/significantly/very much so)
Adults with severe to profound hearing loss have a tremendous potential for an improved quality of life after receiving a cochlear implant.

- improved emotional health*
- reduced isolation*
- expanded options in education, social life and work

Hearing Aid versus Cochlear Implant
Common treatments for hearing loss

Hearing Aids

Cochlear Implant System
How do hearing aids work?

Acoustically amplify sound, relying on the responsiveness of surviving hair cells.
When hearing aids are not enough
How do cochlear implants work?

Bypass damaged hair cells and stimulate the nerve directly.
Adult Outcomes with Cochlear Implants

- Pre-CI speech scores
  ✓ ≤50% HINT Quiet

- Post-CI speech scores\(^1\)
  ✓ 90% HINT Quiet

Two are better than one!
Hearing with Two Ears
Facts we know about bimodal...

- Two ears are better than one
- Richer, fuller sound experience
- Improved speech understanding in quiet
- Improved speech understanding in noise
- Increased music quality & enjoyment
Made for Each Other

**EASY** to hear

**EASY** to use

**EASY** to connect

**EASY** to communicate
The Phonak and Advanced Bionics Wireless Accessories Portfolio
But first, let’s take a step back

- Let’s talk a little bit about Bluetooth
Most of us already use Bluetooth on a daily basis

- Bluetooth is used for a variety of applications, such as:
  - Wireless control and communication between a mobile phone and a wireless headset
  - Wireless communication between computers and input devices, such as keyboards, printers and mice
  - Wireless replacement of serial port applications, such as GPS receivers and medical devices (i.e. – HiPro boxes)
  - Wireless networking of computers, where small amounts of information exchange occur
Bluetooth transfer of information

• It uses an unlicensed radio frequency bandwidth of 2.4 – 2.485GHz

• However, many devices currently operate in the 2.4GHz range so interference can occur

• Is omni-directional and is able to penetrate solid objects
Why is Bluetooth useful for people with hearing aids and CI’s?

- Connectivity to multiple devices
- Hands Free
Why wireless accessories?

- Significant benefits in challenging listening situations
  - 40% more speech understanding on the phone*
  - Hear TV directly in full stereo quality
  - Listening over distance

Phonak Wireless Communication Portfolio

Phone
- EasyCall II
- DECT II
- ComPilot II
- ComPilot Air II

Conversation
- RemoteMic
- Roger Clip-On Mic
- Roger Pen
- Roger EasyPen

TV and music
- TVLink II
- Roger

Control
- PilotOne II
- RemoteControl App

Partners for Better Hearing
Let’s take a look at Phone Solutions
Phonak DECT II cordless phone
Introducing Phonak DECT II cordless phone

- Easy to operate, set-up and use
- Instantly demonstrate the benefits of hearing in both ears
- Optimal (40% more) speech understanding on the phone
- Binaural transmission of the sound simultaneously to both ears
- Reduced noise and maximum understanding
Phonak DECT II description

- Easy-to-operate volume buttons on the side
- Volume boost button OR Demo button
- Speakerphone mode
- Easy-to-use keys
- AM/PM option
- Direct dial key
- Night illumination

PH NAK Partners for Better Hearing
Phonak DECT Phone

“The home and small office solution”
Phonak EasyCall II
Phonak EasyCall II

• The universal cell phone streamer
• Connects to **ANY** Bluetooth-enabled phone
  – including non-smartphones

• 2 versions:
  – EasyCall II for Venture/Belong
  – EasyCall for Spice+ / Quest
Phonak EasyCall II description

- Silicone protective ring
- Micro USB charging port
- Microphone opening
- Main button
Phonak EasyCall

“The cell phone solution”
ComPilot Air II
ComPilot Air II

- The clip-on audio streamer
- Neckloop-free design
- For Bluetooth connectivity
- Simple hearing aid remote control
- RemoteControl App compatible
- Direct dial preferred number feature
- 4 Hour streaming time
Phonak ComPilot Air II description

- Light indicator
- On/Off slider
- Main button
- Mini USB charging port
- Volume controls
- Description
ComPilot Air II improved usability

- Faster, seamless operation
- Integrated instant streaming demonstration capability
- Support two phones parallel, even if TVLink II or RemoteMic is active
- Streaming distance: 16 inches
- Volume control long press for hearing instrument microphone attenuation

Long press volume up to restore hearing aid microphones

Long press volume down to attenuate surrounding sound
Phonak ComPilot II
Great new features!

- Multi-purpose streamer
- Integrated instant streaming demonstration capability
- “Directly call a preferred number” feature
- 24 hours streaming time
- Volume control long press for hearing instrument microphone attenuation
- Supports two phones in parallel while connected to TVLink II or RemoteMic
- RemoteControl App compatible
ComPilot II and ComPilot Air II comparison

- 24 hours streaming time
- Directional microphones
- 3.5 mm and FM/Roger receivers inputs
- Home button

→ TV, phone & music oriented

or

- No neck loop
- Around 4 hours streaming time
- Focus only on Bluetooth

→ Phone & TV oriented
Let’s look at TV and music solutions

Phone

- EasyCall II
- DECT II
- ComPilot II
- ComPilot Air II

TV and music

- TVLink II
- Roger

AB PHONAK | Partners for Better Hearing
The new TVLink II basestation

- Input signal automatically selected
  - Optical (“Toslink”)
  - Digital Coaxial (“SPDIF”)
  - Analog
- HDMI is not supported
- Fully backward compatible to previous ComPilot
Phonak TVLink II description

- New housing design
- New exchangeable charging slot
- Dedicated pairing button
- Indicator lights for selected input
- Mini USB power input
- Audio inputs
  - Digital optical
  - Digital coaxial
  - Analog
- On/Off button & Main indicator light
- Volume control
Phonak TVLink II

“The ideal TV and music interface”
Listening to TV with Roger docking station

• Charging station
• Automatic detection of an audio signal (even when device is OFF)
  – Powers down if no audio signal for 45 seconds
  – No power down even during soft music
Let’s look at conversation solutions

**Phone**
- EasyCall II
- DECT II
- ComPilot II
- ComPilot Air II

**Conversation**
- RemoteMic
- Roger Clip-On Mic
- Roger Pen
- Roger EasyPen

**TV and music**
- TVLink II
- Roger
Listening over distance – RemoteMic v2.0
The Phonak RemoteMic v2.0

- ComPilot II and ComPilot Air II compatible
- New default volume level 8 (previously 11)
- Ideal for a distant speaker over large distance up to 20 m (60 ft)
Phonak RemoteMic description

- Power switch
- New green color
- Microphone opening
- Retaining clip
- Volume buttons
- Light indicator
Phonak RemoteMic

“The wireless solution for one-on-one conversation”
Why Roger?

- **Noise**
  - Loud environment
  - Noisy environment
  - Quiet environment
  
- **Face-to-face discussions,** e.g. in a small café, at home

- **Remote Mic**
  
- **Hearing in noise and over distance,** e.g. in noisy restaurants

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**StereoZoom**

**Directional microphones**

**Omni microphone**

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**Near Field - less than 5ft**

**Far Field - more than 5ft**
Roger vs. Phonak RemoteMic

- While both Roger and RemoteMic can overcome the negative effects of distance on speech understanding, Roger provides some additional benefits:
  - Optimizes SNR at the source with beamforming directional microphones
  - Adaptively mixes the wireless microphone signal with the microphone of the hearing instrument by increasing the gain of the Roger receiver in noisy environments
  - Reduces the gain when no speech is present
Difference in speech understanding
Roger Clip-On Mic vs. Phonak RemoteMic

Speech recognition score (in %)

Roger Clip-On Mic
Phonak RemoteMic

Noise level in dB(A)

Jace Wolfe, 2014, Wireless Microphone Comparison
Examples of 70 dB environments

- Bustling kitchen with dishwasher or garbage disposal running
- Average restaurant
- Traffic noise inside of a car at 65 miles per hour
- Vacuum from 10 feet away
Roger benefits

Performance
- Sound Quality
- Speech understanding in noise and over distance
- Adaptive behavior
- Roger Directional

Ease of Use
- Simple - No programming required
- Automatic mic mode
- RogerReady
- No frequency planning - 2.4 GHz

Multi-functionality
- One device for everything
- TV/multimedia connectivity
- Wideband Bluetooth (Roger pen)
- Expandable multi-talker network

Design
- Discreet
- Cool design
- Appealing colors
Roger Uses

- Office Meeting
- Playground
- Lecture
- Music
- TV
- Noisy Street
- Family Gathering
- Restaurant/Bar
- Calls on the Go
Roger Microphones

<table>
<thead>
<tr>
<th>Roger Pen</th>
<th>Roger EasyPen</th>
<th>Roger Clip-On Mic</th>
</tr>
</thead>
<tbody>
<tr>
<td>A discreet, wireless Roger microphone that delivers</td>
<td>An easy-to-use wireless microphone for one-on-one or group conversations,</td>
<td>A discreet and lightweight stand-alone microphone for a conversation partner,</td>
</tr>
<tr>
<td>It’s the ideal solution for an all-inclusive listening</td>
<td></td>
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<tr>
<td>experience including Bluetooth™ connectivity.</td>
<td></td>
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</tr>
</tbody>
</table>
Roger Pen in detail

- Micro USB socket
- Mic Mode
- Connect
- On-Off
- Bluetooth for smartphone connection
Roger EasyPen in detail

- Micro USB socket
- Microphone
- Connect
- On-Off
- Bluetooth for smartphone connection
## Automatic microphone modes

<table>
<thead>
<tr>
<th></th>
<th>Conference</th>
<th>Interview</th>
<th>Lanyard</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Orientation</strong></td>
<td>Horizontal</td>
<td>In-between</td>
<td>Vertical</td>
</tr>
<tr>
<td><strong>Noise level</strong></td>
<td>Quiet (&lt;70dB)</td>
<td>Noise (&gt;70dB)</td>
<td>Quiet, Noisy</td>
</tr>
<tr>
<td><strong>Pickup distance</strong></td>
<td>Up to 10 feet all around</td>
<td>Up to 3 feet frontal</td>
<td>13 feet, 3 feet, 8 inches</td>
</tr>
<tr>
<td><strong>Signal processing</strong></td>
<td>Omni</td>
<td>Fixed Beamformer</td>
<td>NEW adaptive Beamformer, As Roger inspiro with iLapel</td>
</tr>
</tbody>
</table>
Roger Clip-On Mic in detail

- Micro USB socket
- Connect
- On-Off
Listening to Multimedia via the Audio Cable

- Roger microphone needs to be switched on first
- Instant broadcasting of audio signal when audio is played
  - Microphones are muted
  - Device remains in audio mode until cable is unplugged or Roger microphone is switched off
Listening to multimedia via docking station

- Docking station included with Pen or Clip-On Mic
- Charging station
- Automatic detection of an audio signal (even when device is OFF)
  - Powers down if no audio signal for 45 seconds
  - No power down even during soft music
MultiTalker Network option
Roger Table Mic

• Roger Table Mic is a dedicated microphone for meetings
• Designed purely for use on a table
• Extending the existing Roger for adult portfolio including Roger Pen, Roger EasyPen and Roger Clip-On Mic
• Simple - only two buttons
• Combining multiple Roger Table Mics will make it possible to cover large meeting rooms with many participants
Roger Receivers

Roger Design Integrated

Roger X

Roger MyLink
Universal Roger receivers

- Roger X

- Roger MyLink

- BTE’s and RIC’s with DAI (direct audio input)
- Streamers with 3-pin Euro-plug
Roger X is the world’s smallest universal receiver at 0.83 cm³

Compatible with BTEs, CIs, BAHAs, Streamers

Roger X works fully automatically, no buttons, no programmer

Operating Range 20m / 66ft

Power consumption
Active mode: 3 mA

Roger X MLxi
Roger MyLink features

- Volume control and on/off button
- Quick charging 80% in 1 hour, 100% in 2 hours
- Operating time: 10 hours
- Operating range: 20m /66 ft
- Can also be used with headphones
Roger Focus

- Unilateral hearing loss
- Minimal hearing loss
- Auditory processing disorder
- ADHD
- Autism
- Dyslexia
Phonak Roger

“The wireless solution for listening in loud noise and over a distance”
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AB | PHONAK | Partners for Better Hearing
Phonak Wireless Communication Portfolio

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**TV and music**
- TVLink II
- PilotOne II
- RemoteControl App

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**Control**
Wireless Solutions

Phone
- EasyCall
- DECT Phone
  - ComPilot
  - Roger Pen

Conversation
- Roger Clip-On Mic
- Roger Pen

TV and Music
- RemoteMic
- Roger

Control
- AB myPilot
- ComPilot
Questions?